Sample Course Plans
Grade 9 Science, De-streamed (SNC1W), 2022

What is a course plan and why is it important?

The vision of the Grade 9 science course is for students to acquire and develop the skills and knowledge they need to thrive in today's rapidly changing world. As discoveries and innovations in STEM increasingly impact our lives, science continues to adapt and evolve. A central component of this curriculum is safe, practical, hands-on, experiential learning that will support students in becoming successful and discerning individuals who are scientifically literate.

Vision and Goals of the Grade 9 Science Course (2022)

A course plan outlines and organizes curriculum expectations. It is a living document that is revised as educators become increasingly aware of the abilities, strengths, needs and interests of their students.

A thoughtfully developed course plan:

- ensures that instruction is sequenced in a manner that aligns with research about learning science;
- allocates the appropriate time for concepts and skills so that students have multiple opportunities to focus on the overall expectations in the course;
- connects concepts and skills to other strands within the curriculum, to other subject areas, and to the lives of students;
- ensures that all specific expectations are addressed at least once within the course; and
- recognizes that some expectations need to be revisited several times throughout the course.

Note: These sample course plans outline a possible sequence of instruction for the course. There are many ways to structure an effective plan for learning.

Reflective questions for consideration

Consider the following questions when developing, implementing, and reflecting on course plans.

How can my plans:

- incorporate student voice, choice, and lived experiences to support engagement and understanding?
- honour and value varied realities of students and communities through the use of diverse resources, examples, and pedagogical approaches?
- incorporate tasks that are respectful and reflective of high expectations for all students?
- support the multiple ways assessment information should be collected (e.g., conversations, observations, products)?
- support students in making connections between the curriculum expectations and real-life experiences including developments, research, and innovation in STEM fields?
- support students in exploring pathways and connections associated with various STEM-related careers?
- provide hands-on learning experiences enabling students to deepen their understanding of the science they are learning and improve their STEM skills?
- support academic success by providing students with a range of opportunities to demonstrate their understanding of science concepts and apply STEM skills as evidence of learning?

Grade 9 Science, De-streamed (SNC1W) – Sample Course Plan

Cycle 1: Feeding the world

Mathematical models predict that the world population will approach 10 billion people by 2050. These predictions motivate us to question the impact of various agricultural strategies on different global populations and to assess how these strategies may contribute to or mitigate climate change.

Cluster 1: In this cycle, students investigate effective strategies for feeding the growing global human population and that both avoid contributing to climate change, while respecting traditions.

Cluster 2: Students study the influence of agriculture on the world population, as well as scientific, economic, and social issues relating to this field. In addition, students learn about environmental, economic, and social factors influencing harvests in a region under investigation.

Cluster 3: Students apply chemistry and physics concepts to explain the operation and efficiency of different appliances used in kitchens around the world.

Cluster 1: Harvests around the world

Topics and expectations

STEM Skills, Careers, and Connections: A1.1, A1.3, A1.4, A2.1, A2.2, A2.3, A2.4, A2.5

Biology: B1.1, B1.3, B2.7

Skills and connections	Specific expectations
Students use a scientific research process to investigate agricultural practices and their impacts on ecosystem sustainability, both locally and globally.	A1.1, B1.1, B2.7
Students connect with individuals with diverse lived experiences from various sectors who are working to better understand their sector's impact on climate change and to develop innovative practices and technological solutions to mitigate these impacts.	A2.2, A2.3, A2.4, A2.5, B1.1
Students research and make connections between teachings from different knowledge systems and communities around the world that can contribute to the dynamic equilibrium of agricultural ecosystems.	A1.1, A2.5, B1.3
Students examine an agricultural challenge faced by a local or global community and propose an innovative solution to address the challenge, through the use of a prototype or model.	A1.3, A1.4, A2.1, A2.3, B1.1, B2.7

Cluster 2: Factors impacting harvests

Topics and expectations

STEM Skills, Careers, and Connections: A1.1, A1.2, A1.4, A2.1

Biology: B2.2, B2.3, B2.4

Chemistry: C1.1, C1.2

Earth and Space Science: E2.1

Skills and connections	Specific expectations
Students explore STEM-related occupations, including skilled trades, associated with sustainable agricultural practices.	A1.1, A2.1
Students examine the use of certain elements and compounds in pesticides and insecticides that can disrupt the dynamic equilibrium of ecosystems.	C1.1, C1.2
Through field study or virtual simulations, students investigate the impacts of various factors and processes, including biodiversity, air and water quality, soil health, and ecological succession, on plant growth and the sustainability of an ecosystem.	A1.2, A1.4, B2.4
Students apply coding concepts and skills to model and deepen their understanding of the importance of various factors that influence harvests (e.g., water, air, light).	A1.4, A2.1, B2.4
Students explore the relationship between cellular respiration and photosynthesis and the role that these processes play in maintaining the dynamic equilibrium of ecosystems.	B2.2, B2.3
Students describe the importance of the cycling of matter and the flow of energy that contribute to the dynamic equilibrium within and between ecosystems, and the importance of the Sun and its characteristics in sustaining life on Earth.	B2.2, E2.1

Cluster 3: Science in the kitchen

Topics and expectations

STEM Skills, Careers, and Connections: A1.1, A1.2, A1.3, A1.5

Chemistry: C2.1, C2.4, C2.5, C2.6, C2.7

Physics: D1.1, D1.2, D2.2, D2.8

Skills and connections	Specific expectations
Students investigate the relationship between an element's position in the periodic table, its atomic structure, and its physical and chemical properties.	A1.2, A1.5, C2.4, C2.5, C2.6
Students explore different methods of generating electrical energy and the electrical efficiency of various devices used in food preparation.	D1.1, D2.8
Students apply a scientific research process to investigate the accessibility of electrical energy and assess the impact of power generation and consumption on various local and global communities.	A1.1, D1.2

Skills and connections	Specific expectations
Students apply a scientific experimentation process to compare the chemical and physical properties of different materials and products commonly used in the kitchen. Students explore the relationship between the chemical structure of simple compounds in these materials or products and their chemical formulas.	A1.2, C2.6, C2.7
Students conduct investigations to determine the thermal and/or electrical conductivity of various materials used for cooking.	A1.2, C2.1, C2.5, D2.2
Students compare the energy efficiency of various electrical kitchen appliances using EnerGuide labels. Students apply an engineering design process to investigate ways to improve the efficiency of a device in which electrical energy is produced or consumed.	A1.3, D2.8

Cycle 2: Emerging technologies and climate change

The Earth's climate is constantly changing and has been for thousands of years. However, since the Industrial Revolution, climate change has been accelerating due to human activity – primarily the emission of greenhouse gases. Collective efforts are needed to find ways to reduce greenhouse gas emissions to mitigate climate change. The use of emerging technologies contributes to the fight against climate change and its impact on society and the environment.

Cluster 1: Electrical energy is often suggested as an alternative to reduce greenhouse gas emissions. Students are introduced to this topic through the study of electrical energy and electricity.

Cluster 2: Students explore the constraints of using electric power as an alternative energy source and the challenges associated with the electrification of transportation. They investigate the idea that regardless of the energy source used, there is an impact on society and the environment, and that energy use must be reconsidered.

Cluster 3: Students explore the impact of climate change and of energy transformations on ecosystems and the environment, and ways in which emerging technologies are helping to mitigate these impacts.

Cluster 1: Electricity

Topics and expectations

STEM Skills, Careers, and Connections: A1.1, A1.2, A1.3, A1.4, A2.1, A2.2

Chemistry: C2.2, C2.3, C2.4

Physics: D2.1, D2.2, D2.3, D2.4, D2.5, D2.6, D2.7, D2.8

Skills and connections	Specific expectations
Students investigate the development of various atomic models leading to the identification of subatomic particles. Students also identify the location, relative mass, and charge of subatomic particles within an atom, using the Bohr-Rutherford model.	C2.2, C2.3, C2.4
Students conduct investigations to explain the behaviour of electric charges in static and current electricity in various contexts and relate the observed behaviour to the properties of subatomic particles and atomic structure.	A1.1, A1.2, C2.3, D2.1
Students explore key concepts of electricity (e.g., electrical charges, conductivity, electrostatic forces, types of circuits and their components; electrical quantities, their symbols, and their corresponding SI units) through investigations and make connections between these concepts and their application in residential and commercial contexts.	A1.2, D2.2, D2.3
Students investigate how different types of circuits work and explain the relationship between electric current, potential difference, and resistance.	A1.2, D2.4, D2.5, D2.6
Students explain how energy transformations form the basis of the production and use of electrical energy and develop a prototype or model that demonstrates these energy transformations.	A1.3, D2.7
Students apply their understanding of electricity to construct circuits that will be automated through coding and explain how automated systems can augment efficiency or reduce inefficiencies, for example, by avoiding being constantly under voltage.	A1.3, A1.4, A2.1, A2.2, D2.5, D2.8

Cluster 2: Electrification of transport and alternative energy sources

Topics and expectations

STEM Skills, Careers, and Connections: A1.3, A2.2, A2.5

Chemistry: C1.1, C1.2, C2.6

Physics: D1.1, D1.2, D1.3, D1.4, D2.3, D2.5

Earth and Space Science: E2.2

Skills and connections	Specific expectations
Students connect with individuals from different STEM fields to understand the impacts of climate change in their respective sectors and discuss the technological solutions they develop in order to mitigate these issues.	A2.2, A2.5
Students apply a mathematical model to calculate the electric current, the potential difference, and the resistance in different types of charging stations for electric cars and other devices replacing devices using the combustion of fossil fuels.	D2.5
Students explore different renewable and non-renewable energy sources that could power electrical networks in various communities, considering the impact of the use of these energy sources on communities.	D1.1, D1.2, D1.4, E2.2

Skills and connections	Specific expectations
Students investigate different chemicals (elements and compounds) used to manufacture batteries needed for the electrification of vehicles, as well as the properties, sourcing, and disposal of these chemicals.	C1.1, C1.2, C2.6
Students explore alternative solutions utilizing electrical energy for transportation in their community and develop a prototype or model of an electrical transportation technology that meets the needs of their community.	A1.3, C1.1, D1.1
Students create an inventory of fuel-powered appliances or devices that have been electrified (e.g., chainsaw, lawn mower) and determine advantages and disadvantages of these devices. Students develop a prototype or model of a small home appliance or device, identifying the type of circuits used and their components.	A1.3, D1.3, D1.4, D2.3

Cluster 3: The impact of climate change on ecosystems and the environment

Topics and expectations

STEM Skills, Careers, and Connections: A1.1, A1.4, A2.2, A2.4

Biology: B1.1, B1.2, B1.3, B2.1, B2.4, B2.5, B2.6

Chemistry: C1.2, C2.1

Physics: D1.1, D1.3, D2.8

Earth and Space Science: E1.1, E1.2, E1.3

Skills and connections	Specific expectations
Students investigate emerging technologies in the fields of chemistry and physics and develop an action plan to increase energy efficiency and reduce consumption, with a focus on renewable energy sources.	A2.2, C1.2, D1.1, D1.3, D2.8
Students examine how climate change affects the sustainability of ecosystems, including the impact of these changes on First Nations, Métis, and Inuit communities, and how emerging technology can be used to minimize impacts.	A1.1, A2.4, B1.1, B1.2, B1.3
Students investigate how human activity can contribute to climate change and disrupt the dynamic equilibrium within and between the biosphere, hydrosphere, lithosphere, and atmosphere.	B2.1, B2.5, B2.6, C2.1
Students explore the benefits of biodiversity and examine how various human activities and climate change continue to threaten biodiversity locally and globally. Students use virtual simulations to model the impacts of reduced biodiversity in an ecosystem.	A1.1, A1.4, B2.4, B2.5, B2.6
Students investigate how the use of satellites and other technologies enables data collection and explain how this data can contribute to a better understanding of climate change and its short- and long-term effects.	A1.1, B2.6, E1.1, E1.2, E1.3

Cycle 3: Waste management

Waste accumulates wherever humans explore or settle, whether on land, in the oceans, or even in space. It can take the form of chemical waste, nuclear waste, food waste (organic matter), plastic waste, or other substances that negatively impact ecosystems.

Cluster 1: Students explore chemical and nuclear waste and investigate how these can be disposed of safely.

Cluster 2: Students investigate the effects of waste on the dynamic equilibrium of ecosystems as well as how to reduce the amount of waste by recycling material.

Cluster 3: Students explore the impact of space clutter and the dangers posed by this waste.

Cluster 1: Chemical and nuclear waste management

Topics and expectations

STEM Skills, Careers, and Connections: A1.1, A1.2, A1.5, A2.1

Biology: B2.5

Chemistry: C1.1, C2.6, C2.7

Physics: D1.1, D1.4

Skills and connections	Specific expectations
Students investigate how chemical waste can be safely disposed of in the school lab or at home. They visit, in-person or virtually, a hazardous waste collection centre and explore related skilled trades.	A1.5, A2.1, C2.6
Students apply a scientific research process to explore chemicals that are considered harmful to the environment and how these can disrupt the dynamic equilibrium of ecosystems.	A1.1, B2.5, C1.1, C2.6
Students investigate the physical and chemical properties of various elements and compounds used in household products that require specific disposal protocols to minimize their environmental impact, and suggest alternative substances that have a less harmful impact on the environment. Students explore the relationship between the structures of various simple compounds and their chemical formulas.	A1.2, C2.6, C2.7
Students investigate how nuclear waste resulting from nuclear energy production is managed, and examine innovative technologies developed to manage this waste.	A1.1, D1.1, D1.4

Cluster 2: The effect of waste management on ecosystems

Topics and expectations

STEM Skills, Careers, and Connections: A1.2, A1.3, A1.4, A2.4, A2.5

Biology: B1.3, B2.1, B2.2, B2.7

Chemistry: C2.1

Skills and connections	Specific expectations
Students investigate the recycling of organic matter through composting.	A1.2, B1.3, B2.2, B2.7, C2.1
Students apply an engineering design process to design, build, and test a machine that is programmed to sort and recycle waste or to compost organic matter.	A1.3, A1.4, B2.1
Students examine how First Nations, Métis, and Inuit communities use resources in sustainable ways that minimize consumption of resources.	A2.4, A2.5, B1.3, C2.1

Cluster 3: Decluttering space

Topics and expectations

STEM Skills, Careers, and Connections: A1.1

Biology: B2.5

Earth and Space Science: E1.1, E1.3

Skills and connections	Specific expectations
Students explore how innovations in space exploration and observation technologies can have positive social, economic, and environmental impacts.	A1.1, E1.1, E1.3
Students explore how abandoning obsolete equipment in space can cause clutter and pose a risk to probes, satellites, and space stations, and evaluate strategies used to dispose of space junk and avoid collisions with debris.	A1.1, E1.1, E1.3
Students apply a scientific research process to investigate measures taken by space agencies to avoid contaminating planets or other celestial bodies.	A1.1, B2.5, E1.1, E1.3

Cycle 4: A new habitable planet

Since the dawn of time, human beings have always been fascinated by space. Curiosity is at the heart of the human spirit; it is about discovering the unknown and pushing the limits of our knowledge of the universe. In this cycle, students determine the criteria necessary to make another planet in the solar system habitable for humans.

Cluster 1: Students learn about various emerging technologies that have enabled important scientific discoveries in space exploration and observation.

Cluster 2: Students analyse discoveries of different celestial bodies in the solar system.

Cluster 3: Students investigate ideal conditions for producing a viable environment on a celestial body within the solar system.

Cluster 1: Emerging technologies and space exploration

Topics and expectations

STEM Skills, Careers, and Connections: A1.1, A1.2, A2.1, A2.2

Biology: B2.4, B2.5

Chemistry: C1.1, C1.2, C2.5, C2.6

Physics: D1.2, D1.4, D2.3, D2.4, D2.5, D2.6, D2.8

Earth and Space Science: E1.1, E1.2, E1.3, E2.2

Skills and connections	Specific expectations
Students investigate STEM-related occupations, including skilled trades, and technological innovations related to space exploration.	A2.1, E1.2, E1.3
Students analyse economic and environmental impacts of emerging technologies related to electrical energy production on different communities.	D1.2, D1.4
Students explore various elements, compounds, and energy sources that are required for space exploration. They also discuss the impact of the extraction, use, and disposal of elements and compounds, and the impact of the production and consumption of energy sources on various local and global communities.	A2.2, C1.2, D1.2
Students construct different types of circuits to determine how they function and explore the advantages and disadvantages of them in real-life situations.	A1.2, A2.1, D2.3, D2.4, D2.5
Students develop mathematical models that represent the relationships between current, potential difference, and resistance, and investigate how these relationships are important to various technologies.	A2.2, D2.5, D2.6
Students investigate different methods of electrical energy production and their ability to enable space travel.	A1.1, D2.3, D2.8, E1.1
Students determine the properties of materials that have allowed the development of space exploration technologies, identifying where and how these materials have been sourced, and the impacts of extracting and/or producing these materials.	B2.4, B2.5, C1.1, C2.5, C2.6
Students describe the importance of the Sun and its characteristics with respect to technological advancements.	E2.2

Cluster 2: The characteristics of the planets

Topics and expectations

STEM Skills, Careers, and Connections: A1.1, A1.3, A1.4, A2.5

Biology: B2.2, B2.3, B2.4, B2.5

Earth and Space Science: E1.1, E2.1, E2.2, E2.3, E2.4, E2.5, E2.6

Skills and connections	Specific expectations
Students research contributions to science by people from various communities to our knowledge of the origin and evolution of our solar system, describing various theories explaining the origin and evolution of the solar system and the universe.	A1.1, A2.5, E2.3
Students explain the importance of the Sun and its characteristics and describe its role in the solar system. Students compare the characteristics of components of the solar system and the universe, including quantifying relative distances and sizes.	E2.1, E2.4, E2.5
Students observe and describe phenomena that occur in the solar system and explain the causes of these phenomena.	A1.1, E2.2, E2.6
Students determine the essential needs for the survival of a species on a planet. Students develop a physical or virtual model that illustrates how the needs of a species can be met in the model ecosystem.	A1.3, A1.4, B2.2, B2.3, B2.4
Students investigate and analyse how human activities related to space exploration, such as space debris, may impact the dynamic equilibrium of ecosystems.	A1.1, B2.5, E1.1

Cluster 3: The basic needs for life in space

Topics and expectations

STEM Skills, Careers, and Connections: A2.2

Biology: B2.1, B2.2, B2.4, B2.7

Chemistry: C1.1

Earth and Space Science: E2.1, E2.4

Skills and connections	Specific expectations
Students investigate interactions between the different spheres on Earth and compare Earth's spheres with the spheres of other planets.	B2.1, E2.4
Students analyse the relationship between the composition of the atmosphere and the greenhouse effect on Earth and investigate how this phenomenon influences life on Earth.	A2.2, B2.1, C1.1
Students investigate the conditions required to sustain human life on different planets and describe how to create a sustainable environment.	B2.1, B2.2, E2.4

Skills and connections	Specific expectations
Students identify the factors and processes that could enable human survival on different planets and explain how agricultural innovations can be applied to space habitats.	B2.4, B2.7, E2.1