Course Outline

School Name: KEEWAYTINOOK INTERNET HIGH SCHOOL

Department Name: SCIENCE

Ministry of Education Course Title: ***Science***

Grade Level: ***9***

Ministry Course Code: *SNC1D*

Teacher's Name: Cathy Rodger

Developed by: Cathy Rodger Date: September 2015

Revision Date: September 2015

Developed from: The Ontario Curriculum, Grades 9 and 10: Science, 2008 (Revised)

Text: Sciencepower 9, McGraw-Hill Ryerson Limited, 1999

Prerequisite: None

Credits: One (1.0)

Length: 110 hours

Principal's Name: Kevin Dempsey

Principal's Approval (signature) 

Approval Date: September 21, 2015

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 relate science to technology, society, and the environment. Throughout the course, students will develop their skills in the processes of scientific investigation. Students will acquire an understanding of scientific theories and conduct investigations related to sustainable ecosystems; atomic and molecular structures and the properties of elements and compounds; the study of the universe and its properties and components; and the principles of electricity.

Overall Curriculum Expectations

Unit 1: 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. (This item will be distributed throughout the units.)

Unit 2: Sustainable Ecosystems

- assess the impact of human activities on the sustainability of terrestrial and/or aquatic ecosystems, and evaluate the effectiveness of courses of action intended to remedy or mitigate negative impacts;
- investigate factors related to human activity that affect terrestrial and aquatic ecosystems, and explain how they affect the sustainability of these ecosystems;
- demonstrate an understanding of the dynamic nature of ecosystems, particularly in terms of ecological balance and the impact of human activity on the sustainability of terrestrial and aquatic ecosystems.

Unit 3: Space and Earth Science; The Study of the Universe

- assess some of the costs, hazards, and benefits of space exploration and the contributions of Canadians to space research and technology;
- investigate the characteristics and properties of a variety of celestial objects visible from Earth in the night sky;
- demonstrate an understanding of the major scientific theories about the structure, formation, and evolution of the universe and its components and of the evidence that supports these theories.

Unit 4: Chemistry: Atoms, Elements, and Compounds

- assess social, environmental, and economic impacts of the use of common elements and compounds, with reference to their physical and chemical properties;
- investigate, through inquiry, the physical and chemical properties of common elements and compounds;
- demonstrate an understanding of the properties of common elements and compounds, and of the organization of elements in the periodic table.

Unit 5: Physics: The Characteristics of Electricity

- assess some of the costs and benefits associated with the production of electrical energy from renewable and non-renewable sources, and analyse how electrical efficiencies and savings can be achieved, through both the design of technological devices and practices in the home;
- investigate, through inquiry, various aspects of electricity, including the properties of static and current electricity, and the quantitative relationships between potential difference, current, and resistance in electrical circuits;
- demonstrate an understanding of the principles of static and current electricity.

Course Content

Unit	Length
1. Scientific Investigation Skills	10 hours
2. Biology	25 hours
3. Earth and Space Science	25 hours
4. Chemistry: Atoms, Elements & Compounds	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.

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 and dynamics between ecosystems and human activity are major topics for inquiry. The end-of-unit task will involve conducting research on the health of a forested area: students will explore remediation requirements and the role of government policies in remediation efforts.

Unit 3 – 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 4- Chemistry: How Properties Determine Use

Students investigate a more detailed model of matter in this unit. They are introduced to the organization of 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 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

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.

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.

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. A focus on personal safety ad 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.

Lesson Delivery

This course is organized in a 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.

The teaching of the lessons incorporates the following list of on-line delivery approaches:

- 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

Evaluation

The final grade will be determined as follows:

• 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.

Growing Success: Assessment, Evaluation and Reporting in Ontario Schools. Ontario Ministry of Education Publication, 2010, p.41

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		13%
	Thinking/ Inquiry	Independent projects, experiments, answering questions requiring application of concepts to novel situations		18%
	Communi-cation	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 Assessment (30%)	Culminating Activity	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	Written examination designed to cover all of the overall expectations of the course	K/U	2.5%
			T/I	3.8%
			C	3.7%
			A	5%
			TOTAL	100%

Assessment/Evaluation Strategies

Diagnostic (assessment for learning)

- pre-unit subject assessment, discussion, KWL, mind-maps, prior student records, surveys

Formative (assessment for learning)

- 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, Quizzes, Surveys, Worksheets, Reports, Journals, Performance Tasks, Achievement chart, Field Observations

Summative (assessment of learning)

- Quizzes, tests, labs, Independent Study Units (ISU's), group work.
- Assignments: written submissions; audio, visual or kinesthetic presentations (including poems, dance, videos, and posters), software program results (ie, virtual chemistry and electricity submissions) and models.
- Performance (ie, safe use of scientific equipment, proper use of equipment to collect, organize and analyze data).

Resources

Sciencepower 9, McGraw-Hill Ryerson Limited, 1999
Growing Success: Assessment, Evaluation and Reporting in Ontario Schools, 1st Ed, Ministry of Education of Ontario, 2010

American Association for the Advancement of Science http://www.aaas.org/
Regional Education Laboratories in the USA -- http://www.sedl.org/RELs.html
STAR Centre for Academic Renewal (Texas) http://www.starcenter.org/
Earth/Space Science http://www.drinking-water.org/flash/splash.html
Chemistry - http://www.elmhurst.edu/~chm/vchembook/101Aatoms.html
Environment/Ecology - http://www.breathingearth.net/
Biology - http://frog.edschool.virginia.edu//Frog1/
Physics - http://ippex.pppl.gov/interactive/matter/intro.html
General Science: Gizmos

Program Planning

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 need not be linear to be successful.