# Course Outline

**School Name:** Keewaytinook Internet High School
**Department Name:** Science

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

## Grade Level: 10

## Ministry Course Code: **SNC2L**

Teacher's Name: Raj Budhram

Developed by: Mike Dool Date: December 2009

Revision Date: August 2015

Developed from: The Ontario Curriculum Grade 9 and 10 Science, 2007

Profile Name: Locally Developed Compulsory Credit Course, Course Profile, Science Grade 10, 2005

Text: Science 10, Nelson, 2001.

Prerequisite: SNC1L

Credits: 1

Length: 110 hours

Principal's Name: Kevin Dempsey

Principal's Approval (signature) 

Approval Date: September 8, 2015

# *Course Description/Rationale*

This course reinforces and strengthens science-related knowledge and skills, including scientific inquiry, critical thinking, and the environmental impact of science and technology, to prepare students for success in everyday life, in the workplace, and in the Grade 11/12 Science Workplace Preparation courses.

Students explore a range of topics, including science in media, chemical interactions of common household materials, interdependence of organisms in communities, and using electrical energy.

Students have the opportunity to extend mathematical and scientific inquiry skills. Course work encourages development of reading, writing, and oral language skills through relevant and practical activities.

# *Overall Curriculum Expectations*

Scientific Inquiry: Science in Media

- explain how science-related information is presented in print and electronic media for different purposes and audiences;

- investigate science-related information presented in print and electronic media using appropriate research and reporting skills;

- evaluate claims and presentations of science-related information in media.

Chemistry: Interactions of Common Materials

- understand how chemicals in common household and workplace materials interact;
- investigate the types and rates of interactions between commonly used materials through laboratory activities;
- analyze how material interactions affect our daily lives.

Biology: Living Together

- explain the strategies that organisms use for successful coexistence in populations and communities;
- investigate, using appropriate laboratory and research skills, the implications of organisms existing in communities;
- analyze the challenges that arise from organisms living in communities.

Physics: Using Electrical Energy

- explain the generation, measurement, and conversion of electricity;
- investigate the factors that affect the generation and use of electricity;
- analyze the social, economic, and/or environmental implications of the sources and uses of electrical energy.

# *Course Content*

| Unit | Length |
|---|---|
| **1. Science Inquiry: Science in the Media** | 12 hours |
| **2. Biology: Living Together** | 26 hours |
| **3. Chemistry: Interactions of Common Materials** | 26 hours |
| **4. Physics: Using Electrical Energy** | 26 hours |
| **5. Community Action Plan** | 20 hours |
| **Total** | 110 hours |

# *Unit Descriptions*

**Unit 1 Science Inquiry: Science in the Media**

Scientific literacy is critical for students in an increasingly technological and scientific world. Students are bombarded with science-based claims and a solid base of inquiry skills enables them to distinguish between fact and opinion and to understand media bias in order to make informed decisions. Students are exposed to a variety of opinions and messages.

The scientific inquiry and critical thinking skills developed in this unit are revisited throughout the course and ensure students prepare for success in the final unit evaluation. Media and scientific literacy are emphasized throughout the unit, enabling students to question the presentation of science information in the media.

Students focus on reviewing the laboratory and investigation skills required to evaluate science-based claims through experimental research. Students examine various modes of science-related media and learn to analyze media for the messages portrayed and then investigate a science-related issue through media-based research. Throughout the unit, they practice the Essential Skills of reading text, document use, numeracy, oral communication, computer use, decision making, and working with others.

**Unit 2 – Biology : Living Together**

Living in a community presents challenges for and benefits to all living things – plants, animals, and humans. By observing examples from nature, students make connections to their role as responsible members of the world community.

Students are introduced to the biological concept of population, focusing on the benefits and challenges of organisms of the same species living together. They investigate and report on the problems that arise when populations of microscopic organisms become overcrowded. Through the study of a pond, field, or other biological community, students see that natural populations do not exist in isolation and relate their observations to human populations. Students refine laboratory skills while investigating population growth and structure using larger organisms. These investigations become the basis for the school-based action plan developed in Unit 5 and in the Final Course Evaluation.

**Unit 3 – Chemistry : Interactions of Common Materials**

Using the various forms of media, students develop an awareness of the multitude of common chemical compounds found in everything they use and consume in their everyday lives. They investigate the interactions among compounds and practice literacy skills by appropriately communicating the information learned. Students classify chemicals found in common materials through examination of Household Hazardous Product symbols (HHPs) and Workplace Hazardous Materials Information System (WHMIS) labels found at home, at work, and in the laboratory. They learn and apply different classifications of physical and chemical interactions through research and laboratory activities. Students examine factors that affect rates of chemical and physical interactions qualitatively, through several laboratory investigations. Investigative skills are revisited in the culminating activity in Unit 5 through the research of environmental impacts. In the unit evaluation, students plan, conduct, and communicate the results of an investigation that compares both synthetic and natural materials and their effects on the environment.

**Unit 4 -- Physics : Using Electrical Energy**

The growing demand for electrical energy has important implications for all communities, influencing quality of life and the state of the environment. Students increase awareness and understanding of issues linked to the generation and use of electrical energy. The activities emphasize the skills of collaboration, safe investigation, numeracy, media literacy, and communicating with an audience. The first activity, which continues throughout the unit, helps

students to build an understanding of the terminology used in the study of Electrical Energy. Students gain an awareness of our reliance on electrical energy and an understanding of the energy conversions associated with the use of electricity. They compare electrical appliances and simple machines with respect to energy, power, current, and potential difference through laboratory investigations. Students design and build a device that generates electrical energy and make modifications to increase its output. They expand their understanding of stewardship and their responsibility as energy conservers by researching methods of generating electricity; analyzing social, economic, and/or environmental implications; identifying consumption patterns; and designing and implementing a plan to reduce the consumption of electrical energy.

**Unit 5: Community Action Plan**

Environmental concerns arise from the growing demand for electrical energy and the increased generation of electric power. Students demonstrate the skills and knowledge gained in prior units through the generation of an action plan and public awareness campaign. They learn personal accountability for the state of the environment and come to understand that their actions impact their community.

Students perform a variety of laboratory investigations into environmental concerns related to generating electricity, e.g., effects of acid rain, oil spills, greenhouse gases, particulate matter, and battery disposal. These investigations combine safe laboratory procedures; posing questions; collecting, organizing, and analyzing data; and drawing conclusions. Using a variety of resources, students research the environmental effects of electrical power generation by burning fossil fuels on communities and environmentally friendly alternative power generation. The experimental and internet research lead to the development and presentation of a community-based action plan. This task addresses literacy and numeracy through media-based research, problem solving, communication, and presentation of the action plan and media campaign. Students are given opportunities for self-assessment and to receive teacher and peer feedback to improve their final product.

# *Teaching/Learning Strategies*

**General Strategies**

- Accelerated or individualized pacing: a system of having students work at different levels individually in one classroom. They progress by passing tests for each unit and move at their own pace.
- Chunking and questioning aloud: The process of reading a story aloud to a group of students and stopping after certain blocks of text to ask the students specific questions about their comprehension of the story and some key features of the text
- 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 vetted web sites, video, word processing, dynamic visualization programs (i.e., Geometer's Sketchpad, Virtual Dissection, Virtual Lab).
- Partner reading: Having students work together in pairs to read a text to each other and discover the main ideas of the story. (Develops communication as well as knowledge.)
- Peer tutoring: Having students working pairs with one student tutoring the other student on a particular concept.  (Develops communication as well as knowledge.)
- Response journal: Students record in a journal 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 is.
- Using three dimensional objects such as models, machines, chemicals or blocks.

**Lesson Delivery**

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 and tutorials)
- 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
- Practical Exercises
- Research Projects
- Journaling
- Virtual dissections (as required)

# *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

| Type of Assessment | Category | Details | | Weighting % |
|---|---|---|---|---|
| Term Work (70%) | Knowledge/ Understanding | - understanding of concepts, principles, laws and theories<br>- knowledge of facts and terms<br>- transfer of concepts to new contexts<br>- understanding of relationships between concepts | | 13% |
| | Thinking/ Inquiry | - application of the skills and strategies of scientific inquiry<br>- application of technical skills and procedures<br>- use of tools, equipment and materials | | 19% |
| | Communica-tion | - communication of information and ideas<br>- use of scientific terminology, symbols, conventions and standard (SI) units<br>- use of information technology for scientific purposes | | 19% |
| | Application | - understanding connections among science, technology, society and the environment<br>- analysis of social and economic issues involving science and technology<br>- assessment of impacts of science and technology on the environment<br>- proposing courses of practical action in relation to science- and technology-based problems | | 19% |
| Final Evaluation (30%) | Culminating Activity | A research project of the students choice which will include a proposal, a plan, a peer assessment, teacher conference, an experiment, and a report. | K/U | 3% |
| | | | T/I | 4% |
| | | | C | 4% |
| | | | A | 4% |
| | Final Exam | A series of short problems and scenarios where the students will be able to use the skills and knowledge gained in the course. | K/U | 3% |
| | | | T/I | 4% |
| | | | C | 4% |
| | | | A | 4% |
| | | | 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*

Science Power 10, Nelson, 2001
Locally Developed Compulsory Credit Course, Course Profile, Science Grade 10**,** Public and Catholic District School Board Writing Partnerships**,** Queen's Printer for Ontario, 2005
Guide to Locally Developed Courses, Grades 9 to 12 Development and Approval Procedures, Ministry of Education 2004.
Growing Success: Assessment, Evaluation and Reporting in Ontario Schools, 1st Ed, Ministry of Education of Ontario, 2010

**Internet sites as per teacher's lessons.**

Hands-on Science Activities www.letstalkscience.uwo.ca
Explore Learning www.explorelearning.com
About Chemistry chemistry.about.com
Science Teacher Resources http://www.pbs.org/teachers/
Biology Dictionary http://biology-online.org/dictionary/?Term=Adnate
How Stuff Works www.howstuffworks.com
http://www.webelements.com/
http://www.chem4kids.com/files/matter_intro.html
http://www.elmhurst.edu/~chm/vchembook/101Aatoms.html
http://www.chemtopics.com/

# *Program Planning*

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. Students attend school classrooms for full days, similar to traditional face-to-face programming. The classroom layout is similar to a traditional computer classroom, with a student to computer ratio of 1:1.

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.

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.

Finally, recommendations from Appendix A (Strategies for Literacy Connections in the Science Classroom[1]) will guide further refinement of course material to make it more accessible.