

Course Outline

School Name: KEEWAYTINOOK INTERNET HIGH SCHOOL
Department Name: Sciences

Ministry of Education Course Title: Environmental Science

Grade Level: 11

Ministry Course Code: SVN3E

Teacher's Name: Cathy Rodger

Developed by: Cathy Rodger

Date: September 2019

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Developed from:

Ontario Ministry of Education. (2008). *The Ontario curriculum, grades 11 and 12; Science*.
Toronto ON: Queen's Printer for Ontario.

Text: None

Prerequisite: SNC1P, SNC1L, SNC2L

Credits: One

Length: 110 hours

Principal's Name: Angela Batsford-Mermans

Principal's Approval:



Approval Date: September 21, 2021

Course Description/Rationale

This course provides students with the fundamental knowledge of and skills relating to environmental science that will help them succeed in work and life after secondary school. Students will explore a range of topics, including the impact of human activities on the environment; human health and the environment; energy conservation; resource science and management; and safety and environmental responsibility in the workplace. Emphasis is placed on relevant, practical applications and current topics in environmental science, with attention to the refinement of students' literacy and mathematical literacy skills as well as the development of their scientific and environmental literacy.

Overall Curriculum Expectations

Scientific Investigation and Career Exploration

- Demonstrate scientific investigation skills (related to both inquiry and research) in the four areas of skills (initiating and planning, performing and recording, analyzing and interpreting, and communicating)
- Identify and describe careers related to the fields of science under study, and describe contributions of scientists, including Canadians, to those fields.

Human Impact on the Environment

- Analyze selected current environmental problems in terms of the role human activities have played in creating or perpetuating them, and propose possible solutions to one such problem;
- Investigate air, soil, and water quality in natural and disturbed environments, using appropriate technology;
- Demonstrate an understanding of some of the ways in which human activities affect the environment and how the impact of those activities is measured and monitored.

Human Health and the Environment

- Analyse the effects on human health of environmental contaminants and a significant environmental phenomenon;
- Investigate how different environmental factors can affect people's health and their lifestyle choices;
- Demonstrate an understanding of the ways in which environmental factors can affect human health and how their impact can be reduced.

Energy Conservation

- Evaluate initiatives and technological innovations related to energy consumption and conservation, and assess their impact on personal lifestyles, social attitudes, and the environment;
- Investigate various methods of conserving energy and improving energy efficiency
- Demonstrate an understanding of the basic principles of energy production, with reference to both renewable and non-renewable sources, and of various methods of energy conservation.

Natural Resource Science and Management

- Assess the environmental impact of the harvesting and/or extraction of resources, including ways of reducing this impact, and analyse threats to the sustainability of natural resources;
- Investigate methods scientists use to classify and monitor natural resources, and conduct investigations using those methods;
- Demonstrate an understanding of the sustainable use of resources and its relationship to the biodiversity and sustainability of ecosystems.

The Safe and Environmentally Responsible Workplace

- Assess workplace situations with respect to safety and environmental issues, and propose a course of action to address unsafe working conditions;
- Investigate a variety of safe and environmentally responsible workplace practices;
- Demonstrate an understanding of general workplace safety procedures and environmentally responsible practices.

Course Content

Unit	Length
1. Scientific Investigation Skills / Career Explorations	20 hours
2. Human Impact on the Environment	20 hours
3. Human Health and the Environment	20 hours
4. Energy Conservation	20 hours
5. Natural Resource Science and Management	15 hours
6. The Safe and Environmentally Responsible Workplace	15 hours
Total	110 hours

Unit Descriptions

Unit 1 – Scientific Investigation Skills

Students will demonstrate scientific investigation skills and practices (initiating and planning, performing and recording, analyzing and interpreting, and communicating) used throughout the other units. Use of scientific instruments, accessing virtual laboratories, data collection and presentation, inferencing, and the scientific method will be practiced in this unit. Students will interpret their data as well as communicate their results. Students will have an opportunity to investigate current climate change issues that affect their home reserves such as winter roads, forest fires and invasive species. Career exploration in the field of environmental science will be covered to give students an opportunity to examine possible careers such as water treatment operator and wastewater operator.

Unit 2 – Human Impact on the Environment

Students will investigate current environmental problems in terms of the role human activities have played on the environment. Students will propose solutions to one such problem. Investigation of air, soil and water quality of local conditions will be examined using appropriate technology. Students will demonstrate an understanding of how human activities affect our environment. Students will have an opportunity to conduct interviews with Elders to inquire about past weather patterns compared to today and the impacts that the change has had on hunting, fishing, animal migration and land travel.

Unit 3 – Human Health and the Environment

This unit will focus on human health as a result of environmental contaminants and lifestyle choices. Special focus will be given to the Grassy Narrows First Nation Mercury Contamination, the role that industry plays, government and community. Students will demonstrate ways on how contamination reduction can reduce the impact on human health. Focus will be given to the impacts of mold in First Nation housing and the chronic health issues that can result. Scientific investigation will be conducted on the hazardous waste materials that are located inside of their homes.

Unit 4 – Energy Conservation

This unit will focus on evaluating initiatives and technological innovations related to energy consumption as well as conservation. Assessing personal lifestyle choices, social attitudes and current modern practices will be a focus. Investigation of energy conservation and energy efficiency at a local level, as well as the role the government plays in reducing energy use by industries will be investigated. Understanding the basic principles of renewable and nonrenewable resources will be covered to help students in isolated northern communities have understanding of the cost related to the initial set up of alternative energy production and distribution.

Unit 5 – Natural Resource Science and Management

This unit will expose students to the environmental impact of harvesting and/or extraction of resources. Focus will be given to extraction of resources in the North (Ring of Fire mining, forestry, and fishing), as many of our students will be impacted by the development of road access to their

communities. Students will learn about the sustainable use of resources and its relationship to sustainable ecosystems, as well as biodiversity. Scientific methods will be used to demonstrate classification and monitoring of resources, as well as conducting investigations in local ecosystems (i.e. use of increment borers for dendrochronology).

Unit 6 – The Safe and Environmentally Responsible Workplace

Students will assess workplace situations with respect to safety and environmental issues, and propose a course of action to address unsafe work conditions. Investigation of a variety of safe and environmentally responsible workplace practices will be covered with emphasis on northern remote challenges (i.e. cleaning fuel leaks, toxic substances that are abandoned in surrounding community dumps and bush). Understanding of provincial workplace safety measures, practices and procedures will be covered (i.e. WHMIS MSDS, HHPs, etc.) Students will have an opportunity to examine current practices in their own communities for the treatment of sewage, providing clean water and disposal of household waste.

Teaching/Learning Strategies

This course is organized into an eight-week series of lessons and activities that is presented to students in remote northern communities via the internet. The eighth week is used for course consolidation, review, and the final examination. Teacher and students communicate over the internet through timely activity feedback, emails, messages, video and audio calls. Classroom mentors assume the role of liaison between the teacher and student while also supporting a holistic approach to motivate, engage and support each individual student.

A variety of strategies will be used in the online delivery of this course. Some instructional strategies include:

- The use of flexible groupings
- Cooperative learning: a range of team based learning approaches where students work together to complete a task. i.e. lab activities and experiments will be done as a group with fellow classmates in each community to encourage team problem solving and execution of experiments and labs.
- Ecological approach: involves all aspects of a student's life, including classroom, family, neighborhood, and community, in teaching the student scientific and technological skills.
- Graphic organizers: visual displays to organize information into things like trees, flowcharts, webs, etc. They help students to consolidate information into meaningful whole and they are used to improve comprehension of stories, organization of writing, and understanding of difficult concepts in word problems.
- Hands-on, active participation: Designing activities so that students are actively involved in the project or experiment. Hands-on participation is as important as verbal participation in the activity.
- K-W-L: know, want to know, learned, routine. A form of self-monitoring where students are taught to list what they know already about a subject, what they want to know, and later what they learned.
- Modeling/teacher demonstration: Teacher demonstrates how to do a lab or experiment before having the students try it on their own. . Modelling use of Science equipment and technology such as microscopes and Ipad attachments
- Multimedia: Use of digital media including text, links to web sites, video, word processing, dynamic visualization programs (i.e., Poodl, Virtual Dissection, Virtual Lab).
- The use of manipulatives and models provided in each classroom. There will be a focus on personal safety and the use of scientific tools and equipment.
- Response journal: Students record what they learned that day or strategies they learned or questions they have. Students can share their ideas in the class, with partners, and with the teacher.

Learning goals will be discussed at the beginning of each assignment and success criteria will be provided to students. The success criteria are used to develop the assessment tools in this course, including rubrics and checklists.

Evaluation

The final grade will be determined as follows (Ontario Ministry of Education, 2010):

- Seventy per cent of the grade will be based on evaluation conducted throughout the course. This portion of the grade should reflect the student's most consistent level of achievement throughout the course, although special consideration should be given to more recent evidence of achievement.
- Thirty percent of the grade will be based on a final evaluation administered at or towards the end of the course. This evaluation will be based on evidence from one or a combination of the following: an examination, a performance, an essay, and/or another method of evaluation suitable to the course content. The final evaluation allows the student an opportunity to demonstrate comprehensive achievement of the overall expectations for the course (p. 41).

Ontario Ministry of Education. (2010). *Growing success: Assessment, evaluation and reporting in Ontario schools*. Toronto ON: Queen's Printer for Ontario.

Type of Assessment	Category	Details		Weighting (%)
Term Work (70%)	Knowledge/ Understanding	Information obtained from lessons, websites linked to from lessons, textbook readings. Knowledge & understanding demonstrated through work submitted and through the ability to answer questions requiring targeted knowledge of concepts		12
	Thinking	Independent projects, experiments, answering questions requiring application of concepts to novel situations		18
	Communication	Report writing Science journal Short essay questions		17
	Application	Knowledge is applied and connected to everyday life through investigating careers, observing the night sky, examining home electricity use and practices, and examining the properties of everyday materials.		23
Final Evaluation (30%)	Culminating Activity (15%)	Summative Research and Report which is designed to recall and apply the concepts, approaches, skills and connections learned	Knowledge/Understanding	2.5
			Thinking	3.8
			Communication	3.7
			Application	4
	Exam (15%)	Written examination designed to cover all of the overall expectations of the course.	Knowledge/Understanding	2.5
			Thinking	3.8
			Communication	3.7
			Application	5
TOTAL			100	

Assessment/Evaluation Strategies

A variety of assessment and evaluation methods, strategies and tools are required as appropriate to the expectation being assessed. These include diagnostic, formative, and summative within the course and within each unit.

Assessment *for* learning and assessment *as* learning is obtained through a variety of means, including the following:

- Discussion forums, KWL, mind-maps, anecdotal records, check lists (performance observed, self-assessment), rubrics (what to demonstrate and how they will be assessed).
- Students are given specific, descriptive, and timely feedback: they can assess their own learning and become active participants (Assessment as learning.)
- Online submissions, Rubrics (general and task specific), Surveys, Reports, Performance Tasks, Achievement chart, Field Observations,
- Experiments, labs, Independent Study Units (ISU's), group work.
- Mentor observations
- Assignments: written submissions; audio, visual presentations, software program results (i.e., virtual chemistry and electricity submissions) and models.
- Performance (i.e., safe use of scientific equipment, proper use of equipment to collect, organize and analyze data).

Evidence of student achievement (assessment *of* learning) is collected from various sources, including the following:

- Observation of individual contribution in a group labs
- Ongoing observations of most consistent work, with consideration given to most recent work
- Culminating Activity
- Final exam

The Ministry of Education's 2010 document, *Growing Success*, outlines the seven fundamental principles that guide best practice in the assessment and evaluation of students. KiHS teachers use practices that:

- are fair, transparent, and equitable for all students;
- support all students, including those with special education needs, those who are learning the language of instruction (English or French), and those who are First Nation, Métis, or Inuit;
- are carefully planned to relate to the curriculum expectations and learning goals and, as much as possible, to the interests, learning styles and preferences, needs, and experiences of all students;
- are communicated clearly to students and parents at the beginning of the course and at other points throughout the school year or course;
- are ongoing, varied in nature, and administered over a period of time to provide multiple opportunities for students to demonstrate the full range of their learning;
- provide ongoing descriptive feedback that is clear, specific, meaningful, and timely to support improved learning and achievement;
- develop students' self-assessment skills to enable them to assess their own learning, set specific goals, and plan next steps for their learning (p.6).

Resources

Beaumont, H. (2016, June 1). Canada's ice roads are melting and that is terrible news for Aboriginal communities. <https://www.vice.com/en/article/43m4ab/canadas-ice-roads-are-melting-and-that-is-terrible-news-for-aboriginal-communities>

CBC News. (2013, Jan. 17). *Canadians produce more garbage than anyone else*. <https://www.cbc.ca/news/business/canadians-produce-more-garbage-than-anyone-else-1.1394020>

CBC News. (2017, Feb. 28). *Report suggesting mercury still leaking near Grassy Narrows 'deeply concerning,' chief says*. <https://www.cbc.ca/news/politics/grassy-narrows-old-mercury-report-1.4001775>

- Global Footprint Network. (n.d.) Footprint calculator. <https://www.footprintnetwork.org/resources/footprint-calculator/>
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- Government of Canada. (2015, Sept. 10). *Open burning of garbage: Health and environmental risks*. <https://www.canada.ca/en/environment-climate-change/services/managing-reducing-waste/municipal-solid/environment/open-burning-garbage-health-risks.html>
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- Ontario Ministry of Education. (2008). *The Ontario curriculum, grades 11 and 12: Science*. http://www.edu.gov.on.ca/eng/curriculum/secondary/2009science11_12.pdf
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- Toulouse, P.R. (2016). What matters in Indigenous education: Implementing a vision committed to holism, diversity and engagement. <https://peopleforeducation.ca/wp-content/uploads/2017/07/MWM-What-Matters-in-Indigenous-Education.pdf>
- WWF. (n.d.). *How big is your environmental footprint?* <https://www.footprintnetwork.org/resources/footprint-calculator/>

Program Planning

This course is offered to Indigenous students living in isolated, northern Ontario communities. It is offered by qualified teachers in a blended classroom with a balance of academic, wellness, land-based learning, local language and culture to support the success of the whole student. This course uses the internet for instruction, demonstration and research. It utilizes a student-centered

semi-virtual classroom which capitalizes on the strengths of internet program delivery to minimize the disadvantages of geographic remoteness.

Students are presented with 1320 minutes of instruction/activity via the internet over the period of one week. All lessons, assignments, questions and course material is presented in this manner, with approved print materials available as a student resource in each classroom. The student and instructor communicate via the internet, while a classroom mentor (a fully qualified teacher) assists students in completing tasks in a timely manner and provides support as required.

In science, an understanding of “terminology and concepts” is a precursor to developing skills of investigation and communication. In addition, relating science to society and the environment requires a clear understanding of all three topics. Students must therefore have a firm foundation in scientific terminology and concepts to successfully complete the curriculum. Emphasis in programming will focus on building a strong foundation for future success rather than trying to move routinely through the curriculum. Each student will struggle and excel at various points, and sometimes the class as a whole will need extra time to gain proficiency in a topic. Progress does not need to be linear in order to be successful.

Indigenous and local content is used throughout the course to meet students’ learning needs. Opportunities for outdoor activities and land-based learning are also incorporated and students are encouraged to use local knowledge in their products. Considerations are made to the learning preferences of the student population and lessons can be adjusted for individual students as required. Opportunities have been provided for students to apply ideas and concepts encountered in this course to their lives as an individual and as a member of a First Nations community. Teachers consult the Ontario Ministry of Education policies, guidelines and important initiatives when planning a comprehensive program in this area.