

Course Outline

School Name: KEEWAYTINOOK INTERNET HIGH SCHOOL
Department Name: Science

Ministry of Education Course Title: Science

Grade Level: 9

Ministry Course Code: SNC1P

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 9 to 10; Science*.
Toronto ON: Queen's Printer for Ontario.

Text: None

Prerequisite: None

Credits: One

Length: 110 hours

Principal's Name: Angela Batsford-Mermans

Principal's Approval:



Approval Date: September 8, 2021

Course Description/Rationale

This course enables students to develop their understanding of basic concepts in biology, chemistry, earth and space science, and physics, and to apply their knowledge of science to everyday situations. They are also given opportunities to develop practical skills related to scientific investigation. Students will plan and conduct investigations into practical problems and issues related to the impact of human activity on ecosystems; the structure and properties of elements and compounds; space exploration and the components of the universe; and static and current electricity.

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, analysing and interpreting, and communicating);
- Identify and describe a variety of careers related to the fields of science under study, and identify scientists, including Canadians, who have made contributions to those fields.

Biology: Sustainable Ecosystems and Human Activity

- Analyse the impact of human activity on terrestrial or aquatic ecosystems, and assess the effectiveness of selected initiatives related to environmental sustainability;
- Investigate some factors related to human activity that affect terrestrial or aquatic ecosystems, and describe the consequences that these factors have for the sustainability of these ecosystems;
- Demonstrate an understanding of characteristics of terrestrial and aquatic ecosystems, the interdependence within and between ecosystems, and the impact humans have on the sustainability of these ecosystems.

Chemistry: Exploring Matter

- Analyse how properties of common elements and/or simple compounds affect their use, and assess the social and environmental impact associated with their production or use;
- Investigate, through inquiry, physical and chemical properties of common elements and simple compounds;
- Demonstrate an understanding of the properties of common elements and simple compounds, and general features of the organization of the periodic table.

Earth and Space Science: Space Exploration

- Analyse the major challenges and benefits of space exploration, and assess the contributions of Canadians to space exploration;
- Investigate the properties of different types of celestial objects in the solar system and the universe;
- Demonstrate an understanding of major astronomical phenomena and of the principal components of the solar system and the universe.

Physics: Electrical Applications

- Assess the major social, economic, and environmental costs and benefits of using electrical energy, distinguishing between renewable and non-renewable sources, and propose a plan of action to reduce energy costs;
- Investigate, through inquiry, the properties of static and current electricity and the cost of the consumption of electrical energy;
- Demonstrate an understanding of the concepts and principles of static and current electricity.

Course Content

Unit	Length
1. Scientific Investigation Skills / Career Explorations	10 hours

2. Biology	25 hours
3. Chemistry: Exploring Matter	25 hours
4. Earth and Space Exploration	25 hours
5. Physics	25 hours
Total	110 hours

Unit Descriptions

Unit 1 – Scientific Investigation Skills

Students will start to develop scientific investigation skills and practices (initiating and planning, performing and recording, analyzing and interpreting, and communicating) used throughout the other units. Mind maps, using scientific instruments, accessing virtual laboratories, data collection and presentation, inferencing, and the scientific method are all introduced. Students will interpret their data as well as communicate their results. Students will investigate predator/prey patterns from Northwestern Ontario animal populations as well as possible careers in their local community that are related to the field of Science.

Unit 2 – Biology: Sustainable Ecosystems

This unit is an introduction to ecology. The focus is on ecosystems: characteristics, energy transfer, limiting factors, sustainability and human impacts on sustainability. Interactions between ecosystems and human activity is the major focus for inquiry. Students will examine ecosystems in Northern Ontario, the impacts of human activity on local aquatic environments, as well as the impacts of transportation to Northern reserves of goods and materials.

Unit 3 – Chemistry

Students investigate a more detailed model of matter in this unit. They are introduced to the periodic table. They will begin to develop an understanding of how the organization of the table gives clues as to the chemical properties of each element. Chemical formulas, models, application of chemistry in household products, and the social impact of modern chemistry are introduced. Opportunities also exist for students to perform inquiries into the chemical and physical properties of common elements found in the periodic table. Students will examine the physical and chemical reactions of human practices in their own communities such as burning garbage at the dump.

Unit 4 – Earth and Space Exploration

This unit builds on students' curiosity about space and their place in the universe and develops their observational skills in situations other than the laboratory. Students will explore different types of celestial objects how some of them affect their lives. Celestial objects that play roles in First Nations culture are discussed. Current space work, such as the construction and cost of the new international space station, is stressed. Traditional celestial knowledge and legends will be covered in this section as well as examining astronomical phenomena in their own communities such as Aurora Borealis and lunar eclipse.

Unit 5 – Electricity: Principles of Current Electricity and Economic Cost

This unit will expose students to both practical and social elements involved in the use of electricity. Students will learn about the properties of static and current electricity. They will distinguish between renewable and non-renewable resources. They will also investigate energy consumption and the cost of that energy in their own homes. Students will have an opportunity to learn about the impacts of non-renewable energy sources used in their communities and alternative renewable energy resources that could potentially be an alternative. Students will investigate the consumption of electricity on their reserve, cost and ways to reduce consumption.

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 (local classroom mentor)
- Interactive lessons (Videoconference)
- On-line instruction (self-paced lessons)
- Demonstration (both laboratory work in the classroom as well as animated on-line demonstrations)
- Case study
- Field trips for data collection
- Internet research
- Group work
- Independent Study Units (ISU's)
- Interviews of local individuals

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	Describe the various ways individuals meet their basic food needs. Explain the benefits of working for pay.	12
	Thinking	Analyse the impact of employment changes on personal finances. Compare the products and services offered by a variety of financial institutions.	18
	Communication	Demonstrate the use of effective techniques for making consumer complaints. Clearly communicate the results of their inquiries.	17
	Application	Evaluate retail shopping opportunities available within their community as sources of basic products and services. Apply appropriate conflict-resolutions skills to resolve interpersonal conflicts.	23

Final Evaluation (30%)	Culminating Activity (15%)	Summative Research + Report which is designed to recall and apply the concepts, approaches, skills and connections learned	K/U	2.5
			T	3.8
			C	3.7
			A	5
	Exam (15%)	Written examination designed to cover all of the overall expectations of the course.	K/U	2.5
			T	3.8
			C	3.7
			A	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), Projects, Drawing or Map-making (photographed for submission), Rating scales, Surveys, Worksheets, Reports, Journals, 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
- Conversations with students to check for understanding of concepts
- Ongoing observations of most consistent work, with consideration given to most recent work
- Conversation with students to discuss community values and practices as oppose to Western world views
- 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

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 9 and 10: Science.
http://www.edu.gov.on.ca/eng/curriculum/secondary/science910_2008.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>

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>

Additional Resources

American Association for the Advancement of Science. (n.d.) <https://www.aaas.org/>

Atoms: Protons, Neutrons, Electrons. (n.d.). Study Jams. Scholastic.
<https://studyjams.scholastic.com/studyjams/jams/science/matter/atoms.htm>

Become an electrician. (n.d.). Electrical Contractors Association of Ontario.
<https://www.ecao.org/become-an-electrician>

Canadian Space Agency. (2015, March 6). *Dextre changes a pump on the International Space Station*. YouTube. <https://www.youtube.com/watch?v=7iJUffTjUVo>

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https://www.ccohs.ca/oshanswers/safety_haz/electrical.html

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<https://www.macleans.ca/society/science/question-and-astronaut-chris-hadfield/>

History of Metals Timeline. (n.d.). Makin Metal Powders. <http://www.makin-metals.com/about/history-of-metals-infographic/>

Indigenous Astronomy: The Anishinabe of Central North America. (2003). Virtual Museum.
<http://www.virtualmuseum.ca/edu/ViewLoitDa.do;jsessionid=6F754B1A79AF3723B82BB8884E9754E6?method=preview&lang=EN&id=5188>

Meeker-O'Connell, A. (n.d.). How photocopiers work. How Stuff Works.
<https://home.howstuffworks.com/photocopier.htm>

Mlot, C. (2017, April 18). Two wolves survive in world's longest running predator-prey study. American Association for the Advancement of Science. <https://www.sciencemag.org/news/2017/04/two-wolves-survive-world-s-longest-running-predator-prey-study>

Ophardt, C.E. (2003). *Main index*. Virtual Chembook. <http://chemistry.elmhurst.edu/vchembook/index.html>

Safe drinking water is essential. (n.d.). Koshland Science Museum. <https://www.koshland-science-museum.org/water/new/en/index.html>

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.