

Course Outline

School Name: KEEWAYTINOOK INTERNET HIGH SCHOOL
Department Name: Science

Ministry of Education Course Title: Environmental Science

Grade Level: 11

Ministry Course Code: SVN3M

Teacher's Name: Sangchul Yu

Developed by: Raj Budhram Date: September 2010

Revision Date: September 2021

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: SNC2P or SNC2D

Credits: One

Length: 110 hours

Principal's Name: Angela Batsford-Mermans

Principal's Approval:



Approval Date: September 8, 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 life after secondary school. Students will explore a range of topics, including the role of science in addressing contemporary environmental challenges; the impact of the environment on human health; sustainable agriculture and forestry; the reduction and management of waste; and the conservation of energy. Students will increase their scientific and environmental literacy and examine the interrelationships between science, the environment, and society in a variety of areas.

Overall Curriculum Expectations

Scientific Investigation Skills 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 communication);
- Identify and describe careers related to the fields of science under study, and describe the contributions of scientists, including Canadians, to those fields.

Scientific Solutions to Contemporary Environmental Challenges

- Analyze social and economic issues related to an environmental challenge, and how societal needs influence scientific endeavours related to the environment;
- Investigate a range of perspectives that have contributed to scientific knowledge about the environment, and how scientific knowledge and procedures are applied to address contemporary environmental problems;
- Demonstrate an understanding of major contemporary environmental challenges and how we acquire knowledge about them.

Human Health and the Environment

- Analyze initiatives, both governmental and non-governmental, that are intended to reduce the impact of environmental factors on human health;
- Investigate environmental factors that can affect human health, and analyze related data;
- Demonstrate an understanding of various environmental factors that can affect human health, and explain how the impact of these factors can be reduced.

Sustainable Agriculture and Forestry

- Evaluate the impact of agricultural and forestry practices on human health, the economy, and the environment;
- Investigate conditions necessary for plant growth, including the soil components most suitable for various species, and various environmentally sustainable methods that can be used to promote growth;
- Demonstrate an understanding of conditions required for plant growth and of a variety of environmentally sustainable practices that can be used to promote growth.

Reducing and Managing Waste

- Analyze economic, political, and environmental considerations affecting waste management strategies;
- Investigate the effectiveness of various waste management practices;
- Demonstrate an understanding of the nature and types of waste and strategies for its management.

Conservation of Energy

- Assess the impact on society and the environment of the use of various renewable and non-renewable energy sources, and propose a plan to reduce energy consumption;
- Investigate various methods of conserving energy and improving energy efficiency;
- Demonstrate an understanding of energy production, consumption, and conservation with respect to a variety of renewable and non-renewable sources.

Course Content

Unit	Length
1. Scientific Solutions to Contemporary Environmental Challenges	22 hours
2. Human Health and the Environment	19 hours
3. Sustainable Agriculture and Forestry	27 hours
4. Reducing and Managing Waste	16 hours
5. Conservation of Energy	26 hours
Total	110 hours

Unit Descriptions

Unit 1 – Scientific Solutions to Contemporary Environmental Challenges

In this unit, students will learn through computer simulation, laboratory inquiry, and research that current environmental issues are complex, and may involve conflicting interests or ideas. Although the ideas may be conflicting, students will appreciate that scientific knowledge enables people to make informed decisions about effective ways to address environmental challenges.

Unit 2 – Human Health and the Environment

In this unit, using scientific investigation skills students will be aware that environmental factors can have negative effects on human health. Subsequently, the students will focus on how to reduce the impacts of the environmental factors with specific attention focused on Indigenous concepts of sustainability and Land. At the end of this unit, the students should be aware that it is possible to minimize some of the negative health effects of environmental factors by making informed lifestyle choices and taking other precautions.

Unit 3 – Sustainable Agriculture and Forestry

In this unit, students will investigate the different factors that influence plant growth. They will apply their knowledge in designing a landscape project for their local area. In addition, students will analyze the effects of modern agricultural and forestry practices noting that they can have positive and negative consequences for the economy, human health, and the sustainability of ecosystems, both local and global.

Unit 4 – Reducing and Managing Waste

In this unit, students will investigate the negative effects of waste disposal and determine that waste management plans should be thoroughly planned. Besides students applying their knowledge learned to plan and conduct a waste audit within their school, they will investigate a local, regional, national, or global waste management practice.

Unit 5 – Conservation of Energy

In this unit, students will compare renewable and non-renewable sources of energy and investigate methods of energy conservation. Afterwards, they will conduct several activities to demonstrate what they learned such as planning and conducting an energy audit of a home or business, and designing a working model of a device that use an alternative source of energy.

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:

- Direct instruction (online lecture);
- Adapting to learning styles/multiple intelligences;
- Analysis of student work;
- Discovery/Inquiry based learning;
- Generating and testing hypotheses;
- Graphic organizers;
- Hands on learning;
- Homework and practice;
- Identifying similarities and differences;
- Modelling;
- Sketching to learn;
- Mentoring;
- Visualization;
- Independent research;
- Discussion via forums.

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	Identify and describe careers related to the fields of science under study, and describe the contributions of scientists, including Canadians, to those fields; Demonstrate an understanding of major contemporary environmental challenges and how we acquire knowledge about them; Demonstrate an understanding of various environmental factors that can affect human health, and explain how the impact of these factors can be reduced; Demonstrate an understanding of conditions required for plant growth and of a variety of	12

		<p>environmentally sustainable practices that can be used to promote growth;</p> <p>Demonstrate an understanding of the nature and types of waste and strategies for its management;</p> <p>Demonstrate an understanding of energy production, consumption, and conservation with respect to a variety of renewable and nonrenewable sources.</p>	
	Thinking	<p>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);</p> <p>Investigate a range of perspectives that have contributed to scientific knowledge about the environment, and how scientific knowledge and procedures are applied to address contemporary environmental problems;</p> <p>Investigate environmental factors that can affect human health, and analyze related data;</p> <p>Investigate conditions necessary for plant growth, including the soil components most suitable for various species, and various environmentally sustainable methods that can be used to promote growth;</p> <p>Investigate the effectiveness of various waste management practices;</p> <p>Investigate various methods of conserving energy and improving energy efficiency.</p>	17
	Communication	<p>Expression and organization of ideas and information;</p> <p>Communication for different audiences and purposes in oral, visual, and/or written forms;</p> <p>Use of conventions, vocabulary, and terminology of the discipline in oral, visual, and/or written forms.</p>	17
	Application	<p>Analyze social and economic issues related to an environmental challenge, and how societal needs influence scientific endeavours related to the environment.</p> <p>Analyze initiatives, both governmental and non-governmental, that are intended to reduce the impact of environmental factors on human health;</p> <p>Evaluate the impact of agricultural and forestry practices on human health, the economy, and the environment;</p> <p>Analyze economic, political, and environmental considerations affecting waste management strategies;</p> <p>Assess the impact on society and the environment of the use of various renewable and non-renewable energy sources, and propose a plan to reduce energy consumption.</p>	24
Final Evaluation (30%)	Culminating Activity (15%)	Knowledge/Understanding	2.5
		Thinking	4
		Communication	4

		Application	4.5
	Exam (15%)	Knowledge/Understanding	2.5
		Thinking	4
		Communication	4
		Application	4.5
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:

- Ongoing descriptive feedback feedback (e.g., descriptive feedback on students' online submissions and opinion essay);
- Small-group conversations to develop their opinions and communication skills
- Mentor observations of student's performance while conducting experiments and scientific research
- Conversations with student on a regular basis to verbalize observations, ask questions, and clarify understanding
- Self-assessment (e.g., weekly self-assessment of learning)
- Formative student products (e.g., opinion essay, research project).

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

- Ongoing assessment/observations of most consistent work, with consideration given to most recent work
- Quiz
- 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

- Adriano, L. (2017, Sept. 11). *Industrial pollution plagues more than half of all First Nation communities*. Insurance Business Canada. <https://www.insurancebusinessmag.com/ca/news/environmental/industrial-pollution-plagues-more-than-half-of-all-first-nation-communities-78584.aspx>
- alexhuffmanglobal. (2017, Jan. 23). *Pipeline spills oil on First Nations land in southeast Sask*. Global News. <https://globalnews.ca/news/3200192/pipeline-spills-oil-on-first-nations-land-in-southeast-sask/>
- CBC News in Review. (2005). *Toxic water: The Kashechewan story*. https://media.curio.ca/filer_public/f8/4e/f84e2dd8-76c5-4fbf-b9b7-b9d053b4ac2f/kashechewan.pdf
- Grace, E., Mustoe, F., Ivanco, J., Gue.D., & Brown, F. D. (2001). *SCIENCEPOWER 10*. McGraw Hill Ryerson Limited.
- MyBlueprint. (2017). *MyBlueprint education planner*. www.myblueprint.ca
- Ontario Ministry of Education. (n.d.). *Indigenous education strategy*. <http://www.edu.gov.on.ca/eng/aboriginal/>
- 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
- Ontario Ministry of Education. (2010). *Growing success: Assessment, evaluation and reporting in Ontario schools*. <http://www.edu.gov.on.ca/eng/policyfunding/growSuccess.pdf>
- Ontario Ministry of Education. (2016). *Ontario schools, kindergarten to grade 12: Policy and program requirements*. <http://edu.gov.on.ca/eng/document/policy/os/index.html>
- Ontario Ministry of Education. (2017). *Environmental education: Scope and sequence of expectations*. http://www.edu.gov.on.ca/eng/curriculum/secondary/environmental_ed_9to12_eng.pdf
- Porter, J. (2021). *Children of the poisoned river*. CBC. <https://www.cbc.ca/news2/interactives/children-of-the-poisoned-river-mercury-poisoning-grassy-narrows-first-nation/>
- Ritter, B., Plumb, D., Jenkins, F., Kessel, H.V., & Hirsch, A.J. (2001). *Science 10*. Nelson Thompson Company.
- 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>

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.

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.