

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: Eli K. A. Pivnick

Developed by: Eli K. A. Pivnick

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Revision Date:

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

Profile Name: Science Grade 9 Applied (Public District School Board Writing Partnership)

Text: Investigating Science 9, Pearson, 2009

Prerequisite: None

Credits: One (1.0)

Length: 110 hours

Principal's Name: Darrin Potter

Principal's Approval (signature) _____

Approval Date: _____

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

A. SCIENTIFIC INVESTIGATION SKILLS AND CAREER EXPLORATION

- A1.** 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);
- A2.** 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.

B. BIOLOGY: SUSTAINABLE ECOSYSTEMS

- B1.** 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;
- B2.** investigate factors related to human activity that affect terrestrial and aquatic ecosystems, and explain how they affect the sustainability of these ecosystems;
- B3.** 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.

C. CHEMISTRY: ATOMS, ELEMENTS, AND COMPOUNDS

- C1.** assess social, environmental, and economic impacts of the use of common elements and compounds, with reference to their physical and chemical properties;
- C2.** investigate, through inquiry, the physical and chemical properties of common elements and compounds;
- C3.** demonstrate an understanding of the properties of common elements and compounds, and of the organization of elements in the periodic table.

D. EARTH AND SPACE SCIENCE: THE STUDY OF THE UNIVERSE

- D1.** assess some of the costs, hazards, and benefits of space exploration and the contributions of Canadians to space research and technology;
- D2.** investigate the characteristics and properties of a variety of celestial objects visible from Earth in the night sky;
- D3.** 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.

E. PHYSICS: THE CHARACTERISTICS OF ELECTRICITY

- E1.** 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;
- E2.** 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;
- E3.** demonstrate an understanding of the principles of static and current electricity.

Course Content

Unit	Length
1. Scientific Investigation skills	14 hours
2. Study of the Universe	22 hours
3. Sustainable Ecosystems	22 hours
4. Atoms, Elements & Compounds	22 hours
5. Characteristics of Electricity	22 hours
6. Making Connections	8 hours
Total	110 hours

Unit Descriptions

Unit 1: SCIENTIFIC INVESTIGATION SKILLS AND CAREER EXPLORATION

This unit uses some of the unique properties of water as a unifying theme and provides an opportunity for the teacher to assess the current competence of students in science inquiry, their knowledge of the safe and appropriate use of equipment, and their ability to work independently, in small groups and as a whole class during instruction. The second overall expectation in each strand describes the development of cognitive and manipulative science skills. These are the focus of this unit, although the expectations in this unit are covered throughout the course.

Unit 2: THE STUDY OF THE UNIVERSE

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 the universe and study applications of space science to understand better how scientists investigate the universe and how the resulting technologies affect their lives. Skills of inquiry, problem-solving, critical thinking, collaboration and communication are developed. Major scientific theories about the structure, formation, and evolution of the universe and its components and of the evidence that supports these theories., is stressed. As a culminating activity, the students will develop a proposal for a Space Exploration mission..

Unit 3: SUSTAINABLE ECOSYSTEMS

This ecosystem unit is introduced by examining a wide variety of careers related to Ecology. The primary focus will involve learning and using the inquiry skills necessary to investigate and understand 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. Students will be able to propose and evaluate ideas, think critically, and make decisions based on information from a wide variety of sources including

electronic and print resources. The end-of-unit task will involve students researching and reporting on a specific local or regional environmental issue.

Unit 4: ATOMS, ELEMENTS AND COMPOUNDS

In this unit, students will design and conduct investigations into the properties of common elements and compounds with a focus on laboratory and environmental safety. The topics of this unit lend themselves naturally to experimentation and provide opportunities for students to collect, record, organize, analyze and interpret data. A culminating activity allows students to investigate and identify unknown samples of materials.

Unit 5: THE CHARACTERISTICS OF ELECTRICITY

In this unit, students will gain an understanding of concepts of static and current electricity. They will develop skill in gathering qualitative and quantitative data using a variety of electrical instruments and tools, and will examine the relationships among electrical current, resistance and potential difference. Students will apply their knowledge to the design and construction of an electrical circuit which performs a specific function. Safety concerns related to static and current electricity in daily life, and the safe use of tools and electrical equipment, are addressed. Students will evaluate electrical consumption and cost of various practices in their homes.

Unit 6: MAKING CONNECTIONS

This unit, which comprises the summative assessment tasks, occurs towards the end of the course. It accounts for 30% of the students' overall course grade and assesses all three goals of the science course (relating science to technology, society and the environment; inquiry and communication skills; and basic concepts). The course has been designed to allow students to practise skills, and to identify and correct misconceptions in preparation for the final assessment. This assessment also allows the teacher to establish how well students have achieved Expectations according to the Achievement Chart for Science (see *The Ontario Curriculum, Grades 9 and 10: Science, 2008* – pp. 26-27). The remaining 70% of the course grade will be based on assessments and evaluations conducted throughout the course.

Teaching/Learning Strategies

The delivery of the units and activities of this course will follow the course profile for public schools very closely.

This course is organized in a nine-week series of lessons delivered to students via Internet to computers set up at an access site in their communities. The ninth week is used for topic consolidation, review, and the final examination. The delivery of lessons, assignments, questions, and course material uses the Internet connection. Most communication between students and the teacher is done using the Internet connection with the teacher mentor assuming the role as liaison between the instructor and the student. There are also twice weekly 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 teaching approaches:

- *Direct Instruction (on-line lecture)
- *Interactive lessons (Elluminate, Videoconference)
- *On-line inquiry
- *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 Evaluation
- *Interviews of local individuals

Evaluation

The student's final grade for the course will be determined as outlines in Program Planning and Assessment 2000 (p.15).

Seventy per cent (70%) of the grade will be based on evaluations conducted throughout this course.

This portion of the grade should reflect the students' most consistent level of achievement throughout the course, although special consideration should be given to the more recent evidence of achievement.

Thirty per cent (30%) of the grade will be based on a final evaluation in the form of an examination, performance, essay and /or other method of evaluation towards the end of the course.

<i>Type of Assessment</i>	<i>Category</i>	<i>Details</i>	<i>Weighting (%)</i>	
Formative (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%	
	Inquiry	Independent projects, experiments, answering questions requiring application of concepts to novel situations	17.5%	
	Communication	Report writing, Science journal, Short essay questions	17.5%	
	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	<i>knowledge/ understanding</i>	2.5%
			<i>inquiry</i>	3.8%
			<i>communication</i>	3.7%
			<i>making connections</i>	5%
	Final Exam (15%)	Written examination designed to cover all of the overall expectations of the course	<i>knowledge/ understanding</i>	2.5%
			<i>inquiry</i>	3.8%
			<i>communication</i>	3.7%
			<i>making connections</i>	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 tools such as the following:

Online submissions
Checklists
Paper and pencil activities (scanned for submission)
Rubrics (general and task specific)
Projects
Drawing or Map-making (photographed for submission)
Rating scales
Quizzes
Tests
Worksheets
Reports
Journals
Performance Tasks
Achievement chart
Field Observations
Exams

Resources

Text book: Science Link 9, McGraw-Hill & Ryerson, 2008

A. General References

Armstrong, Thomas. (1994) Multiple Intelligences in the Classroom. Alexandria, VA, USA: Association for Supervision and Curriculum Development. ISBN 0-87120-230-1

Yager, Robert E. (Ed.) (2009) Inquiry: The key to exemplary science. Arlington, VA, USA, NSTA Press. ISBN 978-1-935155-04-1

B. A Selection of Science and Education Internet Sites

American Association for the Advancement of Science

<http://www.aaas.org/>

Association for Supervision and Curriculum Development -- variety of high quality publications and videos on a wide variety of topics -- many principals and superintendents have memberships and can purchase materials at reduced rates. Also the home of Educational Leadership magazine.

<http://www.ascd.org/>

Canadian government and research sites related to science and engineering

<http://www.nserc.ca/relate.htm>

Education Network of Ontario

<http://www.enoreo.on.ca/>

Education resources on the web (Canadian site)

<http://www.educ.uvic.ca/depts/snsc/pages/weblinks/weblinks.htm>

Gateway to Educational Materials

<http://www.thegateway.org/>

Kathy Schrock's Guide for Educators.

<http://discoveryschool.com/schrockguide/>

MET Web Index -- to find anything on the Ministry's web site.

<http://www.edu.gov.on.ca/eng/webmap.htm>

National Science Foundation (USA)

<http://www.nsf.gov/>

Online Resources for Assessment

<http://www.rmcdenver.com/useguide/assessme/online.htm>

Ontario Ministry of Education and Training (MET) -- curriculum documents page

<http://www.edu.gov.on.ca/eng/document/curricul/curricul.html>

Regional Education Laboratories in the USA -- focus on educational research

<http://www.sedl.org/RELS.html>

Rubric for scoring a physics laboratory project

<http://www.glenbrook.k12.il.us/gbssci/phys/projects/q1/tparub.html>

Science Teachers Association of Ontario (STAO) links to science sites

<http://www.stao.org/hotlinks.htm>

STAR Centre for Academic Renewal (Texas)

<http://www.starcenter.org/>

USA National Academy of Sciences

<http://www.nas.edu/>

Earth/Space Science

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

<http://www.grc.nasa.gov/WWW/K-12/teacher.htm>

<http://www.nrel.gov/>

<http://www.astronomy.com>

<http://www.solarviews.com>

Chemistry

<http://www.webelements.com/>

<http://periodic.lanl.gov/default.htm><http://www.kentchemistry.com/moviesfiles/movieindex.htm>

<http://www.chem1.com/acad/webtext/virtualtextbook.html>

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

<http://www.chemtopics.com/>

Environment/Ecology

<http://www.breathingearth.net/>

http://www.footprintnetwork.org/gfn_sub.php?content=calculator

<http://www.youtube.com/watch?v=dz3tPxUFGbY>

Biology

<http://www.cellsalive.com/>

<http://www.innerbody.com/htm/body.html>

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

Physics

<http://www.andythelwell.com/blobz/>

<http://www.colorado.edu/physics/2000/index.pl>

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

Program Planning

This course is offered to students living in isolated northern Canadian communities which do not have access to normal high school facilities, equipment or teachers associated with secondary education. The course uses the global connections of the Internet for some instruction, direction, on-line field trips 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.

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:computer ratio of 1:1. The delivery of lessons, assignments, questions and course material uses the Internet connection. Most communication between students and the teacher instructor is done using an Internet connection including a twice weekly interactive session involving the entire class and the teacher. Support is enhanced by the teacher mentor, a trained teacher present in the classroom for the full day. The mentor assists the student in completing tasks on a timely basis, and providing tutoring where required.

