

## Science Process Skills Overview

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<b>Science Process Skills</b>		
<b>SPS1– Scientific Inquiry and Critical Thinking Skills (INQ)</b>		
	<b>By the end of Grade 2, all students will...</b>	<b>By the end of Grade 4, all students will apply skills from previous grades and...</b>
1. MAKING OBSERVATIONS AND ASKING QUESTIONS	<p>S:SPS1:2:1.1 Make observations and explore materials using all of their senses (one sense at a time).</p> <p>S:SPS1:2:1.2 Record observations using language, concrete objects, and symbolic representations.</p> <p>S:SPS1:2:1.3 Ask questions about objects, organisms and events in their immediate environment.</p> <p>S:SPS1:2:1.4 Ask questions that lead to exploration and investigation as a result of working with materials and objects.</p> <p>S:SPS1:2:1.5 Sort and classify object materials and events based on one or more attributes; and explain the methods used for sorting.</p>	<p>S:SPS1:4:1.1 Extend the senses using simple tools.</p> <p>S:SPS1:4:1.2 Make and record observations for a given purpose.</p> <p>S:SPS1:4:1.3 Differentiate between observations and inferences.</p> <p>S:SPS1:4:1.4 Record observations using standard units of measurement.</p> <p>S:SPS1:4:1.5 Classify according to several attributes and describe or show the method for classification.</p> <p>S:SPS1:4:1.6 Compare methods of classifying based on the goal.</p> <p>S:SPS1:4:1.7 Ask questions about objects, organisms and events in their local environment.</p> <p>S:SPS1:4:1.8 Pose questions to investigate and practical problems to solve.</p>
2. DESIGNING SCIENTIFIC INVESTIGATIONS	<p>S:SPS1:2:2.1 Select tools and procedures, in a purposeful way, to explore objects and materials.</p> <p>S:SPS1:2:2.2 Suggest a plan and describe a sequence of events for conducting an exploration.</p> <p>S:SPS1:2:2.3 Predict how changing one part of an exploration will affect the outcome.</p>	<p>S:SPS1:4:2.1 Plan a step-by-step process to solve a practical problem or to carry out a “fair test” of a simple scientific question.</p> <p>S:SPS1:4:2.2 Select an activity and justify it as an effective means of collecting appropriate data.</p>
3. CONDUCTING SCIENTIFIC INVESTIGATIONS	<p>S:SPS1:2:3.1 Follow their own plan for conducting an investigation.</p> <p>S:SPS1:2:3.2 Follow a simple step-by-step procedure.</p>	<p>S:SPS1:4:3.1 Follow a set of procedures.</p> <p>S:SPS1:4:3.2 Plan and test ideas through guided experiments.</p> <p>S:SPS1:4:3.3 Identify and use appropriate tools.</p>

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4. REPRESENTING AND UNDERSTANDING RESULTS OF INVESTIGATIONS	<p>S:SPS1:2:4.1 Represent and interpret information and observations in many ways (such as in tally, pictographs, bar graphs, tables).</p> <p>S:SPS1:2:4.2 Identify and describe patterns and relationships in observed objects and events.</p>	<p>S:SPS1:4:4.1 Compile and display data in a variety of formats.</p> <p>S:SPS1:4:4.2 Select an appropriate format to represent data or observations.</p> <p>S:SPS1:4:4.3 Identify and suggest possible explanations for patterns.</p> <p>S:SPS1:4:4.4 Analyze data and identify discrepancies.</p>
5. EVALUATING SCIENTIFIC EXPLANATIONS	<i>None at this level.</i>	<p>S:SPS1:4:5.1 Cite evidence or data to support conclusions.</p> <p>S:SPS1:4:5.2 Determine if an observation or measurement supports a given scientific explanation.</p> <p>S:SPS1:4:5.3 Draw a conclusion to answer an initial question, based on the evidence collected.</p>
<p>NECAP ASSESSMENT TARGETS FOR INQUIRY</p> <p><i>MAY BE SUBJECT OF PERFORMANCE COMPONENT</i></p>		<p style="text-align: center;"><b>NECAP ASSESSMENT TARGETS</b></p> <p>S:ESS1:4:2.4      S:ESS1:4:5.2                      S:ESS1:4:6.4      S:LS1:4:1.2                      S:PS1:4:2.5      S:PS2:4:3.8                      S:PS3:4:2.1      S:PS3:4:1.5</p> <p>(For actual text: please see GSE's for Earth Space, Life, and Physical Science.)</p>

<b>Science Process Skills</b>		
<b>SPS2– Unifying Concepts of Science</b>		
	<b>By the end of Grade 2, all students will...</b>	<b>By the end of Grade 4, all students will apply skills from previous grades and...</b>
1. NATURE OF SCIENCE (NOS)	<p>S:SPS2:2:1.1 Recognize that information can be obtained merely by careful observation, but sometimes even more data can be collected by conducting scientific investigations.</p> <p>S:SPS2:2:1.2 Discover that when a scientific investigation is done the way it was done before, we expect to get a very similar result.</p> <p>S:SPS2:2:1.3 Explain that sometimes people aren't sure what will happen because they don't know all the factors that may have an effect on the outcome.</p>	<p>S:SPS2:4:1.1 Recognize that sometimes scientists have different explanations for the same set of observations which usually lead them to make more observations to resolve the differences.</p> <p>S:SPS2:4:1.2 Realize that results of similar scientific investigations seldom turn out exactly the same, but if the differences are large it's important to try to figure out why.</p> <p>S:SPS2:4:1.3 Know when comparisons might not be fair because some conditions are not kept the same.</p> <p>S:SPS2:4:1.4 Explain that scientific investigations may take many different forms, including observing what things are like or what is happening somewhere, collecting specimens for analysis, and doing experiments; and that investigations can focus on physical, biological, and social questions.</p> <p>S:SPS2:4:1.5 Realize that scientists' explanations about what happens in the world come partly from what they observe, and partly from what they think.</p>
2. SYSTEMS AND ENERGY (SAE)	<p>S:SPS2:2:2.1 Show how most things are made of parts.</p> <p>S:SPS2:2:2.2 Observe that when parts are put together, they can do things that they couldn't do by themselves.</p> <p>S:SPS2:2:2.3 Explain that something may not work if some of its parts are missing.</p>	<p>S:SPS2:4:2.1 Demonstrate that if something consists of many parts, the parts usually influence one another.</p> <p>S:SPS2:4:2.2 Provide examples that demonstrate that something may not work well (or at all) if a part of it is missing, broken, worn out, mismatched, or misconnected.</p>

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3. MODELS AND SCALE (MAS)	<p>S:SPS2:2:3.1 Describe how a model of something is different from the real thing but can be used to learn something about the real thing.</p> <p>S:SPS2:2:3.2 Explain how one way to describe something is to say how it is like something else.</p> <p>S:SPS2:2:3.3 Provide examples to explain that things in nature and things people make have very different sizes, weights, ages and speeds.</p>	<p>S:SPS2:4:3.1 Know that seeing how a model works after changes are made to it may suggest how the real thing would work if the same changes were done to it.</p> <p>S:SPS2:4:3.2 Use geometric figures, number sequences, graphs, diagrams, and pictures as scientific models.</p> <p>S:SPS2:4:3.3 Recognize that most everything has limits on how big or small it can be.</p>
4. PATTERNS OF CHANGE (POC)	<p>S:SPS2:2:4.1 Discover that things change in some ways and stay the same in some ways.</p> <p>S:SPS2:2:4.2 Understand that people can keep track of some things by seeing where they come from and where they go.</p> <p>S:SPS2:2:4.3 Observe that things can change in different ways, such as in size, weight, color and movement.</p>	<p>S:SPS2:4:4.1 Observe that some small changes can be detected by taking measurements.</p> <p>S:SPS2:4:4.2 Understand that some changes are so slow or so fast that they are hard to see.</p> <p>S:SPS2:4:4.3 Demonstrate that some features of things may stay the same even when other features change (e.g., some patterns look the same when they are shifted over, turned, reflected, or seen from different directions).</p>
5. FORM AND FUNCTION (FAF)	<p>S:SPS2:2:5.1 Identify shape and use of objects.</p> <p>S:SPS2:2:5.2 Draw an object and the object in use.</p>	<p>S:SPS2:4:5.1 Discover the relationship between shape and use.</p> <p>S:SPS2:4:5.2 Explore methods, designs and problems of transporting liquids.</p>

<b>Science Process Skills</b>		
<b>SPS3– Personal, Social, and Technological Perspectives</b>		
	<b>By the end of Grade 2, all students will...</b>	<b>By the end of Grade 4, all students will apply skills from previous grades and...</b>
1. COLLABORATION IN SCIENTIFIC ENDEAVORS	<p>S:SPS3:2:1.1 Work with a partner to accomplish a specific task.</p> <p>S:SPS3:2:1.2 Take turns.</p> <p>S:SPS3:2:1.3 Ask questions of others about their work.</p>	<p>S:SPS3:4:1.1 Be able to complete an assigned task when given a specific role in a group.</p> <p>S:SPS3:4:1.2 Communicate ideas to others.</p> <p>S:SPS3:4:1.3 Give specific feedback about work of others.</p>
2. COMMON ENVIRONMENTAL ISSUES, NATURAL RESOURCES MANAGEMENT AND CONSERVATION	<p>S:SPS3:2:2.1 Use observation skills to describe the area around their homes and school.</p>	<p>S:SPS3:4:2.1 Demonstrate a basic conservation action such as recycling or a schoolyard habitat project.</p> <p>S:SPS3:4:2.2 Develop questions based upon their observations about the natural world and design a simple investigation.</p> <p>S:SPS3:4:2.3 Develop questions that help them learn about the environment; and design and conduct simple investigations.</p> <p>S:SPS3:4:2.4 Locate and collect information about the environment and environmental and natural resources topics.</p> <p>S:SPS3:4:2.5 Use reliable information to answer questions.</p> <p>S:SPS3:4:2.6 Organize information to search for relationships and patterns concerning the environment and environmental topics.</p> <p>S:SPS3:4:2.7 Identify and investigate issues in their local environments and communities.</p>

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<p>3. SCIENCE AND TECHNOLOGY, TECHNOLOGICAL DESIGN AND APPLICATION</p>	<p>S:SPS3:2:3.1 Demonstrate that all tools have a special purpose (e.g., to measure, to help in observations, to make things or to make things better).</p> <p>S:SPS3:2:3.2 Provide examples that highlight the importance of the planning phase of any project.</p> <p>S:SPS3:2:3.3 Identify multiple ways to solve a design problem.</p> <p>S:SPS3:2:3.4 Describe how most things are made up of multiple parts and explain that things may not work if some parts are missing.</p> <p>S:SPS3:2:3.5 Provide examples of how people throughout history have used legends and stories to explain how the world works.</p>	<p>S:SPS3:4:3.1 Describe the design process as a logical progression for transforming ideas into reality.</p> <p>S:SPS3:4:3.2 Describe how people have designed and used tools throughout history; and provide examples of how many of these tools, while improved, are still in use today.</p> <p>S:SPS3:4:3.3 Provide examples illustrating that throughout history, people of all ages and from all walks of life have made significant contributions to the fields of science and technology.</p>

<b>Science Process Skills</b>		
<b>SPS4– Science Skills for Information, Communication and Media Literacy (from <i>ICT Literacy Map for Science</i>, <a href="http://www.21stcenturyskills.org">www.21stcenturyskills.org</a>)</b>		
	<b>By the end of Grade 2, all students will...</b>	<b>By the end of Grade 4, all students will apply skills from previous grades and...</b>
1. INFORMATION AND MEDIA LITERACY	<p>S:SPS4:2:1.1 Have experience with a variety of media sources.</p> <p>S:SPS4:2:1.2 Use tools.</p> <p>S:SPS4:2:1.3 Use age-appropriate sources such as newspapers, books and websites.</p>	<p>S:SPS4:4:1.1 Access information from a variety of media sources (e.g., Internet, CD-ROM programs, print resources).</p> <p>S:SPS4:4:1.2 Use appropriate tools to measure and graph data.</p> <p>S:SPS4:4:1.3 Analyze and compare data from a variety of age-appropriate sources such as newspapers and websites.</p>
2. COMMUNICATION SKILLS	<p>S:SPS4:2:2.1 Communicate ideas and observations through a variety of tools and formats (e.g., oral, journal, drawing, projects, multimedia).</p>	<p>S:SPS4:4:2.1 Use a variety of tools and formats (oral presentations, journals, and multimedia presentations) to summarize and communicate the results of observations.</p>
3. CRITICAL THINKING AND SYSTEMS THINKING	<p>S:SPS4:2:3.1 Make observations and tell ideas about real-life issues.</p> <p>S:SPS4:2:3.2 Use pictures or other means to organize ideas.</p> <p>S:SPS4:2:3.3 Make a graph to represent data.</p>	<p>S:SPS4:4:3.1 Apply a variety of age-appropriate strategies to address real-life issues (e.g., identify factors that affect plants in a particular habitat).</p> <p>S:SPS4:4:3.2 Build a concept map (or other graphic organizer) to understand a complex problem.</p> <p>S:SPS4:4:3.3 Organize observations and data into tables, charts and graphs.</p>
4. PROBLEM IDENTIFICATION, FORMULATION, AND SOLUTION	<p>S:SPS4:2:4.1 Ask questions and take part in investigations.</p> <p>S:SPS4:2:4.2 Compile observations (one to one relationship) by making or using simple pictographs, tally charts or simple graphs.</p> <p>S:SPS4:2:4.3 Look for evidence to support ideas.</p>	<p>S:SPS4:4:4.1 Ask questions and plan investigations to find answers.</p> <p>S:SPS4:4:4.2 Compile data gathered through observations to record and present results using tally charts, tables and graphs.</p> <p>S:SPS4:4:4.3 Use evidence to construct explanations.</p>
5. CREATIVITY AND INTELLECTUAL CURIOSITY	<p>S:SPS4:2:5.1 Use computer software and various technologies as appropriate to display and communicate information and ideas.</p>	<p>S:SPS4:4:5.1 Use a variety of equipment and software packages to enter, process, display, and/or communicate information in different forms using text, tables, pictures, and sound (e.g., brainstorming software, collaboration software, telecommunications, presentation software, digital cameras, projectors).</p>

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6. INTERPERSONAL AND COLLABORATIVE SKILLS	S:SPS4:2:6.1 Plan and carry out simple activities with a group.	S:SPS4:4:6.1 Plan and conduct a scientific investigation in group settings.  S:SPS4:4:6.2 Engage in group decision making activities.  S:SPS4:4:6.3 Role-play different points of view on an issue.
7. SELF DIRECTION	S:SPS4:2:7.1 Keep a visual or written journal.	S:SPS4:4:7.1 Keep a journal record of observations, recognizing patterns, summarizing findings, and reflecting on the observations.
8. ACCOUNTABILITY AND ADAPTABILITY	S:SPS4:2:8.1 Take part in sharing information with another classroom or school as a group.	S:SPS4:4:8.1 Establish ongoing communication with students from other communities or countries to share and compare data.
9. SOCIAL RESPONSIBILITY	S:SPS4:2:9.1 Collaborate, as a group, with another classroom or school.	S:SPS4:4:9.1 Collaborate with other learners by letter, phone, or online.

<b>Science Process Skills</b>		
<b>SPS1– Scientific Inquiry and Critical Thinking Skills (INQ)</b>		
	<b>By the end of Grade 6, all students will apply skills from previous grades and...</b>	<b>By the end of Grade 8, all students will apply skills from previous grades and...</b>
<p>1. MAKING OBSERVATIONS AND ASKING QUESTIONS</p>	<p>S:SPS1:6:1.1 Make observations and record measurements using a variety of tools and instruments.</p> <p>S:SPS1:6:1.2 Plan observations based on a given purpose.</p> <p>S:SPS1:6:1.3 Identify and investigate similarities and differences among observations and sets of observations.</p> <p>S:SPS1:6:1.4 Use appropriate units and precision of metric measurement when recording data.</p> <p>S:SPS1:6:1.5 Use a classification key, such as a dichotomous key, to identify and distinguish among members of a group or set.</p> <p>S:SPS1:6:1.6 Construct a simple classification key.</p> <p>S:SPS1:6:1.7 Compare methods of classification for a specific purpose.</p> <p>S:SPS1:6:1.8 Ask questions about relationships between and among observations.</p> <p>S:SPS1:6:1.9 Determine which observations will be helpful to a given investigation.</p> <p>S:SPS1:6:1.10 Distinguish between those questions that can be answered by science and those that cannot.</p>	<p>S:SPS1:8:1.1 Use appropriate tools to accurately collect and record both qualitative and quantitative data gathered through observations (e.g., temperature probes, electronic balances, spring scales, microscopes, stop watches).</p> <p>S:SPS1:8:1.2 Determine the degree of accuracy that can be obtained using a given instrument.</p> <p>S:SPS1:8:1.3 Investigate similarities and differences noted when making observations.</p> <p>S:SPS1:8:1.4 Construct and use a dichotomous key to classify a given set of objects or organisms.</p> <p>S:SPS1:8:1.5 Evaluate methods of classification for a specific purpose.</p> <p>S:SPS1:8:1.6 Rephrase questions so that they can be tested or investigated using scientific methodologies.</p> <p>S:SPS1:8:1.7 Ask questions about relationships between and among observable variables.</p>

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2. DESIGNING SCIENTIFIC INVESTIGATIONS	<p>S:SPS1:6:2.1 Design and record a simple step-by-step procedure to follow in order to carry out a fair test of a scientific question.</p> <p>S:SPS1:6:2.2 Identify and utilize appropriate tools/technology for collecting data in designing investigations.</p> <p>S:SPS1:6:2.3 Incorporate components of good experimental design, such as controls and multiple trials, into investigations.</p>	<p>S:SPS1:8:2.1 Identify the manipulated, responding and controlled variables in an experiment.</p> <p>S:SPS1:8:2.2 Design a controlled experiment, identifying and controlling the major variables.</p> <p>S:SPS1:8:2.3 Identify flaws or omissions in the design of simple experiments.</p>
3. CONDUCTING SCIENTIFIC INVESTIGATIONS	<p>S:SPS1:6:3.1 Carry out simple student or teacher-developed procedures or experiments.</p> <p>S:SPS1:6:3.2 Use appropriate tools to collect and record data.</p> <p>S:SPS1:6:3.3 Follow the teacher’s instructions in performing experiments, following all appropriate safety rules and procedures.</p>	<p>S:SPS1:8:3.1 Use appropriate laboratory techniques to carry out student- or teacher-developed procedures or experiments.</p> <p>S:SPS1:8:3.2 Use appropriate tools to gather data as part of an investigation (e.g., ruler, meter stick, thermometer, spring scale, graduated cylinder, calipers, balance, probes, microscopes).</p> <p>S:SPS1:8:3.3 Follow the teacher’s instructions in performing experiments, following all appropriate safety rules and procedures.</p>

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4. REPRESENTING AND UNDERSTANDING RESULTS OF INVESTIGATIONS	<p>S:SPS1:6:4.1 Use appropriate tools to organize, represent, analyze and explain data.</p> <p>S:SPS1:6:4.2 Make and record observations using a pre-determined format.</p> <p>S:SPS1:6:4.3 Compare and display data in a variety of student or computer generated formats (such as diagrams, flow charts, tables, bar graphs, line graphs, scatter plots, and histograms).</p> <p>S:SPS1:6:4.4 Identify patterns and relationships in data and formulate basic explanations.</p> <p>S:SPS1:6:4.5 Draw appropriate conclusions based on data collected.</p>	<p>S:SPS1:8:4.1 Use appropriate tools (including computer hardware and software) to collect, organize, represent, analyze and explain data.</p> <p>S:SPS1:8:4.2 Identify sources of error in experiments.</p> <p>S:SPS1:8:4.3 Draw appropriate conclusions regarding the scientific question under investigation, based on the data collected.</p>

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5. EVALUATING SCIENTIFIC EXPLANATIONS	<p>S:SPS1:6:5.1 Determine if the results of an experiment support or fail to support the scientific idea tested.</p> <p>S:SPS1:6:5.2 Explain how a hypothesis is a direct extension of a scientific idea and therefore makes that idea “testable.”</p>	<p>S:SPS1:8:5.1 Determine if the results of an experiment support or refute the scientific idea tested.</p> <p>S:SPS1:8:5.2 Evaluate whether the information and data collected allows an evaluation of the scientific idea under investigation.</p> <p>S:SPS1:8:5.3 Determine what additional information would be helpful in answering the scientific question.</p>
<p>NECAP ASSESSMENT TARGETS FOR INQUIRY</p> <p><i>MAY BE SUBJECT OF PERFORMANCE COMPONENT</i></p>		<p style="text-align: center;">NECAP ASSESSMENT TARGETS</p> <p>S:ESS1:8:2.2      S:ESS1:8:6.4                      S:LS1:8:2.5      S:LS2:8:1.3                      S:LS4:8:2.4      S:LS1:8:3.7                      S:LS4:8:3.4      S:PS1:8:2.4                      S:PS1:8:2.5      S:PS1:8:1.6                      S:PS2:8:3.6      S:PS3:8:1.3</p> <p>(For actual text: please see GSE’s for Earth Space, Life, and Physical Science.)</p>

<b>Science Process Skills</b>		
<b>SPS2– Unifying Concepts of Science</b>		
	<b>By the end of Grade 6, all students will apply skills from previous grades and...</b>	<b>By the end of Grade 8, all students will apply skills from previous grades and...</b>
1. NATURE OF SCIENCE (NOS)	<p>S:SPS2:6:1.1 Explain that scientists do not pay much attention to claims about how something works unless they are backed up with evidence that can be confirmed with a logical argument.</p> <p>S:SPS2:6:1.2 Describe how results of similar and repeated investigations may vary and suggest possible explanations for variations.</p> <p>S:SPS2:6:1.3 Explain that sometimes similar investigations get different results because of unexpected differences in the things being investigated, the methods used, or the circumstances in which the investigation is carried out, and sometimes just because of uncertainties of observations.</p> <p>S:SPS2:6:1.4 Realize that if more than one variable changes at the same time in an experiment, the outcome of the experiment may not be clearly attributable to any one of the variables.</p>	<p>S:SPS2:8:1.1 Describe how scientific investigations usually involve the collection of relevant evidence, the use of logical reasoning, and the application of imagination in devising hypotheses and explanations to make sense of the collected evidence.</p> <p>S:SPS2:8:1.2 Realize that when similar investigations give different results, the scientific challenge is to judge whether the differences are trivial or significant, and this often requires more investigations.</p> <p>S:SPS2:8:1.3 Realize that knowledge, based on science, is subject to modification as new information challenges prevailing theories and as a new theory leads to looking at old observations in a new way.</p> <p>S:SPS2:8:1.4 Provide examples that show how some scientific knowledge is very old and yet is still applicable today.</p> <p>S:SPS2:8:1.5 Recognize that some matters cannot be examined usefully in a scientific way, such as those matters that by their nature cannot be tested objectively and those that are essentially matters of morality.</p> <p>S:SPS2:8:1.6 Give examples of how science can sometimes be used to inform ethical decisions by identifying the likely consequences of particular actions but cannot be used to establish that some action is either moral or immoral.</p>

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<b>SPS2– Unifying Concepts of Science</b>		
	<b>By the end of Grade 6, all students will apply skills from previous grades and...</b>	<b>By the end of Grade 8, all students will apply skills from previous grades and...</b>
2. SYSTEMS AND ENERGY (SAE)	<p>S:SPS2:6:2.1 Recognize that thinking about things as systems means looking for how every part relates to others.</p> <p>S:SPS2:6:2.2 Discover that collections of pieces (e.g., powders, marbles, sugar cubes or wooden blocks) may have properties that the individual pieces do not.</p> <p>S:SPS2:6:2.3 Estimate or predict the effect that making a change in one part of the system will have on other parts, and on the system as a whole.</p> <p>S:SPS2:6:2.4 Compare a variety of forms of energy, including heat, light, sound, mechanical, electrical, and chemical energy.</p> <p>S:SPS2:6:2.5 Demonstrate how energy can be transformed from one form to another (e.g., from electrical energy to heat, light or mechanical energy).</p>	<p>S:SPS2:8:2.1 Understand that any system is usually connected to other systems, both internally and externally; thus a system may be thought of as containing subsystems and as being a subsystem of a larger system.</p> <p>S:SPS2:8:2.2 Analyze how the output of one part of a system, which can include materials, energy or information, can become the input to other parts.</p> <p>S:SPS2:8:2.3 Realize that as the complexity of any system increases, gaining an understanding of it depends increasingly on summaries (such as averages and ranges) and on descriptions of typical examples of that system.</p> <p>S:SPS2:8:2.4 Explain that when energy is transformed or converted from one type to another, there is no net loss of energy.</p> <p>S:SPS2:8:2.5 Describe how objects and substances can store energy (e.g., a battery, food, gasoline).</p>

<b>Science Process Skills</b>		
<b>SPS2– Unifying Concepts of Science</b>		
	<b>By the end of Grade 6, all students will apply skills from previous grades and...</b>	<b>By the end of Grade 8, all students will apply skills from previous grades and...</b>
3. MODELS AND SCALE (MAS)	<p>S:SPS2:6:3.1 Understand that models are often used to think about processes that happen too slowly, too quickly, or on too small a scale to observe directly; or that are too vast to be changed deliberately; or that are potentially dangerous.</p> <p>S:SPS2:6:3.2 Analyze how finding out the biggest and smallest values of something are often as revealing as knowing what the usual value is.</p>	<p>S:SPS2:8:3.1 Demonstrate how mathematical models can be displayed on a computer and then modified to see what happens.</p> <p>S:SPS2:8:3.2 Know that different models can be used to represent the same thing; what kind of model is used and how complex it should be depends on its purpose; and the usefulness of a model is one of the instances in which intuition and creativity come into play in science, mathematics and engineering.</p> <p>S:SPS2:8:3.3 Discover how properties of systems that depend on volume, such as capacity and weight change, change out of proportion to properties that depend on area, such as strength or surface processes.</p> <p>S:SPS2:8:3.4 Recognize that as the complexity of any system increases, gaining an understanding increasingly depends on summaries (such as averages and ranges) and on descriptions of typical examples of that system.</p>

<b>Science Process Skills</b>		
<b>SPS2– Unifying Concepts of Science</b>		
	<b>By the end of Grade 6, all students will apply skills from previous grades and...</b>	<b>By the end of Grade 8, all students will apply skills from previous grades and...</b>
4. PATTERNS OF CHANGE (POC)	<p>S:SPS2:6:4.1 Understand that things change in steady, repetitive, or irregular ways, or sometimes in more than one way at the same time; often the best way to tell which kinds of change are happening is to make a table or graph of measurements.</p> <p>S:SPS2:6:4.2 Discover how a system may stay the same because nothing is happening or because things are happening that exactly balance each other out.</p>	<p>S:SPS2:8:4.1 Analyze how physical and biological systems tend to change until they become stable and then stay that way unless their surroundings change.</p> <p>S:SPS2:8:4.2 Recognize how many systems contain feedback mechanisms that serve to keep changes within specified limits.</p> <p>S:SPS2:8:4.3 Realize that symbolic equations can be used to summarize how the quantity of something changes over time or in response to other changes.</p> <p>S:SPS2:8:4.4 Explain how symmetry (or the lack of it) may determine properties of many objects, from molecules and crystals to organisms and designed structures.</p> <p>S:SPS2:8:4.5 Realize that cycles, such as the seasons or body temperature, can be described by their cycle length or frequency, what their highest and lowest values are, and when those values occur; different cycles range from many thousand years down to less than a billionth of a second.</p>

<b>Science Process Skills</b>		
<b>SPS2– Unifying Concepts of Science</b>		
	<b>By the end of Grade 6, all students will apply skills from previous grades and...</b>	<b>By the end of Grade 8, all students will apply skills from previous grades and...</b>
5. FORM AND FUNCTION (FAF)	<p>S:SPS2:6:5.1 Describe the structure and function of organs.</p> <p>S:SPS2:6:5.2 Diagram and label the structure of the primary components of representative organs in plants and animals.</p> <p>S:SPS2:6:5.3 Investigate the relationship between various landforms and wind currents.</p>	<p>S:SPS2:8:5.1 Describe the relationship between structure and function of organ systems in plants and animals.</p> <p>S:SPS2:8:5.2 Describe the structure and function of various organ systems (i.e., digestion, respiration, circulation, nervous, protection and support) and how these systems contribute to homeostasis of the organism.</p> <p>S:SPS2:8:5.3 Compare the structure and function of organ systems in one organism to the structure and function in another organism.</p>

<b>Science Process Skills</b>		
<b>SPS3– Personal, Social, and Technological Perspectives</b>		
	<b>By the end of Grade 6, all students will apply skills from previous grades and...</b>	<b>By the end of Grade 8, all students will apply skills from previous grades and...</b>
1. COLLABORATION IN SCIENTIFIC ENDEAVORS	<p>S:SPS3:6:1.1 Work effectively within a cooperative group setting, accepting and executing assigned roles and responsibilities.</p> <p>S:SPS3:6:1.2 Work collectively within a group toward a common goal.</p> <p>S:SPS3:6:1.3 Demonstrate respect of one another’s abilities and contributions to the group.</p>	<p>S:SPS3:8:1.1 Work effectively within a cooperative group setting, accepting and executing assigned roles and responsibilities.</p> <p>S:SPS3:8:1.2 Work collectively within a group toward a common goal.</p> <p>S:SPS3:8:1.3 Demonstrate respect of one another’s abilities and contributions to the group.</p> <p>S:SPS3:8:1.4 Demonstrate an understanding of the ethics involved in scientific inquiry.</p>
2. COMMON ENVIRONMENTAL ISSUES, NATURAL RESOURCES MANAGEMENT AND CONSERVATION	<p>S:SPS3:6:2.1 Develop, focus and explain questions about the environment and do environmental investigations.</p> <p>S:SPS3:6:2.2 Design environmental investigations to answer particular questions.</p> <p>S:SPS3:6:2.3 Explore evidence that human-caused changes have consequences for the immediate environment as well as for other places and future times.</p> <p>S:SPS3:6:2.4 Explore how humans shape and control the environment while creating knowledge and developing new technologies.</p> <p>S:SPS3:6:2.5 Investigate environmental and resource management issues at scales that range from local to national to global.</p>	<p>S:SPS3:8:2.1 Locate and collect reliable information about the environment and environmental topics using a variety of methods and sources.</p> <p>S:SPS3:8:2.2 Judge the weaknesses and strengths of the information they are using.</p> <p>S:SPS3:8:2.3 Explore the uses and limitations of models.</p> <p>S:SPS3:8:2.4 Synthesize observations and findings into coherent explanations about natural resources and the environment.</p>

<b>Science Process Skills</b>		
<b>SPS3– Personal, Social, and Technological Perspectives</b>		
	<b>By the end of Grade 6, all students will apply skills from previous grades and...</b>	<b>By the end of Grade 8, all students will apply skills from previous grades and...</b>
3. SCIENCE AND TECHNOLOGY, TECHNOLOGICAL DESIGN AND APPLICATION	<p>S:SPS3:6:3.1 Identify problems/issues that can be addressed by design technology.</p> <p>S:SPS3:6:3.2 Identify and describe the procedure for designing a product, including identifying a need, researching, brainstorming, selecting, developing a prototype, testing and evaluating.</p> <p>S:SPS3:6:3.3 Evaluate technological designs using established criteria.</p>	<p>S:SPS3:8:3.1 Design a product or solution to a problem.</p> <p>S:SPS3:8:3.2 Build a product that has been designed in class.</p> <p>S:SPS3:8:3.3 Evaluate student-designed products according to established criteria and recommend improvements or modifications.</p>

<b>Science Process Skills</b>	
<b>SPS4– Science Skills for Information, Communication and Media Literacy (from <i>ICT Literacy Map for Science</i>, <a href="http://www.21stcenturyskills.org">www.21stcenturyskills.org</a>)</b>	
<b>By the end of Grade 8, all students will apply skills from previous grades and...</b>	
1. INFORMATION AND MEDIA LITERACY	<p>S:SPS4:8:1.1 Use a variety of information access tools to locate, gather, and organize potential sources of scientific information to answer questions.</p> <p>S:SPS4:8:1.2 Collect real-time observations and data, synthesizing and building upon existing information (e.g., online databases, NOAA, EPA, USGS) to solve problems.</p> <p>S:SPS4:8:1.3 Use appropriate tools to analyze and synthesize information (e.g., diagrams, flow charts, frequency tables, bar graphs, line graphs, stem-and-leaf plots) to draw conclusions and implications based on investigations of an issue or question.</p>
2. COMMUNICATION SKILLS	<p>S:SPS4:8:2.1 Use a wide range of tools and a variety of oral, written, and graphic formats to share information and results from observations and investigations.</p>
3. CRITICAL THINKING AND SYSTEMS THINKING	<p>S:SPS4:8:3.1 Execute steps of scientific inquiry to engage in the problem-solving and decision making processes.</p> <p>S:SPS4:8:3.2 Apply new and unusual applications of existing knowledge to new and different situations.</p> <p>S:SPS4:8:3.3 Make sketches, graphs, and diagrams to explain ideas and to demonstrate the interconnections between systems.</p>
4. PROBLEM IDENTIFICATION, FORMULATION, AND SOLUTION	<p>S:SPS4:8:4.1 Formulate a scientific question about phenomena, a problem, or an issue and using a broad range of tools and techniques; and plan and conduct an inquiry to address the question.</p> <p>S:SPS4:8:4.2 Use evidence collected from observations or other sources and use them to create models and explanations.</p>
5. CREATIVITY AND INTELLECTUAL CURIOSITY	<p>S:SPS4:8:5.1 Use a variety of media tools to make oral and written presentations, which include written notes and descriptions, drawings, photos, and charts to communicate the procedures and results of an investigation.</p>
6. INTERPERSONAL AND COLLABORATIVE SKILLS	<p>S:SPS4:8:6.1 Work in diverse pairs/teams to answer questions, solve problems and make decisions.</p> <p>S:SPS4:8:6.2 Plan and develop team science projects.</p> <p>S:SPS4:8:6.3 Articulate understanding of content through personal interaction and sharing with peers.</p>

<b>Science Process Skills</b>	
<b>SPS4– Science Skills for Information, Communication and Media Literacy (from <i>ICT Literacy Map for Science</i>, <a href="http://www.21stcenturyskills.org">www.21stcenturyskills.org</a>)</b>	
<b>By the end of Grade 8, all students will apply skills from previous grades and...</b>	
7. SELF DIRECTION	S:SPS4:8:7.1 Keep a journal of observations and investigations, and periodically evaluate entries to assess progress toward achieving the understanding of key ideas.
8. ACCOUNTABILITY AND ADAPTABILITY	<p>S:SPS4:8:8.1 Develop and execute a plan to collect and record accurate and complete data from various sources to solve a problem or answer a question; and gather and critically analyze data from a variety of sources.</p> <p>S:SPS4:8:8.2 Participate in science competitions, where students are responsible for creating a product or participating in an event.</p>
9. SOCIAL RESPONSIBILITY	<p>S:SPS4:8:9.1 Collaborate with a network of learners by phone, video, virtual classroom platform.</p> <p>S:SPS4:8:9.2 Participate in simulation or role-playing activities in which students grapple with the ethics of complex issues.</p>

<b>Science Process Skills</b>		
<b>SPS1– Scientific Inquiry and Critical Thinking Skills (INQ)</b>		
	<b>By the end of Grade 11, all students will apply skills from previous grades and...</b>	<b>By the end of Grade 12, advanced students will apply skills from previous grades and...</b>
1. MAKING OBSERVATIONS AND ASKING QUESTIONS	<p>S:SPS1:11:1.1 Ask questions about relationships among variables that can be observed directly as well as those that cannot.</p> <p>S:SPS1:11:1.2 Use complex classification criteria and keys to identify items/organisms.</p> <p>S:SPS1:11:1.3 Evaluate complex methods of classification for a specific purpose.</p> <p>S:SPS1:11:1.4 Identify limitations of a given classification system and identify alternative ways of classifying to accommodate anomalies.</p>	<p>S:SPS1:12:1.1 Define and delimit problems to facilitate investigation.</p> <p>S:SPS1:12:1.2 Make and record measurements to the correct number of significant figures based on the precision of the instrument used.</p> <p>S:SPS1:12:1.3 Make measurements and observations about a variety of events and phenomena, including those that occur during very small and very large time frames.</p> <p>S:SPS1:12:1.4 Ask questions about relationships between and among observable variables as well as theoretical entities.</p> <p>S:SPS1:12:1.5 Use, evaluate and apply complex classification schemes based on an understanding of scientific concepts, laws and principles.</p> <p>S:SPS1:12:1.6 Describe and apply classification systems and nomenclatures used in the sciences.</p>
2. DESIGNING SCIENTIFIC INVESTIGATIONS	<p>S:SPS1:11:2.1 Apply scientific theories and laws to new situations to generate hypotheses.</p> <p>S:SPS1:11:2.2 State a hypothesis and prediction based on available evidence and background information.</p>	<p>S:SPS1:12:2.1 Identify the theoretical basis of an investigation and develop a prediction and a hypothesis that are consistent with the theoretical basis.</p> <p>S:SPS1:12:2.2 Evaluate and select appropriate instruments for collecting data and evidence in an investigation.</p> <p>S:SPS1:12:2.3 Develop appropriate sampling procedures for a given investigation.</p>

<b>Science Process Skills</b>		
<b>SPS1– Scientific Inquiry and Critical Thinking Skills (INQ)</b>		
	<b>By the end of Grade 11, all students will apply skills from previous grades and...</b>	<b>By the end of Grade 12, advanced students will apply skills from previous grades and...</b>
3. CONDUCTING SCIENTIFIC INVESTIGATIONS	<p>S:SPS1:11:3.1 Select and use apparatus and material safely.</p> <p>S:SPS1:11:3.2 Use instruments effectively and accurately for collecting data.</p> <p>S:SPS1:11:3.3 Compile and organize data, using appropriate units.</p>	<p>S:SPS1:12:3.1 Carry out procedures controlling major variables and adapting or extending procedures where required.</p> <p>S:SPS1:12:3.2 Implement appropriate sampling procedures.</p> <p>S:SPS1:12:3.3 Identify and explain sources of error and uncertainty in measurement and express results in a form that acknowledges the degree of uncertainty.</p>
4. REPRESENTING AND UNDERSTANDING RESULTS OF INVESTIGATIONS	<p>S:SPS1:11:4.1 Compile and display data, evidence and information by hand and computer, in a variety of formats, including diagrams, flow charts, tables, graphs and scatter plots.</p>	<p>S:SPS1:12:4.1 Interpret patterns and trends in data, and infer or calculate linear and non-linear relationships among variables.</p> <p>S:SPS1:12:4.2 Compare theoretical and empirical values and account for discrepancies.</p> <p>S:SPS1:12:4.3 Evaluate the relevance, reliability and adequacy of data and data collection methods.</p>
5. EVALUATING SCIENTIFIC EXPLANATIONS	<p>S:SPS1:11:5.1 Explain how data support or refute the hypothesis or prediction.</p> <p>S:SPS1:11:5.2 Provide a statement that addresses and answers the question investigated in light of the evidence generated in the investigation.</p>	<p>S:SPS1:12:5.1 Explain how two different scientific explanations for the same phenomenon can be evaluated using the predictive value of the explanations.</p> <p>S:SPS1:12:5.2 Apply and assess alternative theoretical models.</p>
<p>NECAP ASSESSMENT TARGETS FOR INQUIRY</p> <p><i>MAY BE SUBJECT OF PERFORMANCE COMPONENT</i></p>	<p style="text-align: center;"><b>NECAP ASSESSMENT TARGETS</b></p> <p>S:ESS1:11:4.1      S:ESS1:11:3.2                      S:LS1:11:2.8      S:LS2:11:1.5                      S:LS3:11:3.9      S:LS3:11:2.6                      S:LS4:11:2.6      S:PS1:11:2.6                      S:PS2:11:3.10    S:PS3:11:1.8</p> <p>(For actual text: please see GSE's for Earth Space, Life, and Physical Science.)</p>	

<b>Science Process Skills</b>		
<b>SPS2– Unifying Concepts of Science</b>		
	<b>By the end of Grade 11, all students will apply skills from previous grades and...</b>	<b>By the end of Grade 12, advanced students will apply skills from previous grades and...</b>
1. NATURE OF SCIENCE (NOS)	<p>S:SPS2:11:1.1 Explore new phenomena through investigations conducted for different reasons, or to check on previous results.</p> <p>S:SPS2:11:1.2 Test how well a theory predicts a phenomena.</p> <p>S:SPS2:11:1.3 Recognize that sometimes scientists can control conditions in order to focus on the effect of a single variable; when that is not possible for practical or ethical reasons, they try to observe as wide a range of natural occurrences as possible to be able to discern patterns.</p> <p>S:SPS2:11:1.4 Show how hypotheses are widely used in science for choosing what data to pay attention to and what additional data to seek, and for guiding the interpretation of the data (both new and previously available).</p> <p>S:SPS2:11:1.5 Understand that in the long run, theories are judged by how they fit with other theories, the range of observations they explain, how well they explain observations, and how effective they are in predicting new findings.</p> <p>S:SPS2:11:1.6 Show how the usefulness of a model can be tested by comparing its predictions to actual observations in the real world; but a close match does not mean that the model is the only “true” model or the one that would work.</p> <p>S:SPS2:11:1.7 Realize that in science, the testing, revising, and occasional discarding of theories, new and old, never ends; this ongoing process leads to an increasingly better understanding of how things work in the world but not to absolute truth.</p>	<p>S:SPS2:12:1.1 Recognize that there are different traditions in science about what is investigated and how; but they all have in common certain beliefs about the value of evidence, logic and good arguments.</p> <p>S:SPS2:12:1.2 Understand that no matter how well one theory fits observations, a new theory might fit them better, or might fit a wider range of observations.</p> <p>S:SPS2:12:1.3 Explain how in the short run, new ideas that do not mesh well with mainstream ideas in science often encounter vigorous criticism.</p> <p>S:SPS2:12:1.4 Know that from time to time, major shifts occur in the scientific view of how the world works; more often, however, the changes that take place in the body of scientific knowledge are small modifications of prior knowledge (change and continuity are persistent features of science).</p> <p>S:SPS2:12:1.5 Recognize that evidence for the value of testing, revising and discarding theories is given by the improving ability of scientists to offer reliable explanations and make accurate predictions.</p>

<b>Science Process Skills</b>		
<b>SPS2– Unifying Concepts of Science</b>		
	<b>By the end of Grade 11, all students will apply skills from previous grades and...</b>	<b>By the end of Grade 12, advanced students will apply skills from previous grades and...</b>
2. SYSTEMS AND ENERGY (SAE)	<p>S:SPS2:11:2.1 Realize that systems may be so closely related that there is no way to draw boundaries that separate all parts of one from all parts of the others.</p> <p>S:SPS2:11:2.2 Give examples to show that a system usually has some properties that are different from those of its parts, but appear because of the interaction of those parts.</p> <p>S:SPS2:11:2.3 Demonstrate that even in some very simple systems, it may not always be possible to predict accurately the result of changing some part or connection.</p>	<p>S:SPS2:12:2.1 Use evidence and logic to explain that as the number of parts in a system grows in size, the number of possible interactions increases much more rapidly, roughly with the square of the number of parts.</p> <p>S:SPS2:12:2.2 Know that understanding how things work and designing solutions to problems of almost any kind can be facilitated by systems analysis; in defining a system, it is important to specify its boundaries and subsystems, indicate its relation to other systems, and identify what its input and output are expected to be.</p>
3. MODELS AND SCALE (MAS)	<p>S:SPS2:11:3.1 Understand that the basic idea of mathematical modeling is to find a mathematical relationship that behaves in the same way as the objects or processes under investigation; a mathematical model may give insight about how something really works or may fit observations very well without any intuitive meaning.</p>	<p>S:SPS2:12:3.1 Recognize that computers have greatly improved the power and use of mathematical models by performing computations that are very long, very complicated, or repetitive; therefore, computers can show the consequences of applying complex rules or of changing the rules. The graphic capabilities of computers make them useful in the design and testing of devices and structures and in the simulation of complicated processes.</p>

<b>Science Process Skills</b>		
<b>SPS2– Unifying Concepts of Science</b>		
	<b>By the end of Grade 11, all students will apply skills from previous grades and...</b>	<b>By the end of Grade 12, advanced students will apply skills from previous grades and...</b>
4. PATTERNS OF CHANGE (POC)	<p>S:SPS2:11:4.1 Recognize that things can change in detail, but remain the same in general (e.g., the players change but the team remains, the cells are replaced but the organism remains); sometimes counterbalancing changes are necessary for a thing to retain its essential constancy in the presence of changing conditions.</p> <p>S:SPS2:11:4.2 Describe how graphs and equations are useful (and often equivalent) ways for depicting and analyzing patterns of change.</p> <p>S:SPS2:11:4.3 Give examples of how a system in equilibrium may return to the same state of equilibrium if the disturbances it experiences are small; but large disturbances may cause it to escape that equilibrium and eventually settle into some other state of equilibrium.</p> <p>S:SPS2:11:4.4 Describe how in evolutionary change, the present arises from the materials and forms of the past, more or less gradually, and in ways that can be explained.</p>	<p>S:SPS2:12:4.1 Give examples of how in many physical, biological and social systems, changes in one direction tend to produce opposing (but somewhat delayed) influences, leading to repetitive cycles of behavior.</p> <p>S:SPS2:12:4.2 Realize that most systems above the molecular level involve so many parts and forces and are so sensitive to tiny differences in conditions that their precise behavior is unpredictable, even if all the rules for change are known. Predictable or not, the precise future of a system is not completely determined by its present state and circumstances but also on the fundamentally uncertain outcomes of events on the atomic scale.</p>

<b>Science Process Skills</b>		
<b>SPS2– Unifying Concepts of Science</b>		
	<b>By the end of Grade 11, all students will apply skills from previous grades and...</b>	<b>By the end of Grade 12, advanced students will apply skills from previous grades and...</b>
5. FORM AND FUNCTION (FAF)	<p>S:SPS2:11:5.1 Explore how the movement of ocean floor plates under continental plates or two continental plates moving against each other can deform the earth’s surface.</p> <p>S:SPS2:11:5.2 Provide data and evidence on how folding in crustal plates can cause mountain ranges.</p> <p>S:SPS2:11:5.3 Understand that an atom’s electron configuration determines how the atom can interact with other atoms.</p> <p>S:SPS2:11:5.4 Provide examples of how configuration of atoms in a molecule determines a molecule’s properties.</p> <p>S:SPS2:11:5.5 Discover how the shape of large molecules affects the interaction with other molecules.</p> <p>S:SPS2:11:5.6 Demonstrate that a variety of biological, chemical and physical phenomena can be explained by changes in the arrangement and motion of atoms and molecules.</p>	<i>Same as Grade 11</i>

<b>Science Process Skills</b>		
<b>SPS3– Personal, Social, and Technological Perspectives</b>		
	<b>By the end of Grade 11, all students will apply skills from previous grades and...</b>	<b>By the end of Grade 12, advanced students will apply skills from previous grades and...</b>
1. COLLABORATION IN SCIENTIFIC ENDEAVORS	<p>S:SPS3:11:1.1 Collaborate with existing research efforts.</p> <p>S:SPS3:11:1.2 Identify global researchers in a field of interest.</p>	<i>Same as grade 11</i>
2. COMMON ENVIRONMENTAL ISSUES, NATURAL RESOURCES MANAGEMENT AND CONSERVATION	<p>S:SPS3:11:2.1 Develop, modify, clarify and explain questions that guide environmental investigations of various types.</p> <p>S:SPS3:11:2.2 Design investigations to answer particular questions about the environment.</p> <p>S:SPS3:11:2.3 Locate and collect reliable information for environmental investigations of many types.</p> <p>S:SPS3:11:2.4 Apply basic logic and reasoning skills to evaluate completeness and reliability in a variety of information sources.</p> <p>S:SPS3:11:2.5 Organize and display information in ways appropriate to different types of environmental investigations and purposes.</p> <p>S:SPS3:11:2.6 Create, use and evaluate models to understand environmental phenomena.</p> <p>S:SPS3:11:2.7 Use to evidence and logic in developing proposed explanations that address their initial questions and hypotheses.</p> <p>S:SPS3:11:2.8 Analyze global, social, cultural, political, economic and environmental linkages.</p> <p>S:SPS3:11:2.9 Evaluate presentations of environmental issues for accuracy.</p>	<i>Same as grade 11</i>

<b>Science Process Skills</b>		
<b>SPS3– Personal, Social, and Technological Perspectives</b>		
	<b>By the end of Grade 11, all students will apply skills from previous grades and...</b>	<b>By the end of Grade 12, advanced students will apply skills from previous grades and...</b>
3. SCIENCE AND TECHNOLOGY, TECHNOLOGICAL DESIGN AND APPLICATION	<p>S:SPS3:11:3.1 Analyze environmental issues such as water quality, air quality, hazardous waste, and depletion of natural resources.</p> <p>S:SPS3:11:3.2 Evaluate status of a local community system (transportation, water, communication, food resources or electrical) in partnership with local officials.</p> <p>S:SPS3:11:3.3 Analyze technical writing, graphs, charts, and diagrams.</p>	<i>Same as grade 11</i>

<b>Science Process Skills</b>	
<b>SPS4– Science Skills for Information, Communication and Media Literacy (from <i>ICT Literacy Map for Science</i>, <a href="http://www.21stcenturyskills.org">www.21stcenturyskills.org</a>)</b>	
<b>By the end of Grade 11, all students will apply skills from previous grades and...</b>	
1. INFORMATION AND MEDIA LITERACY	<p>S:SPS4:12:1.1 Select and analyze information from various sources (including electronic resources, print resources, community resources) and personally collected data to answer questions being investigated.</p> <p>S:SPS4:12:1.2 Collect and use qualitative and quantitative data and information, seek evidence and sources of information to identify flaws such as errors and bias, and explain how the evidence supports or refutes an initial hypothesis.</p> <p>S:SPS4:12:1.3 Analyze data and information gathered to clarify problems or issues identifying costs and benefits from a social, cultural, and/or environmental perspective; predict the consequences of action or inaction; and propose possible solutions.</p>
2. COMMUNICATION SKILLS	<p>S:SPS4:12:2.1 Select and use appropriate scientific vocabulary to orally share and communicate scientific ideas, plans, results, and conclusions resulting from investigations.</p> <p>S:SPS4:12:2.2 Create written reports and journals to share and communicate scientific ideas, plans, results, and conclusions resulting from observations and investigations.</p> <p>S:SPS4:12:2.3 Create a multimedia presentation incorporating numeric symbolic and/or graphic modes of representation to share scientific ideas, plans, results, and conclusions.</p>
3. CRITICAL THINKING AND SYSTEMS THINKING	<p>S:SPS4:12:3.1 Pursue scientific inquiry such as observation, measurement, hypothesis formation and analysis, and value “habits of mind” such as persistence, accuracy, and collaboration.</p> <p>S:SPS4:12:3.2 Generate solutions to scientific questions and challenges through developing, modeling and revising investigations.</p> <p>S:SPS4:12:3.3 Apply scientific knowledge and skills to make reasoned decisions about the use of science and scientific innovations.</p>
4. PROBLEM IDENTIFICATION, FORMULATION, AND SOLUTION	<p>S:SPS4:12:4.1 Formulate scientific questions about an issue and define experimental procedures for finding answers.</p> <p>S:SPS4:12:4.2 Plan and conduct practical tests to solve problems or answer a question, collect and analyze data using appropriate instruments and techniques safely and accurately.</p> <p>S:SPS4:12:4.3 Develop models and explanations to fit evidence obtained through investigations.</p>

<b>Science Process Skills</b>	
<b>SPS4– Science Skills for Information, Communication and Media Literacy (from <i>ICT Literacy Map for Science</i>, <a href="http://www.21stcenturyskills.org">www.21stcenturyskills.org</a>)</b>	
<b>By the end of Grade 11, all students will apply skills from previous grades and...</b>	
5. CREATIVITY AND INTELLECTUAL CURIOSITY	<p>S:SPS4:12:5.1 Prepare multimedia presentations to share results of investigations, demonstrating a clear sense of audience and purpose.</p> <p>S:SPS4:12:5.2 Use electronic networks to share information.</p> <p>S:SPS4:12:5.3 Model solutions to a range of problems in science and technology using computer simulation software.</p>
6. INTERPERSONAL AND COLLABORATIVE SKILLS	<p>S:SPS4:12:6.1 Create a culminating team project that demonstrates content knowledge and conceptual understanding and shows connections between science content and real-world settings.</p> <p>S:SPS4:12:6.2 Collect, synthesize, and report information from a variety of points of view.</p>
7. SELF DIRECTION	<p>S:SPS4:12:7.1 Use key ideas of science to document and explain through an investigation the relationship between science and concepts.</p> <p>S:SPS4:12:7.2 Self-assess progress toward a predetermined outcome and decide what needs to be done to meet the goal.</p>
8. ACCOUNTABILITY AND ADAPTABILITY	<p>S:SPS4:12:8.1 Identify the reputable and appropriate communities of learners to whom research findings should be reported, compare data, and adapt as needed.</p> <p>S:SPS4:12:8.2 Use science learned to create a personal action plan on a community issue.</p>
9. SOCIAL RESPONSIBILITY	<p>S:SPS4:12:9.1 Collaborate with interested learners using appropriate web resources and publication media such as journals (print and electronic).</p>