Course Outline

School Name: KEEWAYTINOOK INTERNET HIGH SCHOOL Department Name: Science
Ministry of Education Course Title: Grade 9 Science, Academic
Grade Level: 9
Ministry Course Code: SNC1D

Teacher's Name: Cathy Rodger

Developed by: Cathy Rodger Date: September 2019

Revision Date: Dec 2015

Developed from: The Ontario Curriculum, Grade 9 and 10 Science, 2008

Text: None

Prerequisite: None

Credits: One

Length: 110 hours

Principal's Name: Angela Batsford-Mermans

Principal's Approval: 

Approval Date: September 12, 2019

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. Earth and Space Exploration	25 hours
4. Chemistry	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.

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.

Unit 3 – Chemistry: How Properties Determine Use

Students investigate a more detailed model of matter in this unit. They are introduced to the periodic table. The 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, physical and chemical properties of matter, and how those properties influence commercial application, are investigated. Opportunities also exist for students to perform inquiries into the chemical and physical properties of common elements found in the periodic table.

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. The Space Station, and careers associated with it, are examined from the Canadian perspective. Major scientific theories about the structure, formation, and evolution of the universe are stressed.

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 static and current electricity, series and parallel circuits, and the relationships between resistance, potential difference, and current. They will also investigate energy consumption, efficiency, and develop plans to reduce electrical energy consumption in a home or commercial setting.

Teaching/Learning Strategies

This course is organized in an eight-week series of lessons delivered to students via Internet. Desktop computers are set up at an access site in their communities. The 8th week is used for topic consolidation, review, culminating activity and the final examination.

Most communication between students and the teacher is performed through the Moodle In each classroom, the teacher/mentor assumes the role of liaison between the instructor and the student. There will also be on-line interactive sessions between teacher and students, and additional on-line tutorials as needed.

Instructional Strategies will 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 child's life, including classroom, family, neighborhood, and community, in teaching the child useful life and educational 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., Poodll, 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.
- Teaching main idea: Teaching students how to pick out the main idea of a paragraph or reading and explain why it is the main idea. Done as a class or in small groups to build consensus of what the main idea. Visualization: Having the students draw a scene of a story, the plot, etc. to demonstrate student comprehension of the story or to have students organize ideas. May encourage students who have strong artistic talent, but emerging reading skills.

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, checklists and exemplars.

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 per cent 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. 47).

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%***
	Making Connections	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%***
Summative (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/I	3.8%
			C	3.7%
			A	5%
	Final 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 information is obtained through a variety of means, including the following:

- pre-unit subject assessment, discussion, KWL, mind-maps, prior student records, surveys
- 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) , Worksheets, Reports, Journals, Performance Tasks, Achievement chart, Field Observations
- Labs, experiments, Research and Investigations, 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 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
- Final exam

Resources

Ontario Ministry of Education. (2010). *Growing Success: Assessment, Evaluation and Reporting in Ontario Schools*. Toronto, ON: Queen's Printer for Ontario.

Ontario Ministry of Education. (2008). *The Ontario Curriculum Grades 9 and 10: Science.* Toronto, ON: Queen's Printer for Ontario.

Ontario Ministry of Education. (2017). Indigenous education strategy. Retrieved from http://wwwedu.gov.on.ca/eng/aboriginal/

Ontario Ministry of Education. (2016). *Ontario School, Kindergarten to Grade 12: Policy and Program Requirements*. Retrieved from http://wwwedu.gov.on.ca/eng/document/policy/os/index.html

A Selection of Science and Education Internet Sites

Earth/Space Science

American Association for the Advancement of Science http://www.aaas.org/

http://www.starcenter.org/

http://www.virtualmuseum.ca/edu/ViewLoitDa.do;jsessionid=6F754B1A79AF3723B82BB8884E9754E6?method=preview&lang=EN&id=5188

USA National Academy of Sciences - http://www.nas.edu/

http://deepimpact.umd.edu/gallery/video/MASTERlarge.gif

https://www.nasa.gov/externalflash/the_shuttle/

https://youtu.be/7iJUtfTjUVo

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

Chemistry

http://www.elmhurst.edu/~chm/vchembook/101Aatoms.html

http://www.drinking-water.org/flash/splash.html

http://studyjams.scholastic.com/studyjams/jams/science/matter/atoms.htm

http://www.makin-metals.com/about/history-of-metals-infographic/

Environment/Ecology

http://www.breathingearth.net

http://www.isleroyalestatus.com/index.html

http://www.sciencemag.org/news/2017/04/two-wolves-survive-world-s-longest-running-predator-prey-study

http://frog.edschool.virginia.edu//Frog1/

Physics

http://ippex.pppl.gov/interactive/matter/intro.html

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

https://home.howstuffworks.com/photocopier1.htm

http://www.eschooltoday.com/energy/non-renewable-energy/what-is-uranium.html

http://ecao.org/electrician.asp

General Science: Gizmos

Program Planning

This course is offered to Indigenous students living in isolated northern Ontario communities which do not have access to regular high school facilities, equipment or teachers associated with secondary education. 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 tutoring 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 not be linear in order to be successful.

The program may be altered based on specific student interests, techniques or resources that proved successful in a previous unit. As much effort as possible will be made to integrate community concerns and interest in the curriculum. Open discussion is encouraged – in fact, it can be used to assess communication skills.

This course is offered to students living in isolated communities who do not have access to normal high school facilities, equipment or teachers associated with secondary education. The course uses Internet connectivity for most instruction and feedback. It utilizes a student centered semi-virtual classroom which capitalizes on the strengths of internet program delivery to minimize the disadvantages of geographic remoteness. The student attends school in full days similar to traditional face-to face programming. The classroom is similar to a computer classroom with a student to computer ratio of 1:1. Students may also receive support from various programs at KIHS, including the First Nation Student Success Program and the Special Education Program.

Indigenous and local content is used throughout the course to meet the students’ learning needs. Considerations are made to the learning preference of the population and lessons can be adjusted for individual students as required.