Grade 10: Evidence for Climate Change (Academic–SNC2D/MPM2D)

Curriculum Connections

Earth and Space Science: Climate Change

IP = Initiating and Planning, PR = Performing and Recording, AI = Analysing and Interpreting, C = Communicating

Science Curriculum Connections	Mathematics Curriculum Connections
Activity 1: Carbon Dioxide	
Scientific Investigation Skills and Career Exploration – **A1.1** formulate scientific questions about observed relationships, ideas, problems, and/or issues, make predictions, and/or formulate hypotheses to focus inquiries or research [IP] – **A1.2** select appropriate instruments (e.g., a microscope, laboratory glassware, an optical bench) and materials (e.g., prepared slides, an aquarium, lenses, pH paper) for particular inquiries [IP] – **A1.3** identify and locate print, electronic, and human sources that are relevant to research questions [IP] – **A1.8** analyse and interpret qualitative and/or quantitative data to determine whether the evidence supports or refutes the initial prediction or hypothesis, identifying possible sources of error, bias, or uncertainty [AI] – **A1.10** draw conclusions based on inquiry results and research findings, and justify their conclusions [AI] ***Earth and Space Science: Climate Change*** – **D2.1** use appropriate terminology related to climate change, including, but not limited to: *albedo*, *anthropogenic*, *atmosphere*, *cycles*, *heat sinks*, and *hydrosphere* [C] – **D2.3** analyse different sources of scientific data (e.g., lake cores, tree rings, fossils and preserved organisms, ice cores) for evidence of natural climate change and climate change influenced by human activity [PR, AI, C] – **D2.4** investigate a popular hypothesis on a cause-and-effect relationship having to do with climate change (e.g., the combustion of fossil fuels is responsible for rising global temperatures; the concentration of atmospheric CO_2 is responsible for rising global temperatures; global temperatures have been on the increase since the industrial revolution; the severity of cyclones, hurricanes, and tornadoes increases as atmospheric temperatures increase), using simulations and/or time-trend data that model climate profiles (e.g., data from Statistics Canada and Environment Canada) [PR, AI, C] – **D2.6** investigate, through laboratory inquiry or simulations, how water in its various states influences climate patterns (e.g., water bodies moderate climate, water vapour is a greenhouse gas, ice increases the albedo of Earth's surface) [PR, AI] – **D3.4** identify natural phenomena (e.g., plate tectonics, uplift and weathering, solar radiance, cosmic ray cycles) and human activities (e.g., forest fires, deforestation, the burning of fossil fuels, industrial emissions) known to affect climate, and describe the role of both in Canada's contribution to climate change – **D3.5** describe the principal sources and sinks, both natural and/or anthropogenic, of greenhouse gases (e.g., carbon dioxide, methane, nitrous oxide, halocarbons, water vapour) – **D3.6** describe how different carbon and nitrogen compounds (e.g., carbon dioxide, methane, nitrous oxide) influence the trapping of heat in the atmosphere and hydrosphere – **D3.7** describe, in general terms, the causes and effects of the anthropogenic greenhouse effect, the depletion of stratospheric and tropospheric ozone, and the formation of ground-level ozone and smog – **D3.8** identify and describe indicators of global climate change (e.g., changes in: glacial and polar ice, sea levels, wind patterns, global carbon budget assessments)	***Analytic Geometry*** *Using Linear Systems to Solve Problems* – solve problems that arise from realistic situations described in words or represented by linear systems of two equations involving two variables, by choosing an appropriate algebraic or graphical method

Science Curriculum Connections	Mathematics Curriculum Connections
Activity 2: Climate Modelling	
Scientific Investigation Skills and Career Exploration – **A1.1** formulate scientific questions about observed relationships, ideas, problems, and/or issues, make predictions, and/or formulate hypotheses to focus inquiries or research [IP] – **A1.8** analyse and interpret qualitative and/or quantitative data to determine whether the evidence supports or refutes the initial prediction or hypothesis, identifying possible sources of error, bias, or uncertainty [AI] – **A1.9** analyse the information gathered from research sources for reliability and bias [AI] – **A1.10** draw conclusions based on inquiry results and research findings, and justify their conclusions [AI] – **A2.1** identify and describe a variety of careers related to the fields of science under study (e.g., meteorologist, medical illustrator, geochemist, optical physicist) and the education and training necessary for these careers ***Earth and Space Science: Climate Change*** – **D1.1** analyse current and/or potential effects, both positive and negative, of climate change on human activity and natural systems (e.g., loss of habitat for Arctic mammals such as polar bears and loss of traditional lifestyles for Inuit as Arctic ice shrinks; famine as arable land is lost to desertification; an increase in water-borne disease and human resettlement as coastal lands are flooded; expansion of the growing season in some regions) [AI, C] – **D2.1** use appropriate terminology related to climate change, including, but not limited to: *albedo*, *anthropogenic*, *atmosphere*, *cycles*, *heat sinks*, and *hydrosphere* [C] – **D2.3** analyse different sources of scientific data (e.g., lake cores, tree rings, fossils and preserved organisms, ice cores) for evidence of natural climate change and climate change influenced by human activity [PR, AI, C] – **D2.4** investigate a popular hypothesis on a cause-and-effect relationship having to do with climate change (e.g., the combustion of fossil fuels is responsible for rising global temperatures; the concentration of atmospheric CO_2 is responsible for rising global temperatures; global temperatures have been on the increase since the industrial revolution; the severity of cyclones, hurricanes, and tornadoes increases as atmospheric temperatures increase), using simulations and/or time-trend data that model climate profiles (e.g., data from Statistics Canada and Environment Canada) [PR, AI, C] – **D2.9** compare different perspectives and/or biases evident in discussions of climate change in scientific and non-scientific media (e.g., with reference to knowledge, beliefs, and values) [AI, C] – **D3.4** identify natural phenomena (e.g., plate tectonics, uplift and weathering, solar radiance, cosmic ray cycles) and human activities (e.g., forest fires, deforestation, the burning of fossil fuels, industrial emissions) known to affect climate, and describe the role of both in Canada's contribution to climate change – **D3.5** describe the principal sources and sinks, both natural and/or anthropogenic, of greenhouse gases (e.g., carbon dioxide, methane, nitrous oxide, halocarbons, water vapour) – **D3.6** describe how different carbon and nitrogen compounds (e.g., carbon dioxide, methane, nitrous oxide) influence the trapping of heat in the atmosphere and hydrosphere – **D3.7** describe, in general terms, the causes and effects of the anthropogenic greenhouse effect, the depletion of stratospheric and tropospheric ozone, and the formation of ground-level ozone and smog – **D3.8** identify and describe indicators of global climate change (e.g., changes in: glacial and polar ice, sea levels, wind patterns, global carbon budget assessments)	***Analytic Geometry*** *Using Linear Systems to Solve Problems* – solve problems that arise from realistic situations described in words or represented by linear systems of two equations involving two variables, by choosing an appropriate algebraic or graphical method

Science Curriculum Connections	Mathematics Curriculum Connections
Activity 3: A Warming World	
Scientific Investigation Skills and Career Exploration – **A1.1** formulate scientific questions about observed relationships, ideas, problems, and/or issues, make predictions, and/or formulate hypotheses to focus inquiries or research [IP] – **A1.2** select appropriate instruments (e.g., a microscope, laboratory glassware, an optical bench) and materials (e.g., prepared slides, an aquarium, lenses, pH paper) for particular inquiries [IP] – **A1.5** conduct inquiries, controlling some variables, adapting or extending procedures as required, and using standard equipment and materials safely, accurately, and effectively, to collect observations and data [PR] – **A1.6** gather data from laboratory and other sources, and organize and record the data using appropriate formats, including tables, flow charts, graphs, and/or diagrams [PR] – **A1.8** analyse and interpret qualitative and/or quantitative data to determine whether the evidence supports or refutes the initial prediction or hypothesis, identifying possible sources of error, bias, or uncertainty [AI] – **A1.9** analyse the information gathered from research sources for reliability and bias [AI] – **A1.10** draw conclusions based on inquiry results and research findings, and justify their conclusions [AI] ***Earth and Space Science: Climate Change*** – **D2.1** use appropriate terminology related to climate change, including, but not limited to: *albedo*, *anthropogenic*, *atmosphere*, *cycles*, *heat sinks*, and *hydrosphere* [C] – **D2.3** analyse different sources of scientific data (e.g., lake cores, tree rings, fossils and preserved organisms, ice cores) for evidence of natural climate change and climate change influenced by human activity [PR, AI, C] – **D2.5** investigate, through laboratory inquiry or simulations, the effects of heat transfer within the hydrosphere and atmosphere [PR, AI] – **D2.6** investigate, through laboratory inquiry or simulations, how water in its various states influences climate patterns (e.g., water bodies moderate climate, water vapour is a greenhouse gas, ice increases the albedo of Earth's surface) [PR, AI] – **D3.2** describe and explain heat transfer in the hydrosphere and atmosphere and its effects on air and water currents – **D3.8** identify and describe indicators of global climate change (e.g., changes in: glacial and polar ice, sea levels, wind patterns, global carbon budget assessments)	***Analytic Geometry*** *Using Linear Systems to Solve Problems* – solve problems that arise from realistic situations described in words or represented by linear systems of two equations involving two variables, by choosing an appropriate algebraic or graphical method

Science Curriculum Connections	Mathematics Curriculum Connections
Activity 4: The Impact of Transportation	
Scientific Investigation Skills and Career Exploration – **A1.1** formulate scientific questions about observed relationships, ideas, problems, and/or issues, make predictions, and/or formulate hypotheses to focus inquiries or research [IP] – **A1.7** select, organize, and record relevant information on research topics from various sources, including electronic, print, and/or human sources (e.g., websites for public health organizations, federal and provincial government publications, reference books, personal interviews), using recommended formats and an accepted form of academic documentation [PR] – **A1.8** analyse and interpret qualitative and/or quantitative data to determine whether the evidence supports or refutes the initial prediction or hypothesis, identifying possible sources of error, bias, or uncertainty [AI] – **A1.10** draw conclusions based on inquiry results and research findings, and justify their conclusions [AI] – **A1.11** communicate ideas, plans, procedures, results, and conclusions orally, in writing, and/or in electronic presentations, using appropriate language and a variety of formats (e.g., data tables, laboratory reports, presentations, debates, simulations, models) [C] – **A2.1** identify and describe a variety of careers related to the fields of science under study (e.g., meteorologist, medical illustrator, geochemist, optical physicist) and the education and training necessary for these careers ***Earth and Space Science: Climate Change*** – **D1.1** analyse current and/or potential effects, both positive and negative, of climate change on human activity and natural systems (e.g., loss of habitat for Arctic mammals such as polar bears and loss of traditional lifestyles for Inuit as Arctic ice shrinks; famine as arable land is lost to desertification; an increase in water-borne disease and human resettlement as coastal lands are flooded; expansion of the growing season in some regions) [AI, C] – **D1.2** assess, on the basis of research, the effectiveness of some current individual, regional, national, or international initiatives that address the issue of climate change (e.g., Drive Clean, ENERGY STAR, federal and provincial government rebates for retrofitting older buildings to be more energy efficient, carbon offset programs, community tree-planting programs, municipal recycling programs, Intergovernmental Panel on Climate Change [IPCC]), and propose a further course of action related to one of these initiatives [PR, AI, C] – **D2.1** use appropriate terminology related to climate change, including, but not limited to: *albedo*, *anthropogenic*, *atmosphere*, *cycles*, *heat sinks*, and *hydrosphere* [C] – **D2.9** compare different perspectives and/or biases evident in discussions of climate change in scientific and non-scientific media (e.g., with reference to knowledge, beliefs, and values) [AI, C] – **D3.4** identify natural phenomena (e.g., plate tectonics, uplift and weathering, solar radiance, cosmic ray cycles) and human activities (e.g., forest fires, deforestation, the burning of fossil fuels, industrial emissions) known to affect climate, and describe the role of both in Canada's contribution to climate change – **D3.5** describe the principal sources and sinks, both natural and/or anthropogenic, of greenhouse gases (e.g., carbon dioxide, methane, nitrous oxide, halocarbons, water vapour) – **D3.7** describe, in general terms, the causes and effects of the anthropogenic greenhouse effect, the depletion of stratospheric and tropospheric ozone, and the formation of ground-level ozone and smog	***Analytic Geometry*** *Using Linear Systems to Solve Problems* – solve problems that arise from realistic situations described in words or represented by linear systems of two equations involving two variables, by choosing an appropriate algebraic or graphical method

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Activity 5: How Much Carbon Is in That Tree?	
Scientific Investigation Skills and Career Exploration – **A1.1** formulate scientific questions about observed relationships, ideas, problems, and/or issues, make predictions, and/or formulate hypotheses to focus inquiries or research [IP] – **A1.2** select appropriate instruments (e.g., a microscope, laboratory glassware, an optical bench) and materials (e.g., prepared slides, an aquarium, lenses, pH paper) for particular inquiries [IP] – **A1.3** identify and locate print, electronic, and human sources that are relevant to research questions [IP] – **A1.6** gather data from laboratory and other sources, and organize and record the data using appropriate formats, including tables, flow charts, graphs, and/or diagrams [PR] – **A1.8** analyse and interpret qualitative and/or quantitative data to determine whether the evidence supports or refutes the initial prediction or hypothesis, identifying possible sources of error, bias, or uncertainty [AI] – **A1.10** draw conclusions based on inquiry results and research findings, and justify their conclusions [AI] – **A1.12** use appropriate numeric, symbolic, and graphic modes of representation, and appropriate units of measurement (e.g., SI and imperial units) [C] – **A1.13** express the results of any calculations involving data accurately and precisely [C] – **A2.1** identify and describe a variety of careers related to the fields of science under study (e.g., meteorologist, medical illustrator, geochemist, optical physicist) and the education and training necessary for these careers ***Earth and Space Science: Climate Change*** – **D2.1** use appropriate terminology related to climate change, including, but not limited to: *albedo*, *anthropogenic*, *atmosphere*, *cycles*, *heat sinks*, and *hydrosphere* [C] – **D3.5** describe the principal sources and sinks, both natural and/or anthropogenic, of greenhouse gases (e.g., carbon dioxide, methane, nitrous oxide, halocarbons, water vapour)	***Analytic Geometry*** *Using Linear Systems to Solve Problems* – solve systems of two linear equations involving two variables, using the algebraic method of substitution or elimination – solve problems that arise from realistic situations described in words or represented by linear systems of two equations involving two variables, by choosing an appropriate algebraic or graphical method ***Trigonometry*** *Investigating Similarity and Solving Problems Involving Similar Triangles* – verify, through investigation (e.g., using dynamic geometry software, concrete materials), the properties of similar triangles (e.g., given similar triangles, verify the equality of corresponding angles and the proportionality of corresponding sides) – solve problems involving similar triangles in realistic situations (e.g., shadows, reflections, scale models, surveying) *Solving Problems Involving the Trigonometry of Right Triangles* – determine the measures of the sides and angles in right triangles, using the primary trigonometric ratios and the Pythagorean theorem – solve problems involving the measures of sides and angles in right triangles in real-life applications (e.g., in surveying, in navigating, in determining the height of an inaccessible object around the school), using the primary trigonometric ratios and the Pythagorean theorem

Science Curriculum Connections	Mathematics Curriculum Connections
Activity 6: When Does It Make Sense to Switch?	
Scientific Investigation Skills and Career Exploration – **A1.1** formulate scientific questions about observed relationships, ideas, problems, and/or issues, make predictions, and/or formulate hypotheses to focus inquiries or research [IP] – **A1.7** select, organize, and record relevant information on research topics from various sources, including electronic, print, and/or human sources (e.g., websites for public health organizations, federal and provincial government publications, reference books, personal interviews), using recommended formats and an accepted form of academic documentation [PR] – **A1.8** analyse and interpret qualitative and/or quantitative data to determine whether the evidence supports or refutes the initial prediction or hypothesis, identifying possible sources of error, bias, or uncertainty [AI] – **A1.10** draw conclusions based on inquiry results and research findings, and justify their conclusions [AI] – **A1.12** use appropriate numeric, symbolic, and graphic modes of representation, and appropriate units of measurement (e.g., SI and imperial units) [C] – **A1.13** express the results of any calculations involving data accurately and precisely [C] ***Earth and Space Science: Climate Change*** – **D2.1** use appropriate terminology related to climate change, including, but not limited to: *albedo*, *anthropogenic*, *atmosphere*, *cycles*, *heat sinks*, and *hydrosphere* [C] – **D3.4** identify natural phenomena (e.g., plate tectonics, uplift and weathering, solar radiance, cosmic ray cycles) and human activities (e.g., forest fires, deforestation, the burning of fossil fuels, industrial emissions) known to affect climate, and describe the role of both in Canada's contribution to climate change – **D3.5** describe the principal sources and sinks, both natural and/or anthropogenic, of greenhouse gases (e.g., carbon dioxide, methane, nitrous oxide, halocarbons, water vapour)	***Analytic Geometry*** *Using Linear Systems to Solve Problems* – solve systems of two linear equations involving two variables, using the algebraic method of substitution or elimination – solve problems that arise from realistic situations described in words or represented by linear systems of two equations involving two variables, by choosing an appropriate algebraic or graphical method
Design Challenge: Climate in a Container	
Scientific Investigation Skills and Career Exploration – **A1.1** formulate scientific questions about observed relationships, ideas, problems, and/or issues, make predictions, and/or formulate hypotheses to focus inquiries or research [IP] – **A1.2** select appropriate instruments (e.g., a microscope, laboratory glassware, an optical bench) and materials (e.g., prepared slides, an aquarium, lenses, pH paper) for particular inquiries [IP] – **A1.4** apply knowledge and understanding of safe practices and procedures when planning investigations (e.g., appropriate techniques for handling, storing, and disposing of laboratory materials [following the Workplace Hazardous Materials Information System-WHMIS]; safe operation of optical equipment; safe handling and disposal of biological materials), with the aid of appropriate support materials (e.g., the Reference Manual on the WHMIS website; the Live Safe! Work Smart! website) [IP] – **A1.5** conduct inquiries, controlling some variables, adapting or extending procedures as required, and using standard equipment and materials safely, accurately, and effectively, to collect observations and data [PR] – **A1.6** gather data from laboratory and other sources, and organize and record the data using appropriate formats, including tables, flow charts, graphs, and/or diagrams [PR] – **A1.8** analyse and interpret qualitative and/or quantitative data to determine whether the evidence supports or refutes the initial prediction or hypothesis, identifying possible sources of error, bias, or uncertainty [AI] – **A1.10** draw conclusions based on inquiry results and research findings, and justify their conclusions [AI] – **A2.1** identify and describe a variety of careers related to the fields of science under study (e.g., meteorologist, medical illustrator, geochemist, optical physicist) and the education and training necessary for these careers	

Science Curriculum Connections	Mathematics Curriculum Connections
Earth and Space Science: Climate Change – **D2.1** use appropriate terminology related to climate change, including, but not limited to: *albedo*, *anthropogenic*, *atmosphere*, *cycles*, *heat sinks*, and *hydrosphere* [C] – **D2.2** design and build a model to illustrate the natural greenhouse effect, and use the model to explain the anthropogenic greenhouse effect [IP, PR, C] – **D2.4** investigate a popular hypothesis on a cause-and-effect relationship having to do with climate change (e.g., the combustion of fossil fuels is responsible for rising global temperatures; the concentration of atmospheric CO_2 is responsible for rising global temperatures; global temperatures have been on the increase since the industrial revolution; the severity of cyclones, hurricanes, and tornadoes increases as atmospheric temperatures increase), using simulations and/or time-trend data that model climate profiles (e.g., data from Statistics Canada and Environment Canada) [PR, AI, C] – **D2.5** investigate, through laboratory inquiry or simulations, the effects of heat transfer within the hydrosphere and atmosphere [PR, AI] – **D2.6** investigate, through laboratory inquiry or simulations, how water in its various states influences climate patterns (e.g., water bodies moderate climate, water vapour is a greenhouse gas, ice increases the albedo of Earth's surface) [PR, AI] – **D2.7** investigate, through research or simulations, the influence of ocean currents on local and global heat transfer and precipitation patterns [PR, AI] – **D3.1** describe the principal components of Earth's climate system (e.g., the sun, oceans, and atmosphere; the topography and configuration of land masses) and how the system works – **D3.2** describe and explain heat transfer in the hydrosphere and atmosphere and its effects on air and water currents – **D3.3** describe the natural greenhouse effect, explain its importance for life, and distinguish it from the anthropogenic greenhouse effect – **D3.4** identify natural phenomena (e.g., plate tectonics, uplift and weathering, solar radiance, cosmic ray cycles) and human activities (e.g., forest fires, deforestation, the burning of fossil fuels, industrial emissions) known to affect climate, and describe the role of both in Canada's contribution to climate change – **D3.5** describe the principal sources and sinks, both natural and/or anthropogenic, of greenhouse gases (e.g., carbon dioxide, methane, nitrous oxide, halocarbons, water vapour) – **D3.6** describe how different carbon and nitrogen compounds (e.g., carbon dioxide, methane, nitrous oxide) influence the trapping of heat in the atmosphere and hydrosphere – **D3.7** describe, in general terms, the causes and effects of the anthropogenic greenhouse effect, the depletion of stratospheric and tropospheric ozone, and the formation of ground-level ozone and smog – **D3.8** identify and describe indicators of global climate change (e.g., changes in: glacial and polar ice, sea levels, wind patterns, global carbon budget assessments)	

Grade 10: Evidence for Climate Change (Applied–SNC2P/MFM2P)

Curriculum Connections

Earth and Space Science: Earth's Dynamic Climate

IP = Initiating and Planning, PR = Performing and Recording, AI = Analysing and Interpreting, C = Communicating

Science Curriculum Connections	Mathematics Curriculum Connections
Activity 1: Carbon Dioxide	
Scientific Investigation Skills and Career Exploration – **A1.1** formulate scientific questions about observed relationships, ideas, problems, and/or issues, make predictions, and/or formulate hypotheses to focus inquiries or research [IP] – **A1.2** select appropriate instruments (e.g., a microscope, laboratory glassware, an optical bench) and materials (e.g., prepared slides, an aquarium, lenses, acid-base indicators) for particular inquiries [IP] – **A1.3** identify and locate print, electronic, and human sources that are relevant to research questions [IP] – **A1.8** analyse and interpret qualitative and/or quantitative data to determine whether the evidence supports or refutes the initial prediction or hypothesis, identifying possible sources of error, bias, or uncertainty [AI] – **A1.10** draw conclusions based on inquiry results and research findings, and justify their conclusions [AI] ***Earth and Space Science: Earth's Dynamic Climate*** – **D2.1** use appropriate terminology related to Earth's dynamic climate, including, but not limited to: *anthropogenic, atmosphere, carbon footprint, carbon sink, climate, greenhouse gases, hydrosphere,* and *weather* [C] – **D2.2** investigate the principles of the natural greenhouse effect, using simulations, diagrams, and/or models, and compare these principles to those of an actual greenhouse [PR, AI] – **D2.3** use a research process to investigate a source of greenhouse gases (e.g., decaying garbage, animal digestive processes, burning biomass) and its effect on a region of Canada (e.g., melting of the polar ice cap in the Arctic, shrinking of glaciers in the Rockies) [IP, PR, AI] – **D2.4** conduct an inquiry to determine how different factors (e.g., an increase in surface temperature, an increase in water temperature) affect global warming and climate change [PR] – **D3.2** describe the natural greenhouse effect, its importance for life, and the difference between it and the anthropogenic greenhouse effect – **D3.4** identify different greenhouse gases (e.g., carbon dioxide, methane, water vapour, nitrous oxide), and explain how they are produced naturally in the environment – **D3.5** describe methods by which greenhouse gases are produced by humans (e.g., burning of biomass, chemical reactions involving pollutants) – **D3.6** identify the natural and human causes of climate change in the world and, in particular, how Canada contributes to climate change – **D3.7** identify indicators of global climate change (e.g., changes in: the mass of glacial and polar ice, sea levels, wind patterns, global carbon budget assessments, migratory patterns of birds)	***Modelling Linear Relations*** *Graphing and Writing Equations of Lines* – connect the rate of change of a linear relation to the slope of the line, and define the slope as the ratio m = *rise/run* – identify, through investigation, $y = mx + b$ as a common form for the equation of a straight line, and identify the special cases $x = a$, $y = b$ – identify, through investigation with technology, the geometric significance of m and b in the equation $y = mx + b$ – identify, through investigation, properties of the slopes of lines and line segments (e.g., direction, positive or negative rate of change, steepness, parallelism), using graphing technology to facilitate investigations, where appropriate *Solving and Interpreting Systems of Linear Equations* – solve problems that arise from realistic situations described in words or represented by given linear systems of two equations involving two variables, by choosing an appropriate algebraic or graphical method

Science Curriculum Connections	Mathematics Curriculum Connections
Activity 2: Climate Modelling	
Scientific Investigation Skills and Career Exploration – **A1.1** formulate scientific questions about observed relationships, ideas, problems, and/or issues, make predictions, and/or formulate hypotheses to focus inquiries or research [IP] – **A1.8** analyse and interpret qualitative and/or quantitative data to determine whether the evidence supports or refutes the initial prediction or hypothesis, identifying possible sources of error, bias, or uncertainty [AI] – **A1.9** analyse the information gathered from research sources for reliability and bias [AI] – **A1.10** draw conclusions based on inquiry results and research findings, and justify their conclusions [AI] – **A2.1** identify and describe a variety of careers related to the fields of science under study (e.g., veterinarian assistant, quality control technician, conservation officer, sound and light technician) and the education and training necessary for these careers ***Earth and Space Science: Earth's Dynamic Climate*** – **D1.2** analyse ways in which human actions (e.g., burning fossil fuels, implementing tree-planting programs) have increased or decreased the production of greenhouse gases [AI, C] – **D2.1** use appropriate terminology related to Earth's dynamic climate, including, but not limited to: *anthropogenic, atmosphere, carbon footprint, carbon sink, climate, greenhouse gases, hydrosphere,* and *weather* [C] – **D2.3** use a research process to investigate a source of greenhouse gases (e.g., decaying garbage, animal digestive processes, burning biomass) and its effect on a region of Canada (e.g., melting of the polar ice cap in the Arctic, shrinking of glaciers in the Rockies) [IP, PR, AI] – **D2.4** conduct an inquiry to determine how different factors (e.g., an increase in surface temperature, an increase in water temperature) affect global warming and climate change [PR] – **D2.7** compare different perspectives and/or biases evident in discussions of climate change in scientific and non-scientific media (e.g., with reference to knowledge, beliefs, and/or values) [PR, AI] – **D3.4** identify different greenhouse gases (e.g., carbon dioxide, methane, water vapour, nitrous oxide), and explain how they are produced naturally in the environment – **D3.5** describe methods by which greenhouse gases are produced by humans (e.g., burning of biomass, chemical reactions involving pollutants) – **D3.6** identify the natural and human causes of climate change in the world and, in particular, how Canada contributes to climate change – **D3.7** identify indicators of global climate change (e.g., changes in: the mass of glacial and polar ice, sea levels, wind patterns, global carbon budget assessments, migratory patterns of birds)	***Modelling Linear Relations*** *Graphing and Writing Equations of Lines* – connect the rate of change of a linear relation to the slope of the line, and define the slope as the ratio m = *rise/run* – identify, through investigation with technology, the geometric significance of m and b in the equation $y = mx + b$ – identify, through investigation, properties of the slopes of lines and line segments (e.g., direction, positive or negative rate of change, steepness, parallelism), using graphing technology to facilitate investigations, where appropriate *Solving and Interpreting Systems of Linear Equations* – solve problems that arise from realistic situations described in words or represented by given linear systems of two equations involving two variables, by choosing an appropriate algebraic or graphical method

Science Curriculum Connections	Mathematics Curriculum Connections
Activity 3: A Warming World	
Scientific Investigation Skills and Career Exploration – **A1.1** formulate scientific questions about observed relationships, ideas, problems, and/or issues, make predictions, and/or formulate hypotheses to focus inquiries or research [IP] – **A1.2** select appropriate instruments (e.g., a microscope, laboratory glassware, an optical bench) and materials (e.g., prepared slides, an aquarium, lenses, acid-base indicators) for particular inquiries [IP] – **A1.5** conduct inquiries, controlling some variables, adapting or extending procedures as required, and using standard equipment and materials safely, accurately, and effectively, to collect observations and data [PR] – **A1.6** gather data from laboratory and other sources, and organize and record the data using appropriate formats, including tables, flow charts, graphs, and/or diagrams [PR] – **A1.8** analyse and interpret qualitative and/or quantitative data to determine whether the evidence supports or refutes the initial prediction or hypothesis, identifying possible sources of error, bias, or uncertainty [AI] – **A1.9** analyse the information gathered from research sources for reliability and bias [AI] – **A1.10** draw conclusions based on inquiry results and research findings, and justify their conclusions [AI] ***Earth and Space Science: Earth's Dynamic Climate*** – **D1.1** analyse, on the basis of research, various ways in which living things and natural systems have been affected by climate change (e.g., the effect of loss of permafrost on northern roads and housing; the effect of longer growing seasons in some regions on farmers; the effect of warming oceans on coral reefs), and communicate their findings [IP, PR, AI, C] – **D2.1** use appropriate terminology related to Earth's dynamic climate, including, but not limited to: *anthropogenic, atmosphere, carbon footprint, carbon sink, climate, greenhouse gases, hydrosphere,* and *weather* [C] – **D2.4** conduct an inquiry to determine how different factors (e.g., an increase in surface temperature, an increase in water temperature) affect global warming and climate change [PR] – **D2.6** compare different tools or systems used by scientists to make informed decisions on global climate change (e.g., Ecoregions of Canada, bioclimate profiles) [PR, AI] – **D3.3** describe how heat is transferred and stored in both hydrospheric and atmospheric heat sinks – **D3.7** identify indicators of global climate change (e.g., changes in: the mass of glacial and polar ice, sea levels, wind patterns, global carbon budget assessments, migratory patterns of birds)	***Measurement and Trigonometry*** *Solving Problems Involving Surface Area and Volume, Using the Imperial and Metric Systems of Measurement* – perform everyday conversions between the imperial system and the metric system (e.g., millilitres to cups, centimetres to inches) and within these systems (e.g., cubic metres to cubic centimetres, square feet to square yards), as necessary to solve problems involving measurement ***Modelling Linear Relations*** *Graphing and Writing Equations of Lines* – connect the rate of change of a linear relation to the slope of the line, and define the slope as the ratio m = *rise/run* – identify, through investigation with technology, the geometric significance of m and b in the equation $y = mx + b$ – identify, through investigation, properties of the slopes of lines and line segments (e.g., direction, positive or negative rate of change, steepness, parallelism), using graphing technology to facilitate investigations, where appropriate *Solving and Interpreting Systems of Linear Equations* – solve problems that arise from realistic situations described in words or represented by given linear systems of two equations involving two variables, by choosing an appropriate algebraic or graphical method

Science Curriculum Connections	Mathematics Curriculum Connections
Activity 4: The Impact of Transportation	
Scientific Investigation Skills and Career Exploration – **A1.1** formulate scientific questions about observed relationships, ideas, problems, and/or issues, make predictions, and/or formulate hypotheses to focus inquiries or research [IP] – **A1.7** select, organize, and record relevant information on research topics from various sources, including electronic, print, and/or human sources (e.g., a website for a public health organization, federal and provincial government publications, reference books, personal interviews), using recommended formats and an accepted form of academic documentation [PR] – **A1.8** analyse and interpret qualitative and/or quantitative data to determine whether the evidence supports or refutes the initial prediction or hypothesis, identifying possible sources of error, bias, or uncertainty [AI] – **A1.10** draw conclusions based on inquiry results and research findings, and justify their conclusions [AI] – **A1.11** communicate ideas, plans, procedures, results, and conclusions orally, in writing, and/or in electronic presentations, using appropriate language and a variety of formats (e.g., data tables, laboratory reports, presentations, debates, simulations, models) [C] – **A2.1** identify and describe a variety of careers related to the fields of science under study (e.g., veterinarian assistant, quality control technician, conservation officer, sound and light technician) and the education and training necessary for these careers ***Earth and Space Science: Earth's Dynamic Climate*** – **D1.2** analyse ways in which human actions (e.g., burning fossil fuels, implementing tree-planting programs) have increased or decreased the production of greenhouse gases [AI, C] – **D2.1** use appropriate terminology related to Earth's dynamic climate, including, but not limited to: *anthropogenic, atmosphere, carbon footprint, carbon sink, climate, greenhouse gases, hydrosphere,* and *weather* [C] – **D2.3** use a research process to investigate a source of greenhouse gases (e.g., decaying garbage, animal digestive processes, burning biomass) and its effect on a region of Canada (e.g., melting of the polar ice cap in the Arctic, shrinking of glaciers in the Rockies) [IP, PR, AI] – **D2.5** investigate their personal carbon footprint, using a computer simulation or numerical data (e.g., determine carbon emissions that result from their travelling to school, work, and recreation venues; from vacation travelling; from buying products imported from distant countries), and plan a course of action to reduce their footprint (e.g., a plan to increase their use of bicycles or public transit; to eat more local foods) [PR, AI, C] – **D2.7** compare different perspectives and/or biases evident in discussions of climate change in scientific and non-scientific media (e.g., with reference to knowledge, beliefs, and/or values) [PR, AI] – **D3.5** describe methods by which greenhouse gases are produced by humans (e.g., burning of biomass, chemical reactions involving pollutants) – **D3.6** identify the natural and human causes of climate change in the world and, in particular, how Canada contributes to climate change	***Modelling Linear Relations*** *Manipulating and Solving Algebraic Equations* – solve first-degree equations involving one variable, including equations with fractional coefficients (e.g., using the balance analogy, computer algebra systems, paper and pencil) – determine the value of a variable in the first degree, using a formula (i.e., by isolating the variable and then substituting known values; by substituting known values and then solving for the variable) (e.g., in analytic geometry, in measurement) *Solving and Interpreting Systems of Linear Equations* – solve problems that arise from realistic situations described in words or represented by given linear systems of two equations involving two variables, by choosing an appropriate algebraic or graphical method

Science Curriculum Connections	Mathematics Curriculum Connections
Activity 5: How Much Carbon Is in That Tree?	
Scientific Investigation Skills and Career Exploration – **A1.1** formulate scientific questions about observed relationships, ideas, problems, and/or issues, make predictions, and/or formulate hypotheses to focus inquiries or research [IP] – **A1.2** select appropriate instruments (e.g., a microscope, laboratory glassware, an optical bench) and materials (e.g., prepared slides, an aquarium, lenses, acid-base indicators) for particular inquiries [IP] – **A1.3** identify and locate print, electronic, and human sources that are relevant to research questions [IP] – **A1.6** gather data from laboratory and other sources, and organize and record the data using appropriate formats, including tables, flow charts, graphs, and/or diagrams [PR] – **A1.8** analyse and interpret qualitative and/or quantitative data to determine whether the evidence supports or refutes the initial prediction or hypothesis, identifying possible sources of error, bias, or uncertainty [AI] – **A1.10** draw conclusions based on inquiry results and research findings, and justify their conclusions [AI] – **A1.12** use appropriate numeric, symbolic, and graphic modes of representation, and appropriate units of measurement (e.g., SI and imperial units) [C] – **A1.13** express the results of any calculations involving data accurately and precisely [C] – **A2.1** identify and describe a variety of careers related to the fields of science under study (e.g., veterinarian assistant, quality control technician, conservation officer, sound and light technician) and the education and training necessary for these careers ***Earth and Space Science: Earth's Dynamic Climate*** – **D1.2** analyse ways in which human actions (e.g., burning fossil fuels, implementing tree-planting programs) have increased or decreased the production of greenhouse gases [AI, C] – **D2.1** use appropriate terminology related to Earth's dynamic climate, including, but not limited to: *anthropogenic, atmosphere, carbon footprint, carbon sink, climate, greenhouse gases, hydrosphere,* and *weather* [C] – **D2.5** investigate their personal carbon footprint, using a computer simulation or numerical data (e.g., determine carbon emissions that result from their travelling to school, work, and recreation venues; from vacation travelling; from buying products imported from distant countries), and plan a course of action to reduce their footprint (e.g., a plan to increase their use of bicycles or public transit; to eat more local foods) [PR, AI, C] – **D3.5** describe methods by which greenhouse gases are produced by humans (e.g., burning of biomass, chemical reactions involving pollutants)	***Measurement and Trigonometry*** *Solving Problems Involving the Trigonometry of Right Triangles* – determine the measures of the sides and angles in right triangles, using the primary trigonometric ratios and the Pythagorean theorem – solve problems involving the measures of sides and angles in right triangles in real-life applications (e.g., in surveying, in navigating, in determining the height of an inaccessible object around the school), using the primary trigonometric ratios and the Pythagorean theorem *Solving Problems Involving Surface Area and Volume, Using the Imperial and Metric Systems of Measurement* – perform everyday conversions between the imperial system and the metric system (e.g., millilitres to cups, centimetres to inches) and within these systems (e.g., cubic metres to cubic centimetres, square feet to square yards), as necessary to solve problems involving measurement – solve problems involving the surface areas of prisms, pyramids, and cylinders, and the volumes of prisms, pyramids, cylinders, cones, and spheres, including problems involving combinations of these figures, using the metric system or the imperial system, as appropriate

Science Curriculum Connections	Mathematics Curriculum Connections
Activity 6: When Does It Make Sense to Switch?	
Scientific Investigation Skills and Career Exploration – **A1.1** formulate scientific questions about observed relationships, ideas, problems, and/or issues, make predictions, and/or formulate hypotheses to focus inquiries or research [IP] – **A1.7** select, organize, and record relevant information on research topics from various sources, including electronic, print, and/or human sources (e.g., a website for a public health organization, federal and provincial government publications, reference books, personal interviews), using recommended formats and an accepted form of academic documentation [PR] – **A1.8** analyse and interpret qualitative and/or quantitative data to determine whether the evidence supports or refutes the initial prediction or hypothesis, identifying possible sources of error, bias, or uncertainty [AI] – **A1.10** draw conclusions based on inquiry results and research findings, and justify their conclusions [AI] – **A1.12** use appropriate numeric, symbolic, and graphic modes of representation, and appropriate units of measurement (e.g., SI and imperial units) [C] – **A1.13** express the results of any calculations involving data accurately and precisely [C] ***Earth and Space Science: Earth's Dynamic Climate*** – **D1.2** analyse ways in which human actions (e.g., burning fossil fuels, implementing tree-planting programs) have increased or decreased the production of greenhouse gases [AI, C] – **D2.1** use appropriate terminology related to Earth's dynamic climate, including, but not limited to: *anthropogenic, atmosphere, carbon footprint, carbon sink, climate, greenhouse gases, hydrosphere,* and *weather* [C] – **D3.5** describe methods by which greenhouse gases are produced by humans (e.g., burning of biomass, chemical reactions involving pollutants) – **D3.6** identify the natural and human causes of climate change in the world and, in particular, how Canada contributes to climate change	***Modelling Linear Relations*** *Manipulating and Solving Algebraic Equations* – solve first-degree equations involving one variable, including equations with fractional coefficients (e.g., using the balance analogy, computer algebra systems, paper and pencil) *Graphing and Writing Equations of Lines* – connect the rate of change of a linear relation to the slope of the line, and define the slope as the ratio $m = rise/run$ – determine the equation of a line, given its graph, the slope and y-intercept, the slope and a point on the line, or two points on the line *Solving and Interpreting Systems of Linear Equations* – determine graphically the point of intersection of two linear relations (e.g., using graph paper, using technology) – solve systems of two linear equations involving two variables with integral coefficients, using the algebraic method of substitution or elimination – solve problems that arise from realistic situations described in words or represented by given linear systems of two equations involving two variables, by choosing an appropriate algebraic or graphical method *Solving and Interpreting Systems of Linear Equations* – solve problems that arise from realistic situations described in words or represented by given linear systems of two equations involving two variables, by choosing an appropriate algebraic or graphical method

Science Curriculum Connections	Mathematics Curriculum Connections
Design Challenge: Climate in a Container	
Scientific Investigation Skills and Career Exploration – **A1.1** formulate scientific questions about observed relationships, ideas, problems, and/or issues, make predictions, and/or formulate hypotheses to focus inquiries or research [IP] – **A1.2** select appropriate instruments (e.g., a microscope, laboratory glassware, an optical bench) and materials (e.g., prepared slides, an aquarium, lenses, acid-base indicators) for particular inquiries [IP] – **A1.4** apply knowledge and understanding of safe practices and procedures when planning investigations (e.g., appropriate techniques for handling, storing, and disposing of laboratory materials [following the Workplace Hazardous Materials Information System-WHMIS]; safe operation of optical equipment; safe handling and disposal of biological materials), with the aid of appropriate support materials (e.g., the Reference Manual on the WHMIS website; the Live Safe! Work Smart! website) [IP] – **A1.5** conduct inquiries, controlling some variables, adapting or extending procedures as required, and using standard equipment and materials safely, accurately, and effectively, to collect observations and data [PR] – **A1.6** gather data from laboratory and other sources, and organize and record the data using appropriate formats, including tables, flow charts, graphs, and/or diagrams [PR] – **A1.8** analyse and interpret qualitative and/or quantitative data to determine whether the evidence supports or refutes the initial prediction or hypothesis, identifying possible sources of error, bias, or uncertainty [AI] – **A1.10** draw conclusions based on inquiry results and research findings, and justify their conclusions [AI] – **A2.1** identify and describe a variety of careers related to the fields of science under study (e.g., veterinarian assistant, quality control technician, conservation officer, sound and light technician) and the education and training necessary for these careers ***Earth and Space Science: Earth's Dynamic Climate*** – **D1.2** analyse ways in which human actions (e.g., burning fossil fuels, implementing tree-planting programs) have increased or decreased the production of greenhouse gases [AI, C] – **D2.1** use appropriate terminology related to Earth's dynamic climate, including, but not limited to: *anthropogenic, atmosphere, carbon footprint, carbon sink, climate, greenhouse gases, hydrosphere,* and *weather* [C] – **D2.2** investigate the principles of the natural greenhouse effect, using simulations, diagrams, and/or models, and compare these principles to those of an actual greenhouse [PR, AI] – **D2.3** use a research process to investigate a source of greenhouse gases (e.g., decaying garbage, animal digestive processes, burning biomass) and its effect on a region of Canada (e.g., melting of the polar ice cap in the Arctic, shrinking of glaciers in the Rockies) [IP, PR, AI] – **D2.4** conduct an inquiry to determine how different factors (e.g., an increase in surface temperature, an increase in water temperature) affect global warming and climate change [PR] – **D3.1** describe the principal components of Earth's climate system (e.g., the sun, oceans, and the atmosphere; the topography and configuration of land masses) – **D3.2** describe the natural greenhouse effect, its importance for life, and the difference between it and the anthropogenic greenhouse effect – **D3.3** describe how heat is transferred and stored in both hydrospheric and atmospheric heat sinks – **D3.4** identify different greenhouse gases (e.g., carbon dioxide, methane, water vapour, nitrous oxide), and explain how they are produced naturally in the environment – **D3.6** identify the natural and human causes of climate change in the world and, in particular, how Canada contributes to climate change	