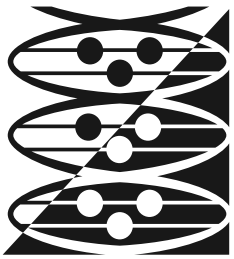

SCIENCE GRADE 6

From Integrated Resource Package 2005

BRITISH COLUMBIA
Ministry of Education

GBG 006

Acknowledgments

Many people contributed their expertise to this document. The Project Co-ordinators were Darlene Monkman, Pierre Gilbert, and Wael Afifi of the Ministry of Education, working with other ministry personnel and our partners in education. Important contributions were made by the Aboriginal Education Branch and Aboriginal Working Group. We would like to thank all who participated in this process, including members of the various focus groups that reviewed early drafts.

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This Integrated Resource Package (IRP) provides basic information teachers will require in order to implement Science K to 7. This document supersedes the *Science Kindergarten to Grade 7 Integrated Resource Package 1995.*

This IRP has been modified from the 1995 version in the following ways:

- fewer topics and thus fewer prescribed learning outcomes per grade level
- separation of the prescribed learning outcomes for Kindergarten, Grade 1, Grade 2, and Grade 3
- integration of science processes through all grades
- addition of Key Elements and Achievement Indicators
- improved support for planning and assessment
- alignment with the Pan-Canadian Common Framework of Science Learning Outcomes, 1997 (Council of Ministers of Education, Canada, http://cmec.ca/science/framework/)
- integration of Aboriginal content in the prescribed learning outcomes
- integration of Information and Communication Technology in the prescribed learning outcomes.

A variety of resources were used in the development of this IRP:

- British Columbia Science Kindergarten to Grade 7 IRP (1995)
- Pan-Canadian Common Framework of Science Learning Outcomes (1997), Council of Ministers of Education, Canada (http://cmec.ca/science/framework/)
- Science Curriculum Review Report (2001) http://www.bced.gov.bc.ca/branches/pser/whatsnew.htm#scrr
- Provincial science curricula
  - APEF (Atlantic Provinces Education Foundation)
  - Ontario
  - Manitoba
  - Alberta
- *Content Knowledge: A Compendium of Standards and Benchmarks for K-12 Education*, 3rd Edition (2000), Kendall, J. S. & Marzano, R.J. (http://www.mcrel.org/standards-benchmarks)
- *Atlas of Science Literacy* (2001), American Association for the Advancement of Science, Project 2061, National Science Teachers Association, Washington DC
- *Designs for Science Literacy* (2000), American Association for the Advancement of Science, Project 2061, National Science Teachers Association, Washington DC
- *Elementary Science Reference Cards*, David Penner, Gilbert Smith. BCTF Lesson Aide (1987)
- *Science K to 7 & Multi-graded Classrooms: A Supplement to the Science K to 7 Curriculum* (1997), Year A. Susan Martin, BCTF Lesson Aide.
- *Science K to 7 & Multi-Graded Classrooms – A Supplement to the Science K to 7 Curriculum* (1997), Year B. Susan Martin, BCTF Lesson Aide
- *Shared Learnings* (1998), Aboriginal Education Initiative, British Columbia Ministry of Education

> The information contained in this document is also available on the Internet at http://www.bced.gov.bc.ca/irp/irp.htm

The following paragraphs provide brief descriptions of the components of the IRP.

INTRODUCTION TO SCIENCE K TO 7

The Introduction provides general information about Science K to 7, including special features and requirements. It also provides a rationale for teaching Science K to 7 in BC schools, and specific considerations for program delivery.

This section also contains more specific information about the curriculum to guide educators in planning their program. Included are:

- a graphic overview of the course content
- curriculum organizers (and suborganizers as appropriate)—groupings for prescribed learning outcomes that share a common focus
- suggested timeframe for each curriculum organizer

PRESCRIBED LEARNING OUTCOMES

This section contains the prescribed learning outcomes, which are content standards for the provincial education system; they are the prescribed curriculum. They set out the required attitudes, skills, and knowledge—what students are expected to know and be able to do—for each subject and grade. Learning outcomes are clearly stated and expressed in measurable terms. All learning outcomes complete the stem, "It is expected that students will ...." In this section, prescribed learning outcomes are presented both by organizer and by grade.

STUDENT ACHIEVEMENT

This section restates the prescribed learning outcomes, along with information about classroom assessment and measuring student achievement, including sets of specific achievement indicators for each prescribed learning outcome. Achievement indicators are statements that describe what students should be able to do in order to demonstrate that they fully meet the curriculum expectations for the subject and grade level. Achievement indicators are not mandatory; they are provided to assist teachers in assessing how well their students achieve the prescribed learning outcomes.

This section further includes key elements, which provide guidance for teachers regarding the expected depth and breadth of the prescribed learning outcomes, including vocabulary, knowledge, and skills and attitudes.

CLASSROOM ASSESSMENT MODEL

This section contains a series of classroom units that address clusters of learning outcomes organized by topic or theme. The units have been developed by BC teachers, and are provided to support classroom assessment. These units are suggestions only—teachers may use or modify the units to assist them as they plan for the implementation of this curriculum.

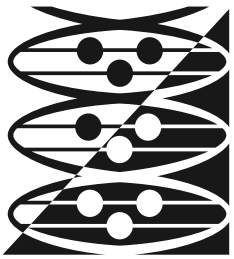
Each unit includes the prescribed learning outcomes, suggested achievement indicators, key elements, a suggested timeframe, a sequence of suggested instruction and assessment activities, recommended learning resources, selected relevant web sites, and sample assessment instruments.

LEARNING RESOURCES

This section contains general information on learning resources, and provides the titles, descriptions, and ordering information for the recommended learning resources in the Science K to 7 Grade Collection.

GLOSSARY

The glossary defines terms used in this Integrated Resource Package.



INTRODUCTION

This IRP sets out the provincially prescribed curriculum for science Kindergarten to grade 7. The development of this IRP has been guided by the principles of learning:

- Learning requires the active participation of the student.
- People learn in a variety of ways and at different rates.
- Learning is both an individual and a group process.

In addition to these three principles, this document recognizes that British Columbia's schools include young people of varied backgrounds, interests, abilities, and needs. Wherever appropriate for this curriculum, ways to meet these needs and to ensure equity and access for all learners have been integrated as much as possible into the learning outcomes, achievement indicators, instructional activities, and assessment activities.

Curriculum Overview

Rationale

The British Columbia Ministry of Education supports the statement that advancements in science and technology play a significant role in everyday life.

British Columbia also subscribes to the vision that all Canadian students, regardless of gender or cultural background, should have opportunities to develop scientific literacy.

Scientific literacy is an evolving combination of the science-related attitudes, skills, and knowledge students need to:

- develop inquiry, problem-solving, and decision-making abilities as citizens
- become lifelong learners
- maintain a sense of wonder about the world around them.

Diverse experiences in a Science program will provide students with many opportunities to understand their interrelationships among science, technology, and society that will affect their personal lives, their careers, and their future.

Goals for Scientific Literacy

These goals are in alignment with the four foundational statements from the Pan-Canadian Science Framework (Council of Ministers of Education, Canada, 1997) that delineate the four critical aspects of students' scientific literacy.

GOAL 1: Science, technology, society, and the environment (STSE)

Students will develop an understanding of the nature of science and technology, of the relationships between science and technology, and of the social and environmental contexts of science and technology.

GOAL 2: Skills

Students will develop the skills required for scientific and technological inquiry, for solving problems, for communicating scientific ideas and results, for working collaboratively, and for making informed decisions.

GOAL 3: Knowledge

Students will construct knowledge and understandings of concepts in life science, physical science, and Earth and space science, and apply these understandings to interpret, integrate, and extend their knowledge.

GOAL 4: Attitudes

Students will be encouraged to develop attitudes that support the responsible acquisition and application of scientific and technological knowledge to the mutual benefit of self, society, and the environment.

Curriculum Organizers

A curriculum organizer consists of a set of prescribed learning outcomes that share a common focus. The prescribed learning outcomes for Science K to 7 are grouped under the following curriculum organizers and suborganizers

- Processes of Science
- Life Science
- Physical Science
- Earth and Space Science

Processes of Science

Science, as a process, starts with students learning skills such as observing, classifying, predicting, inferring, and hypothesizing. It also includes scientific reasoning, critical thinking, and decision making. The combination of these skills within the science curriculum content enables students to develop their understanding of science. While these skills are not unique to science, they are important in the application of science to new situations.

There is no universal list of scientific process skills. Those identified in this curriculum are not intended to be a linear scope and sequence; instead, they suggest multiple ways in which learning science can be explored. At each grade level, two processes are introduced and then reinforced with the curriculum content in the subsequent grades; but teachers are expected to involve all of the skills their students are capable of using.

Teachers will know when the process skills are developmentally appropriate for their students. While this IRP has highlighted specific process skills for each grade, other skills could be actively developed and extended with students after the initial skills are introduced.

Process skills are best learned in hands-on activities where students engage in a problem-solving task while doing science. The hands-on model of learning science allows students to construct meaningful connections within the brain. In young children, process skills can be found in the natural practice of manipulating materials while asking questions and being curious. The names of the skills can be used and reinforced by teachers as students use and learn to apply these skills to science activities. The science process names will become familiar to students, enabling them to use the correct vocabulary when they explain their involvement in science and technology inquiries.

Life Science

This is the study of the diversity, continuity, interactions, and balance among organisms and their environments. By using the skills, processes, and attitudes of science, students extend their understanding of the living world and their place within it.

Physical Science

This is the study of matter and energy, and their interactions. By using the skills, processes, and attitudes of science, students build a foundation for their understanding of the physical world.

Earth and Space Science

This is the study of the universe and the structure of the Earth. By using the skills, processes, and attitudes of science, students develop an understanding of the forces, processes, and dynamic life-supporting qualities of the Earth.

Aboriginal Content in the Science Curriculum

The science curriculum guide integrates prescribed learning outcomes within a classroom model that includes instructional strategies, assessment tools and models that can help teachers provide all students with an understanding and appreciation of Aboriginal science. Integration of authentic Aboriginal content into the K to 7 science curriculum with the support of Aboriginal people will help promote understanding of BC's Aboriginal peoples among *all* students.

The incorporating of Aboriginal science with western science can provide a meaningful context for Aboriginal students and enhance the learning experience for all students. The inclusion of Aboriginal examples of science and technologies can make the subject more authentic, exciting, relevant and interesting for *all* students.

Numerous difficulties arise when trying to incorporate indigenous knowledge and world views into the western science classroom. The participants of the Ministry of Education Aboriginal Science meetings therefore suggest a model involving a parallel process, where Aboriginal and Western understandings exist separately, yet side-by-side and in partnership with one another. Each side is enriched by the contrasting perspective that the other brings to any discussion. Aboriginal peoples are calling for this type of relationship with Canadian schools in a

variety of settings (e.g., Ministry documents, science textbooks and curriculum materials, and teaching methods).

Traditional Ecological Knowledge and Wisdom (TEKW) is defined as the study of systems of knowledge developed by a given culture. It brings the concept of wisdom to our discussion of science and technology. TEKW tends to be holistic, viewing the world as an interconnected whole where humans are not regarded as more important than nature. It is a subset of traditional science, and is considered a branch of biological and ecological science. This knowledge with its characteristic respect for sustaining community and environment offers proven conceptual approaches which are becoming increasingly important to all BC residents.

Examples of TEKW science may be accessed through living elders and specialists of various kinds or found in the literature of TEKW, anthropology, ethnology, ecology, biology, botany, ethnobiology, medicine, horticulture, agriculture, astronomy, geology, climatology, architecture, navigation, nautical science, engineering, and mathematics.

Recognition of the importance of incorporating TEKW into environmental planning is evident in science-based reports and agreements in Canada and internationally. The Brundtland Commission report, *Our Common Future* (World Commission on Environment and Development, 1987), drew our attention to the contributions of traditional knowledge. In British Columbia, the report of the scientific panel for sustainable forest practices in Clayoquot Sound emphasizes TEKW and the importance of including indigenous knowledge in planning and managing traditional territories. The recognition of TEKW globally is explicitly addressed in international agreements including the Convention on Biological Diversity, Agenda 21, and UNCED '92, or the Earth Summit at Rio de Janeiro.

Organizing for Instruction and Assessment

Suggested Time Frame

The Kindergarten to Grade 12 Education Plan (1994) outlines the required areas of study for the primary and intermediate years and, as appropriate, indicates the recommended time allotments for each area of learning. In the primary years, teachers determine the time allotments for each required area of study and may choose to combine various curricula to enable students to integrate ideas and see applications of knowledge. Teachers are encouraged to exercise professional judgment when interpreting the suggested instructional time allotments provided here and in the Classroom Model units.

In grades 4 to 7, a minimum of 30% (285 hours/year, slightly more than 7 hours/week) of the total time in school is recommended for the study of science, mathematics, and technology. (see below).

The following chart shows the suggested estimated instructional time to deliver the prescribed learning outcomes for each Science curriculum organizer, Grade 1 to Grade 7. At the Kindergarten level, the suggested time is 50% of the amount outlined below for each organizer. These estimations have been provided as suggestions only; when delivering the prescribed curriculum, teachers will adjust the instructional time as necessary.

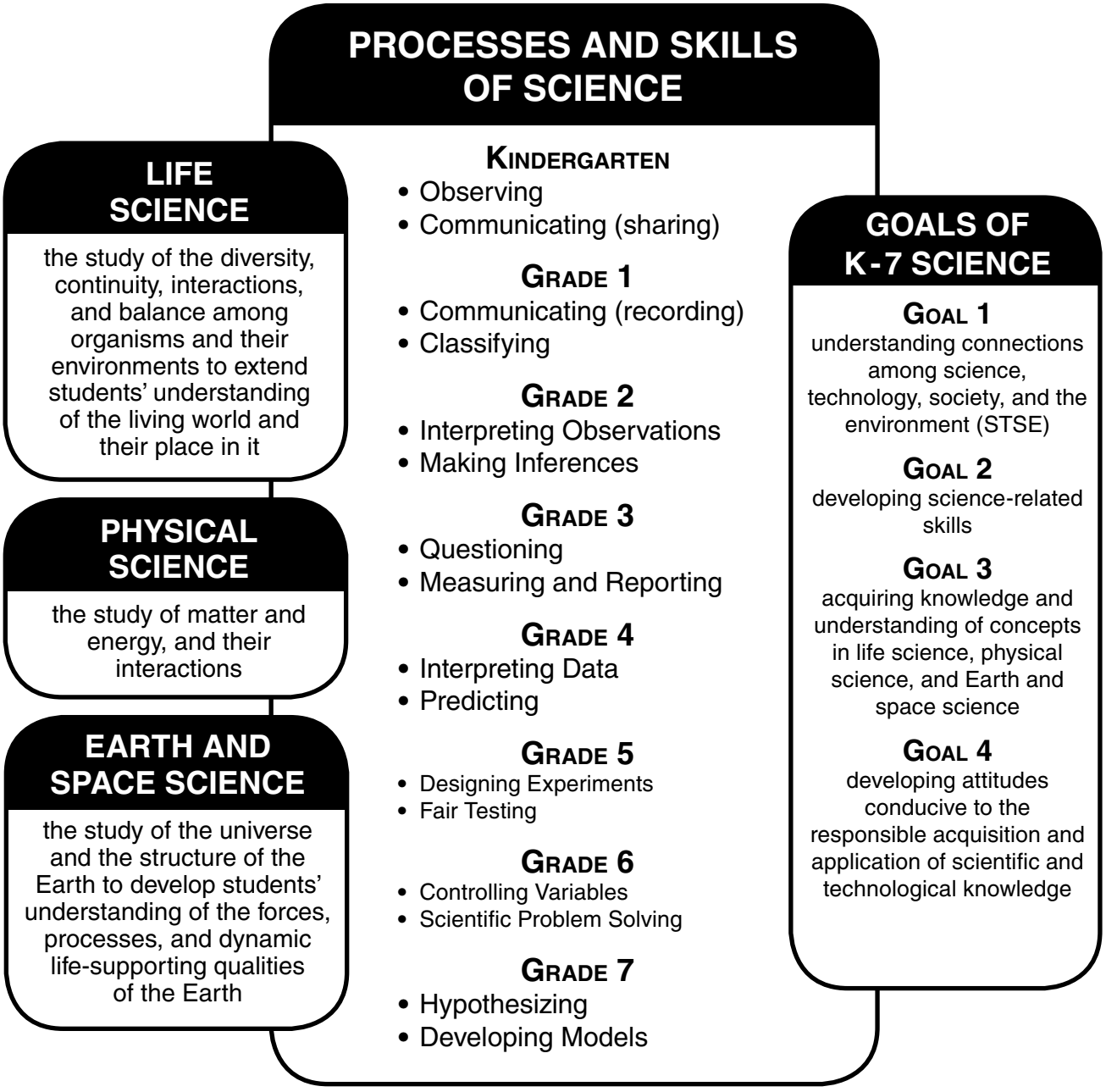
Curriculum Organizer	Suggested Time
Applications of Science	integrated with other organizers
Life Science	25-30 hours
Physical Science	25-30 hours
Earth and Space Science	25-30 hours

These estimated time allotments represent the amount of instructional time that has been recommended to meet the prescribed learning outcomes within each curriculum organizer. When delivering the prescribed curriculum, teachers may freely adjust the instructional time to meet their students' diverse needs. These estimated instructional times have been recommended by the IRP writers to assist their colleagues; they are suggestions only.

Science K to 7: Topics at a Glance

	Processes and Skills of Science	Life Science	Physical Science	Earth and Space Science
Kindergarten	• Observing • Communicating (sharing)	Characteristics of Living Things	Properties of Objects and Materials	Surroundings
Grade 1	• Communicating (recording) • Classifying	Needs of Living Things	Force and Motion	Daily and Seasonal Changes
Grade 2	• Interpreting Observations • Making Inferences	Animal Growth and Changes	Properties of Matter	Air, Water, and Soil
Grade 3	• Questioning • Measuring and Reporting	Plant Growth and Changes	Materials and Structures	Stars and Planets
Grade 4	• Interpreting Data • Predicting	Habitats and Communities	Light and Sound	Weather
Grade 5	• Designing Experiments • Fair Testing	Human Body	Forces and Simple Machines	Renewable and Non-Renewable Resources
Grade 6	• Controlling Variables • Scientific Problem Solving	Diversity of Life	Electricity	Exploration of Extreme Environments
Grade 7	• Hypothesizing • Developing Models	Ecosystems	Chemistry	Earth's Crust

GETTING THE MOST OUT OF THIS IRP



Considerations for Program Delivery

This section of the IRP contains additional information to help educators develop their school practices and plan their program delivery to meet the needs of all learners. Included in this section is information about:

- addressing local needs
- involving parents and guardians
- course requirements respecting beliefs
- establishing a positive classroom climate
- safety in the Science K to 7 classroom
- confidentiality
- inclusion, accessibility, and equity
- working with the school and community
- working with the Aboriginal community
- information and communications technology
- copyright.

Addressing Local Needs

The Science K to 7 curriculum includes opportunities for individual teacher and student choice in the exploration of topics to meet certain learning outcomes. This flexibility allows educators to plan their programs to meet the particular requirements of their students and to respond to local needs. It may be appropriate to allow for student input when selecting current and relevant topics.

Where specific topics have been included in the learning outcomes, the intent is for all students to have an opportunity to address these important issues. The inclusion of these topics is not intended to exclude any additional issues that may also be relevant for individual school communities.

Involving Parents and Guardians

The family is the primary educator in the development of students' attitudes and values. The school plays a supportive role by focussing on the prescribed learning outcomes in the Science K to 7 curriculum. Parents and guardians can support, enrich, and extend the curriculum at home.

It is highly recommended that schools inform parents and guardians about the Science K to 7 curriculum, and teachers (along with school and district administrators) may use various strategies to do so:

- Inform parents/guardians and students, via a course outline at the beginning of the course, of the prescribed learning outcomes for the course.
- Respond to parent and guardian requests to discuss course unit plans, learning resources, etc.

Course Requirements Respecting Beliefs

For many students and teachers, the study of some science concepts may lead to issues and questions that go beyond the immediate scope of curriculum (e.g., science is used to meet many industrial requirements, but industrial decision makers must consider factors other than scientific feasibility before adopting a particular process). The technological application of science in areas such as genetic engineering, human reproduction, and medical technology raises questions of ethics and values. Because these social questions arise, in part, from capabilities that science makes possible, they should be addressed. It must be made clear to students, however, that science only provides the background for what is hoped will be informed personal and social decisions. Teachers must handle these questions objectively and with sensitivity.

Reconciling scientific discoveries (for example, in genetic engineering) and religious faith poses a particular challenge for some students. While respecting the personal beliefs of students, teachers should be careful to distinguish between knowledge based on the application of scientific methods, and religious teachings and associated beliefs such as creationism, theory of divine creation, or intelligent-design theory.

Establishing a Positive Classroom Climate

Teachers are responsible for setting and promoting a classroom climate in which students feel comfortable learning about and discussing topics in Science K to 7. The following are some guidelines that may help educators establish and promote a positive classroom climate.

- Allow class members sufficient time and opportunities to become comfortable with each other before engaging in group discussion. It is important that the classroom climate encourage students to relate to one another in positive, respectful, and supportive ways. Be prepared to facilitate any potentially controversial discussions.
- Establish clear ground rules for class discussions that demonstrate respect for privacy, for diversity, and for the expression of differing viewpoints.
- Become familiar with:
  - relevant legislation (e.g., Human Rights Code; Child, Family and Community Services Act)
  - relevant initiatives (e.g., Safe, Caring and Orderly Schools: A Guide and Diversity in BC Schools: A Framework)
  - provincial and district policies and protocols concerning topics such as disclosure related to child abuse, and protection of privacy.

Further information about these policies and initiatives is available online:

BC Handbook for Action on Child Abuse and Neglect
http://www.mcf.gov.bc.ca/child_protection/pdf/handbook_action_child_abuse.pdf

Safe, Caring and Orderly Schools
http://www.bced.gov.bc.ca/sco/

Diversity in BC Schools: A Framework
http://www.bced.gov.bc.ca/diversity/diversity_framework.pdf

Human Rights Code
http://www.qp.gov.bc.ca/statreg/stat/H/96210_01.htm

Child, Family and Community Services Act
http://www.qp.gov.bc.ca/statreg/stat/C/96046_01.htm

Activities and discussion related to some of the topics in Science K to 7 may evoke an emotional response from individual students. Inform an administrator or counsellor when any concern arises, and ensure students know where to go for help and support.

Ensure that any external groups or organizations making a presentation to students have met the district's guidelines for presenting. There should be a direct relationship between the content of the presentation and the prescribed learning outcomes. Review any materials they may use, especially handouts, for appropriateness.

Safety in the Science Kindergarten to Grade 7 Classroom

Science education is an activity-based process that provides an exciting method of teaching and learning. However, experiments and demonstrations may involve inherent risks for both the teacher and the student.

Safety guidelines must be discussed with students. These safety guidelines must support and encourage the investigative approach generally and laboratory instruction specifically, while at the same time promoting safety in the classroom and laboratory. Encouraging a positive safety attitude is a responsibility shared among the board, school administrators, teachers, and students in every school district. The co-operation of all these groups helps develop a strong safety consciousness both inside and outside our schools.

Teachers are reminded especially of the potential risks associated with activities that involve extraction and analysis of human fluids or tissue. Before attempting these activities, they should consult the ministry's Science Safety Manual on the use of human tissue and fluid in science classrooms.

Another important aspect of in-school safety is the Workplace Hazardous Materials Information System (WHMIS). Through labelling, material safety data sheets, and education and training, WHMIS is designed to ensure that those using hazardous materials have sufficient information to handle them safely. Each school district should have an individual trained in WHMIS who can work with teachers to establish safe, well-ventilated classroom and laboratory working conditions.

To assist teachers in providing a safe science-learning environment, the Ministry of Education publishes the Science Safety Resource Manual, which has been distributed to every school. This resource is available online at http://www.bced.gov.bc.ca/irp/resdocs/scisafety.htm.

Confidentiality

The Freedom of Information and Protection of Privacy Act (FOIPPA) applies to students, to school district employees, and to all curricula. Teachers, administrators, and district staff should consider the following:

- Be aware of district and school guidelines regarding the provisions of FOIPPA and how it applies to all courses, including Science K to 7.
- Inform students of their rights under FOIPPA, especially the right to have access to their own personal information in their school records.
- Do not use students' Personal Education Numbers (PEN) on any assignments that students wish to keep confidential.
- Minimize the type and amount of personal information collected and ensure that it is used only for relevant purposes.
- Inform students that they will be the only ones recording personal information about themselves unless they have consented to teachers collecting that information from other people, including parents.

- Inform students why they are being asked to provide any personal information in the context of the Science K to 7 curriculum.
- Ensure that any information used in assessing students' progress is up-to-date, accurate, and complete.
- Inform students they can request that the school correct or annotate any of their personal information kept in records at the school.
- Be aware that parents' rights to have access to their children's personal information are limited to that which pertains to their child's progress. Ensure students are aware that their parents may have access to the work they create as part of the course.

For more information about confidentiality, refer to http://www.mser.gov.bc.ca/FOI_POP/index.htm

Inclusion, Equity, and Accessibility for All Learners

British Columbia's schools include young people of varied backgrounds, interests, and abilities. The Kindergarten to grade 12 school system is committed to meeting the needs of all students. When selecting specific topics, activities, and resources to support the implementation of Science K to 7, teachers are encouraged to ensure that these choices support inclusion, equity, and accessibility for all students. In particular, teachers should ensure that classroom instruction, assessment, and resources reflect sensitivity to diversity and incorporate positive role portrayals, relevant issues, and themes such as inclusion, respect, and acceptance.

Government policy supports the principles of integration and inclusion of students who have English as a second language and of students with special needs. Most of the suggested assessment activities in this IRP can be used with all students, including those with special and/or ESL needs. Some strategies may require adaptations to ensure that those with special and/or ESL needs can successfully achieve the prescribed learning outcomes. Modifications can be made to the prescribed learning outcomes for students with Individual Education Plans.

For more information about resources and support for students with special needs, refer to http://www.bced.gov.bc.ca/specialed/

For more information about resources and support for ESL students, refer to http://www.bced.gov.bc.ca/esl/

Working with the School and Community

This curriculum addresses a wide range of skills and understandings that students are developing in other areas of their lives. It is important to recognize that learning related to this curriculum extends beyond the science classroom.

School and district-wide programs—such as active schools, workplace safety, work experience, anti-bullying, and alcohol and drug education—support and extend learning in Science K to 7. Community organizations may also support the curriculum with locally developed learning resources, guest speakers, workshops, and field studies. Teachers may wish to draw on the expertise of these community organizations and members.

Working with the Aboriginal Community

The Ministry of Education is dedicated to ensuring that the cultures and contributions of Aboriginal peoples in BC are reflected in all provincial curricula. To address these topics in the classroom in a way that is accurate and that respectfully reflects Aboriginal concepts of teaching and learning, teachers are strongly encouraged to seek the advice and support of local Aboriginal communities. As Aboriginal communities are diverse in terms of language, culture, and available resources, each community will have its own unique protocol to gain support for integration of local knowledge and expertise. To begin discussion of possible instructional and assessment activities, teachers should first contact Aboriginal education co-ordinators, teachers, support workers, and counsellors in their district who will be able to facilitate the identification of local resources and contacts such as Elders, chiefs, tribal or band councils, Aboriginal cultural centres, Aboriginal Friendship Centres, and Métis or Inuit organizations.

In addition, teachers may wish to consult the various Ministry of Education publications available, including the "Planning Your Program" section of the resource, Shared Learnings (1998). This resource was developed to help all teachers provide students with

knowledge of, and opportunities to share experiences with, Aboriginal peoples in BC.

For more information about these documents, consult the Aboriginal Education web site: http://www.bced.gov.bc.ca/abed/welcome.htm

Information and Communications Technology

The study of information and communications technology is increasingly important in our society. Students need to be able to acquire and analyse information, to reason and communicate, to make informed decisions, and to understand and use information and communications technology for a variety of purposes. Development of these skills is important for students in their education, their future careers, and their everyday lives.

Literacy in the area of information and communications technology can be defined as the ability to obtain and share knowledge through investigation, study, instruction, or transmission of information by means of media technology. Becoming literate in this area involves finding, gathering, assessing, and communicating information using electronic means, as well as developing the knowledge and skills to use and solve problems effectively with the technology. Literacy also involves a critical examination and understanding of the ethical and social issues related to the use of information and communications technology. When planning for instruction and assessment in Science K to 7, teachers should provide opportunities for students to develop literacy in relation to information and communications technology sources, and to reflect critically on the role of these technologies in society.

Copyright and Responsibility

Copyright is the legal protection of literary, dramatic, artistic, and musical works; sound recordings; performances; and communications signals. Copyright provides creators with the legal right to be paid for their work and the right to say how their work is to be used. There are some exceptions in the law (i.e., specific things permitted) for schools but these are very limited, such as copying for private study or research. The copyright law determines how resources can be used in the classroom and by students at home.

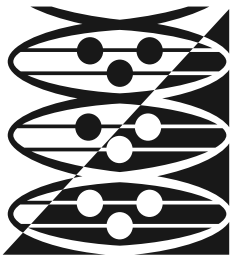
In order to respect copyright it is necessary to understand the law. It is unlawful to do the following, unless permission has been given by a copyright owner:

- photocopy copyrighted material to avoid purchasing the original resource for any reason
- photocopy or perform copyrighted material beyond a very small part—in some cases the copyright law considers it "fair" to copy whole works, such as an article in a journal or a photograph, for purposes of research and private study, criticism, and review
- show videotaped television or radio programs to students in the classroom unless these are cleared for copyright for educational use (there are exceptions such as for news and news commentary taped within one year of broadcast that by law have record-keeping requirements—see the web site at the end of this section for more details)
- photocopy print music, workbooks, instructional materials, instruction manuals, teacher guides, and commercially available tests and examinations
- show videotapes at schools that are not cleared for public performance
- perform music or do performances of copyrighted material for entertainment (i.e., for purposes other than a specific educational objective)
- copy work from the Internet without an express message that the work can be copied.

Permission from or on behalf of the copyright owner must be given in writing. Permission may also be given to copy or use all or some portion of copyrighted work through a licence or agreement. Many creators, publishers, and producers have formed groups or "collectives" to negotiate royalty payments and copying conditions for educational institutions. It is important to know what licences are in place and how these affect the activities schools are involved in. Some licenses may also have royalty payments that are determined by the quantity of photocopying or the length of performances. In these cases, it is important to assess the educational value and merits of copying or performing certain works to protect the school's financial exposure (i.e., only copy or use that portion that is absolutely necessary to meet an educational objective).

It is important for education professionals, parents, and students to respect the value of original thinking and the importance of not plagiarizing the work of others. The works of others should not be used without their permission.

For more information about copyright, refer to: http://cmec.ca/copyright/indexe.stm



PRESCRIBED LEARNING OUTCOMES

Prescribed learning outcomes are content standards for the provincial education system; they are the prescribed curriculum. They set out the required attitudes, skills, and knowledge—what students are expected to know and be able to do—by the end of the specified subject and grade. Learning outcomes are clearly stated and expressed in measurable and observable terms.

Schools have the responsibility to ensure that all prescribed learning outcomes in this curriculum are met; however, schools have flexibility in determining how delivery of the curriculum can best take place.

It is expected that student achievement will vary in relation to the learning outcomes. Evaluation, reporting, and student placement with respect to these outcomes are dependent on the professional judgment and experience of teachers, guided by provincial policy.

Prescribed learning outcomes for Science K to 7 are presented by grade and by curriculum organizer and suborganizer; however, this arrangement is not intended to imply a required instructional sequence.

Wording of Prescribed Learning Outcomes

All learning outcomes complete the stem, "It is expected that students will ...."

When used in a prescribed learning outcome, the word "including" indicates that any ensuing item **must be addressed.** Lists of items introduced by the word "including" represent a set of minimum requirements associated with the general requirement set out by the outcome. The lists are not necessarily exhaustive, however, and teachers may choose to address additional items that also fall under the general requirement set out by the outcome.

Conversely, the abbreviation "e.g.," (for example) in a prescribed learning outcome indicates that the ensuing items are provided for illustrative purposes or clarification, and are **not requirements that must be addressed.** Presented in parentheses, the list of items introduced by "e.g.," is neither exhaustive nor prescriptive, nor is it put forward in any special order of importance or priority. Teachers are free to substitute items of their own choosing that they feel best address the intent of the learning outcome.

Domains of Learning

Prescribed learning outcomes in BC curricula identify required learning in relation to one or more of the three domains of learning: cognitive, psychomotor, and affective. The following definitions of the three domains are based on Bloom's taxonomy (*Taxonomy of Educational Objectives,* Bloom et al., 1956).

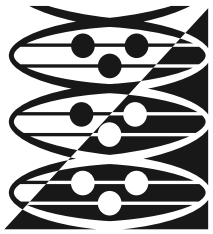
The **cognitive domain** deals with the recall or recognition of knowledge and the development of intellectual abilities. The cognitive domain can be further specified as including three cognitive levels: knowledge, understanding and application, and higher mental processes. These levels are determined by the verb used in the learning outcome, and illustrate how student learning develops over time.

- *Knowledge* includes those behaviours that emphasize the recognition or recall of ideas, material, or phenomena.
- *Understanding and application* represents a comprehension of the literal message contained in a communication, and the ability to apply an appropriate theory, principle, idea, or method to a new situation.
- *Higher mental processes* include analysis, synthesis, and evaluation. The higher mental processes level subsumes both the knowledge and the understanding and application levels.

The **affective domain** concerns attitudes, beliefs, and the spectrum of values and value systems.

The **psychomotor domain** includes those aspects of learning associated with movement and skill demonstration, and integrates the cognitive and affective consequences with physical performances.

Domains of learning and cognitive levels also form the basis of the Assessment Overview Tables provided for each grade in the Classroom Assessment Model.



Prescribed Learning Outcomes

By Curriculum Organizer

PROCESSES OF SCIENCE

Kindergarten
- use the five senses to make observations
- share with others information obtained by observing

Grade 1
- communicate their observations, experiences, and thinking in a variety of ways (e.g., verbally, pictorially, graphically)
- classify objects, events, and organisms

Grade 2
- use their senses to interpret observations
- infer the probable outcome of an event or behaviour based on observations

Grade 3
- ask questions that foster investigations and explorations relevant to the content
- measure objects and events

Grade 4
- make predictions, supported by reasons and relevant to the content
- use data from investigations to recognize patterns and relationships and reach conclusions

Grade 5
- identify variables that can be changed in an experiment
- evaluate the fairness of a given experiment
- describe the steps in designing an experiment

Grade 6
- manipulate and control a number of variables in an experiment
- apply solutions to a technical problem (e.g., malfunctioning electrical circuit)

Grade 7
- test a hypothesis by planning and conducting an experiment that controls for two or more variables
- create models that help to explain scientific concepts and hypotheses

LIFE SCIENCE

Kindergarten

- describe features of local plants and animals (e.g., colour, shape, size, texture)
- compare local plants
- compare common animals

Grade 1

- classify living and non-living things
- describe the basic needs of local plants and animals (e.g., food, water, light)
- describe how the basic needs of plants and animals are met in their environment

Grade 2

- classify familiar animals according to similarities and differences in appearance, behaviour, and life cycles
- describe some changes that affect animals (e.g., hibernation, migration, decline in population)
- describe how animals are important in the lives Aboriginal peoples in BC
- describe ways in which animals are important to other living things and the environment

Grade 3

- compare familiar plants according to similarities and differences in appearance and life cycles
- describe ways in which plants are important to other living things and the environment
- describe how plants are harvested and used throughout the seasons

Grade 4

- compare the structures and behaviours of local animals and plants in different habitats and communities
- analyse simple food chains
- demonstrate awareness of the Aboriginal concept of respect for the environment
- determine how personal choices and actions have environmental consequences

Grade 5

- describe the basic structure and functions of the human respiratory, digestive, circulatory, skeletal, muscular, and nervous systems
- explain how the different body systems are interconnected

Grade 6

- demonstrate the appropriate use of tools to examine living things that cannot be seen with the naked eye
- analyse how different organisms adapt to their environments
- distinguish between life forms as single or multi-celled organisms and belonging to one of five kingdoms: Plantae, Animalia, Monera, Protista, Fungi

Grade 7

- analyse the roles of organisms as part of interconnected food webs, populations, communities, and ecosystems
- assess survival needs and interactions between organisms and the environment
- assess the requirements for sustaining healthy local ecosystems
- evaluate human impacts on local ecosystems

Physical Science

Kindergarten
- describe properties of materials, including colour, shape, texture, size, and weight
- identify materials that make up familiar objects
- describe ways to rethink, refuse, reduce, reuse, and recycle

Grade 1
- demonstrate how force can be applied to move an object
- compare the effect of friction on the movement of an object over a variety of surfaces
- demonstrate and describe the effects of magnets on different materials

Grade 2
- identify the properties of solids, liquids, and gases
- investigate changes to the properties of matter when it is heated or cooled
- investigate the interactions of liquids and solids

Grade 3
- describe shapes that are part of natural and human-built structures (e.g., domes, arches, pyramids)
- compare the effects of different materials, shapes, and forces on the strength and stability of different structures
- conduct investigations into ways to improve the strength and stability of structures

Grade 4
- identify sources of light and sound
- explain properties of light (e.g., travels in a straight path, can be reflected)
- explain properties of sound (e.g., travels in waves, travels in all directions)

Grade 5
- demonstrate how various forces can affect the movement of objects
- demonstrate mechanical advantage of simple machines, including lever, wedge, pulley, ramp, screw, and wheel
- design a compound machine
- describe applications of simple and compound machines used in daily life in BC communities

Grade 6
- evaluate various methods for producing small electrical charges
- test a variety of electrical pathways using direct current circuits
- demonstrate that electricity can be transformed into light, heat, sound, motion, and magnetic effects
- differentiate between renewable and non-renewable methods of producing electrical energy

Grade 7
- conduct investigations into properties of matter
- classify substances as elements, compounds, and mixtures
- measure substances and solutions according to pH, solubility, and concentration

EARTH AND SPACE SCIENCE

Kindergarten
- demonstrate the ability to observe their surroundings
- describe features of their immediate environment

Grade 1
- describe changes that occur in daily and seasonal cycles and their effects on living things
- describe activities of Aboriginal peoples in BC in each seasonal cycle

Grade 2
- describe physical properties of air, water, and soil
- distinguish ways in which air, water, and soil interact
- explain why air, water, and soil are important for living things

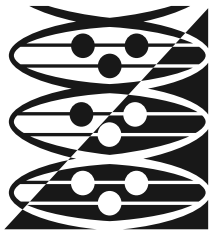
Grade 3
- describe characteristics and movements of objects in our solar system
- compare familiar constellations in seasonal skies
- demonstrate awareness of the special significance of celestial objects for Aboriginal peoples

Grade 4
- measure weather in terms of temperature, precipitation, cloud cover, wind speed and direction
- analyse impacts of weather on living and non-living things

Grade 5
- analyse how BC's living and non-living resources are used
- identify methods of extracting or harvesting and processing BC's resources
- analyse how the Aboriginal concept of interconnectedness of the environment is reflected in responsibility for and caretaking of resources
- describe potential environmental impacts of using BC's living and non-living resources

Grade 6
- explain obstacles unique to exploration of a specific extreme environment
- assess technologies used for extreme environments
- describe contributions of Canadians to exploration technologies

Grade 7
- compare the characteristics of the Earth's core, mantle, and crust, and describe the formation of rocks
- analyse the dynamics of tectonic plate movement and landmass formation
- explain how the Earth's surface changes over time



Prescribed Learning Outcomes

Grade 6

GRADE 6

Processes and Skills of Science

It is expected that students will:

- manipulate and control a number of variables in an experiment
- apply solutions to a technical problem (e.g., malfunctioning electrical circuit)

Life Science: Diversity of Life

It is expected that students will:

- demonstrate the appropriate use of tools to examine living things that cannot be seen with the naked eye
- analyse how different organisms adapt to their environments
- distinguish between life forms as single or multi-celled organisms and belonging to one of five kingdoms: Plantae, Animalia, Monera, Protista, Fungi

Physical Science: Electricity

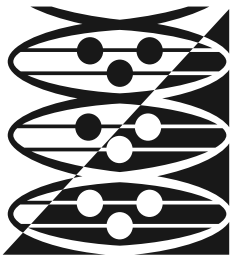
It is expected that students will:

- evaluate various methods for producing small electrical charges
- test a variety of electrical pathways using direct current circuits
- demonstrate that electricity can be transformed into light, heat, sound, motion, and magnetic effects
- differentiate between renewable and non-renewable methods of producing electrical energy

Earth and Space Science: Exploration of Extreme Environments

It is expected that students will:

- explain obstacles unique to exploration of a specific extreme environment
- assess technologies used for extreme environments
- describe contributions of Canadians to exploration technologies



STUDENT ACHIEVEMENT

This section of the IRP contains information about classroom assessment and student achievement, including specific achievement indicators to assist teachers in assessing student achievement in relation to each prescribed learning outcome. Also included in this section are key elements—descriptions of content that help determine the intended depth and breadth of prescribed learning outcomes.

Classroom Assessment and Evaluation

Assessment is the systematic gathering of information about what students know, are able to do, and are working toward. Assessment evidence can be collected using a wide variety of methods, such as::

- observation
- student self-assessments and peer assessments
- quizzes and tests (written, oral, practical)
- samples of student work
- projects
- oral and written reports
- journals and learning logs
- performance reviews
- portfolio assessments.

Student performance is based on the information collected through assessment activities. Teachers use their insight, knowledge about learning, and experience with students, along with the specific criteria they establish, to make judgments about student performance in relation to prescribed learning outcomes.

There are three major types of assessment that can be used in conjunction with each other to support student achievement.

- Assessment **for** learning is assessment for purposes of greater learning achievement.
- Assessment **as** learning is assessment as a process of developing and supporting students' active participation in their own learning.
- Assessment **of** learning is assessment for purposes of providing evidence of achievement for reporting.

Assessment for Learning

Classroom assessment for learning provides ways to engage and encourage students to become involved in their own day-to-day assessment—to acquire the skills of thoughtful self-assessment and to promote their own achievement.

This type of assessment serves to answer the following questions:

- What do students need to learn to be successful?
- What does the evidence of this learning look like?

Assessment for learning is criterion-referenced, in which a student's achievement is compared to established criteria rather than to the performance of other students. Criteria are based on prescribed learning outcomes, as well as on suggested achievement indicators or other learning expectations.

Students benefit most when assessment feedback is provided on a regular, ongoing basis. When assessment is seen as an opportunity to promote learning rather than as a final judgment, it shows students their strengths and suggests how they can develop further. Students can use this information to redirect their efforts, make plans, communicate with others (e.g., peers, teachers, parents) about their growth, and set future learning goals.

Assessment for learning also provides an opportunity for teachers to review what their students are learning and what areas need further attention. This information can be used to inform teaching and create a direct link between assessment and instruction. Using assessment as a way of obtaining feedback on instruction supports student achievement by informing teacher planning and classroom practice.

Assessment as Learning

Assessment as learning actively involves students in their own learning processes. With support and guidance from their teacher, students take responsibility for their own learning, constructing meaning for themselves. Through a process of continuous self-assessment, students develop the ability to take stock of what they have already learned, determine what they have not yet learned, and decide how they can best improve their own achievement.

Although assessment as learning is student-driven, teachers can play a key role in facilitating how this assessment takes place. By providing regular opportunities for reflection and self-assessment, teachers can help students develop, practise, and become comfortable with critical analysis of their own learning.

Assessment of Learning

Assessment of learning can be addressed through summative assessment, including large-scale assessments and teacher assessments. These summative assessments can occur at the end of the year or at periodic stages in the instructional process.

Large-scale assessments, such as Foundation Skills Assessment (FSA) and Graduation Program exams, gather information on student performance

throughout the province and provide information for the development and revision of curriculum. These assessments are used to make judgments about students' achievement in relation to provincial and national standards. There is no large-scale provincial assessment for science K to 7.

Assessment *for* Learning	Assessment *as* Learning	Assessment *of* Learning
Formative assessment *ongoing in the classroom* • teacher assessment, student self-assessment, and/or student peer assessment • criterion-referenced—criteria based on prescribed learning outcomes identified in the provincial curriculum, reflecting performance in relation to a specific learning task • involves both teacher and student in a process of continual reflection and review about progress • teachers adjust their plans and engage in corrective teaching in response to formative assessment	Formative assessment *ongoing in the classroom* • self-assessment • provides students with information on their own achievement and prompts them to consider how they can continue to improve their learning • student-determined criteria based on previous learning and personal learning goals • students use assessment information to make adaptations to their learning process and to develop new understandings	Summative assessment occurs at *end of year or at key stages* • teacher assessment • may be either criterion-referenced (based on prescribed learning outcomes) or norm-referenced (comparing student achievement to that of others) • information on student performance can be shared with parents/guardians, school and district staff, and other education professionals (e.g., for the purposes of curriculum development) • used to make judgments about students' performance in relation to provincial standards

Criterion-Referenced Assessment and Evaluation

In criterion-referenced evaluation, a student's performance is compared to established criteria rather than to the performance of other students. Evaluation in relation to prescribed curriculum requires that criteria be established based on the learning outcomes.

Criteria are the basis for evaluating student progress. They identify, in specific terms, the critical aspects of a performance or a product that indicate how well the student is meeting the prescribed learning outcomes. For example, weighted criteria, rating scales, or scoring guides (reference sets) are ways that student performance can be evaluated using criteria.

Wherever possible, students should be involved in setting the assessment criteria. This helps students develop an understanding of what high-quality work or performance looks like.

Criterion-referenced assessment and evaluation may involve these steps:

Step 1	Identify the prescribed learning outcomes and suggested achievement indicators (as articulated in this IRP) that will be used as the basis for assessment.
Step 2	Establish criteria. When appropriate, involve students in establishing criteria.
Step 3	Plan learning activities that will help students gain the attitudes, skills, or knowledge outlined in the criteria.
Step 4	Prior to the learning activity, inform students of the criteria against which their work will be evaluated.
Step 5	Provide examples of the desired levels of performance.
Step 6	Conduct the learning activities.
Step 7	Use appropriate assessment instruments (e.g., rating scale, checklist, scoring guide) and methods (e.g., observation, collection, self-assessment) based on the particular assignment and student.
Step 8	Review the assessment data and evaluate each student's level of performance or quality of work in relation to criteria.
Step 9	Where appropriate, provide feedback and/or a letter grade to indicate how well the criteria are met.
Step 10	Communicate the results of the assessment and evaluation to students and parents/guardians.

Key Elements

Key elements provide an overview of content in each curriculum organizer. They can be used to determine the expected depth and breadth of the prescribed learning outcomes.

Note that some topics appear at multiple grade levels in order to emphasize their importance and to allow for developmental learning.

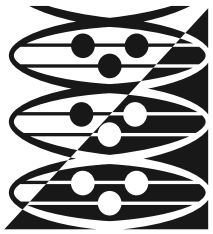
Achievement Indicators

To support teachers in assessing provincially prescribed curricula, this IRP includes sets of achievement indicators in relation to each learning outcome.

Achievement indicators define the specific level of attitudes demonstrated, skills applied, or knowledge acquired by the student in relation to a corresponding prescribed learning outcome. They describe what evidence a teacher might look for to determine whether or not the student has fully met the intent of the learning outcome. In some cases, achievement indicators may also include suggestions as to the type of task that would provide evidence of having met the learning outcome (e.g., a constructed response such as a list, comparison, analysis, or chart; a product created and presented such as a report, drama presentation, poster, letter, or model; a particular skill demonstrated such as interpreting data).

Achievement indicators are not mandatory; they are suggestions only, provided to assist teachers in assessing how well their students achieve the prescribed learning outcomes. Teachers are encouraged to modify and expand on these suggestions as required to address local needs.

The following pages contain the suggested achievement indicators corresponding to each prescribed learning outcome for the Science K to 7 curriculum. The achievement indicators are arranged by curriculum organizer and suborganizer for each grade; however, this order is not intended to imply a required sequence of instruction and assessment.



STUDENT ACHIEVEMENT

Grade 6

GRADE 6: PROCESSES OF SCIENCE

Key Elements: Processes of Science

Estimated Time: integrate with other curriculum organizers

Controlling Variables

Discovering and then deliberately controlling the conditions that influence the outcome of an experiment are needed to avoid drawing incorrect conclusions from observations. It requires that all factors and influences be identified first and then manipulated in a systematic manner. Students must ensure that only one variable is changed (or tested) at a time. Those variables not changed are called the control. Important conditions to consider while experimenting might include:

- determining equal measures by mass or volume of the test objects
- setting standard conditions for light, temperature, and water
- identifying other variables or factors that could affect the outcome
- limiting or removing those other variables not involved in the study
- following the experimental design by controlling relevant variables
- repeating the experiment many times to yield consistent results
- using the recorded data as evidence of a "cause" relationship.

When assessing students' understanding and ability to apply controls to the variables, consider how the independence of the variables was restricted. Observe how the procedures followed during the investigation were uniformly applied to all similar components or test items throughout the experiment. By conducting fair tests, the cause and effect is best inferred from the results gathered. Observe how many recorded events were repeated to obtain consistent results before they were accepted.

Problem Solving

The process of scientific problem solving is a critical thinking response to observed experiences in which a science problem is solved. It combines all the activities of asking questions, gathering evidence, designing and proposing solutions, and testing those solutions by making a prototype. This grade level sees the beginning of technical design work, and problems are solved by practical methods. Problem solving includes these stages:

- determine the humans needs involved in the situation (or assigned task)
- identify the task, and observe the key attributes involved
- establish the criteria for use of the prototype (set limits)
- plan creatively a possible set of solutions
- determine the available materials or equipment, and select a course of action
- draw a series of possible solutions for building
- build a prototype or model
- test and evaluate the model according to the criteria
- evaluate the results and redo if necessary
- communicate success to others.

When assessing students' understanding and ability to apply solutions to a technical problem, consider how well they identify the problem, design possible solutions, construct a product or answer, test and evaluate the results, and communicate success. Students may not initially understand the concepts involved, but as the process continues, consider the extent to which the details are accurately identified and modifications made for a suitable outcome.

GRADE 6 PROCESSES OF SCIENCE

Prescribed Learning Outcomes	Suggested Achievement Indicators
It is expected that students will:	*The following set of indicators may be used to assess student achievement for each corresponding prescribed learning outcome.* *Students who have fully met the prescribed learning outcome are able to:*
• manipulate and control a number of variables in an experiment	❑ identify quantities of key factors (e.g., light, water, nutrition, temperature) as relevant variables in a test (e.g., of biological growth) ❑ suggest and systematically implement controls on variables directly related to the outcome of an experiment (e.g., amount, quality, length) ❑ explain, with reference to possible consequences, the importance of a consistent and standardized approach to dealing with variables
• apply solutions to a technical problem (e.g., malfunctioning electrical circuit)	❑ make adjustments in technique when immediate results are not obtained (e.g., adjust microscope settings) ❑ use a persistent and organized approach to determine why a technical product (e.g., an electrical circuit) is not working, and modify it to make it work ❑ suggest effective and practical ways to modify a technological instrument or tool (vehicles, clothes, food, buildings, wrenches) to permit its function in an extreme environment

Processes and Skills of Science							
Kindergarten	**Grade 1**	**Grade 2**	**Grade 3**	**Grade 4**	**Grade 5**	**Grade 6**	**Grade 7**
• Observing • Communicating (sharing)	• Communicating (recording) • Classifying	• Interpreting Observations • Making Inferences	• Questioning • Measuring and Reporting	• Interpreting Data • Predicting	• Designing Experiments • Fair Testing	• Controlling Variables • Scientific Problem Solving	• Hypothesizing • Developing Models

GRADE 6 LIFE SCIENCE: DIVERSITY OF LIFE

Key Elements: Life Science

Estimated Time: 25 – 30 hours

By the end of the grade, students will have observed and classified various organisms according to their form and function.

Diversity of Life

The study of the diversity of life is an introduction to micro-organisms and biological classification systems. Students use appropriate tools to observe plants, animals, and micro-organisms. Students also use classification systems to group organisms according to features of form and function.

Vocabulary

microscopes, slide, cover slip, magnify, micro-organism, species, kingdom, Plantae, Animalia, Monera, Protista, Fungi, invertebrate, vertebrate, mammals, birds, reptiles, amphibians, fish, classification systems, cell, cell membrane, nucleus, chloroplasts, chlorophyll, colouration, mimicry, camouflage, behaviour

Knowledge

- cells are the basic units of life and carry on all the functions needed for survival
- living things may be unicellular or multicellular
- plant cells differ from animal cells in their structure
- scientists classify organisms into groups according to internal and external features
- scientists traditionally use a five-kingdom system to classify organisms
- the kingdoms are: Animalia, Plantae, Protista, Monera, and Fungi
- each of the kingdoms has its own set of characteristics

Skills and Attitudes

- classify organisms using attributes
- demonstrate the use of a microscope to view a prepared slide
- demonstrate safe practices in investigations
- show respect for all living organisms
- use appropriate tools and techniques to gather, analyse, interpret, and share scientific ideas

GRADE 6 LIFE SCIENCE: DIVERSITY OF LIFE

Prescribed Learning Outcomes	Suggested Achievement Indicators
It is expected that students will:	*The following set of indicators may be used to assess student achievement for each corresponding prescribed learning outcome.* *Students who have fully met the prescribed learning outcome are able to:*
• demonstrate the appropriate use of tools to examine living things that cannot be seen with the naked eye	❑ correctly use tools such as a magnifying glass or microscope to observe a variety of microscopic organisms ❑ precisely draw various characteristics of microscopic organisms on the basis of their own observations
• analyse how different organisms adapt to their environments	❑ identify two or more specific adaptations of various life forms (e.g., colouration or other physical characteristics, mimicry or other behaviour) ❑ suggest a plausible explanation of how particular adaptations help life forms interact in their environments ❑ create a detailed report describing the symbiosis between two organisms
• distinguish between life forms as single or multi-celled organisms and belonging to one of five kingdoms: Plantae, Animalia, Monera, Protista, Fungi	❑ accurately list the characteristics that define all living things, including ability to reproduce, grow, respire, use energy, respond to stimuli ❑ identify and distinguish Plantae, Animalia, Monera, Protista, and Fungi as kingdoms of life ❑ correctly sort micro-organisms according to their characteristics, with teacher support (e.g., a descriptive key for Monera, Protista, and Fungi)

GRADE 6 PHYSICAL SCIENCE: ELECTRICITY

Key Elements: Physical Science

Estimated Time: 25 – 30 hours

By the end of the grade, students will have gained a basic understanding of electricity.

Electricity

In this study, students gain a basic understanding of how electricity works. They explore the characteristics of static and current electricity. Students discover the characteristics of conductors, insulators, switches, batteries, light bulbs, and electromagnets. Students test, design, construct, and evaluate various combinations of circuits, switches, batteries and bulbs. Students examine the production and transmission of electricity in British Columbia.

Vocabulary

atom, electron, static electricity and current electricity, electrical current, closed and open circuit, conductor, insulator, battery, magnetism, parallel circuit, series circuit, switch, voltage, geothermal, nuclear, tidal, solar, wind power, biomass power, coal, gas, fossil fuels, hydro, hydro-electric dams, renewable, non-renewable, consumption, conservation, electrocution, direct current, bulb, positive, negative, electrical energy

Knowledge

- static electricity is the result of the accumulation of excess charge on an object
- an electron is a negatively charged particle
- the presence of excess electrons produces a net negative charge, and the lack of electrons produces a net positive charge
- unlike electric charges attract, and like charges repel
- electric current is the movement of electrons through a conductor
- conductors permit a flow of electric current, while insulators block the flow of electric current
- chemicals can be used to transfer electrical energy (e.g., dry cell batteries)
- electric currents have magnetic fields
- electricity may flow in series or parallel circuits
- electrical energy can be transferred to produce heat, light, motion, and chemical activity (e.g., inside the standard light bulb is a filament that glows because it gives off heat and light energy); likewise, heat, light, motion, and chemical activity can be transferred to produce electrical energy
- different sources of energy can be transferred to produce electrical energy (e.g., wind, water, steam, solar, tidal, etc.)

Skills and Attitudes

- demonstrate curiosity, creativity, open mindedness, accuracy, precision, persistence, and appreciate their importance as scientific attributes
- manipulate, construct, and test electrical circuits that use batteries
- show increasing confidence as scientific problem solvers by asking questions, solving problems, and making decisions
- demonstrate the safe use of electricity
- demonstrate the safe use and handling of home electrical appliances

GRADE 6 PHYSICAL SCIENCE: ELECTRICITY

Prescribed Learning Outcomes	Suggested Achievement Indicators
It is expected that students will:	*The following set of indicators may be used to assess student achievement for each corresponding prescribed learning outcome.* *Students who have fully met the prescribed learning outcome are able to:*
• evaluate various methods for producing small electrical charges	❑ identify the charges (like, unlike, or no charge) of pairs of statically charged objects (e.g., charged through rubbing various fibres and solid materials) by systematically and accurately testing their attractions ❑ describe and distinguish between friction-produced electrical charge (static) and chemically produced electric charge (batteries) ❑ with teacher support, test and evaluate the effectiveness of various grounding techniques for preventing static charge build-up on objects
• test a variety of electrical pathways using direct current circuits	❑ proficiently assemble a working electrical circuit with a switch ❑ correctly explain the solution for fixing an improperly arranged circuit (short-circuit) ❑ demonstrate the difference between parallel and series circuits when using batteries
• demonstrate that electricity can be transformed into light, heat, sound, motion, and magnetic effects	❑ create circuits that reliably produce light, heat, sound, motion, and magnetic effects ❑ transfer electrical energy into multiple other forms of energy (e.g., light, heat, sound, motion energy), safely and reliably ❑ produce demonstrable magnetic effects using electric current
• differentiate between renewable and non-renewable methods of producing electrical energy	❑ compile a comprehensive list of various ways in which electricity is produced ❑ summarize the main advantages and disadvantages of the various methods used to produce the electricity used in our daily lives

GRADE 6 EARTH AND SPACE SCIENCE: EXPLORATION OF EXTREME ENVIRONMENTS

Key Elements: Earth and Space Science

Estimated Time: 25 – 30 hours

By the end of the grade, students will have demonstrated how exploration technologies help understand extreme environments and described Canada's role in researching and developing such technologies.

Exploration of Extreme Environments

The study of extreme environments includes space, polar regions, oceans, deserts, caves, and volcanoes. Through discussions, observations, and research, students define extreme environments and explain obstacles to their exploration. Knowledge of past and present explorations is important in developing a greater understanding of extreme environments. Students may research the history of flight or evaluate either space or ocean exploration. Students discuss Canadian contributions to exploration technologies and consider how future technologies may affect them. In this unit, students demonstrate their knowledge and scientific skills when they design and construct models, prepare research reports, and conduct demonstrations and simulations.

Vocabulary

environment, extreme, technology, exploration, Canadarm, recycling, life-support (other vocabulary will depend on the specific extreme environment chosen by the teacher/class)

Knowledge

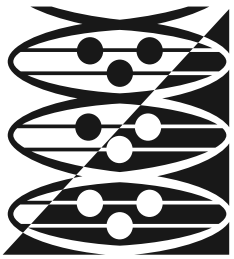
- there are living things naturally inhabiting many extreme environments, but much about them is still unknown
- technologies such as boats, clothing, and space ships have allowed humans to live in environments to which they are not fully adapted
- humans need more complicated technology to survive in and explore more extreme environments, which may have conditions such as high or low temperature or pressure, or the absence of an atmosphere or gravity
- Canadians have contributed to technological advancement in the exploration of extreme environments

Skills and Attitudes

- ask questions and exchange ideas to solve problems related to the exploration of extreme environments
- evaluate information and ideas encountered during investigations of extreme environment
- use appropriate tools to gather, analyse, interpret, and share scientific ideas
- formulate hypotheses
- appreciate the cumulative nature of technological advancement
- explain reasons for an adaptive technology and how it compensates for the extreme condition(s)
- construct models of exploration technologies

GRADE 6 EARTH AND SPACE SCIENCE: EXPLORATION OF EXTREME ENVIRONMENTS

Prescribed Learning Outcomes	Suggested Achievement Indicators
It is expected that students will:	*The following set of indicators may be used to assess student achievement for each corresponding prescribed learning outcome.* *Students who have fully met the prescribed learning outcome are able to:*
• explain obstacles unique to exploration of a specific extreme environment	❑ identify the salient characteristics of an extreme environment (e.g., space, polar ice, oceans, volcanoes, and the atmosphere—a place that humans do not naturally inhabit but choose to explore) ❑ give several examples of resources and knowledge that can be obtained from distant explorations ❑ give several examples of how technology can be used by humans to travel to and explore an unknown environment
• assess technologies used for extreme environments	❑ identify several types of equipment and methods currently used to explore extreme environments (e.g., scuba, fibre optics, Mars Lander) ❑ accurately describe the stages of development for a previously created technology (e.g., kites, balloons, planes, rockets, submarines, space suits) ❑ design a complete model for travelling into a specific extreme environment (e.g., submarines, sonic-aircraft, spaceships) ❑ coherently defend a position with respect to the ethical considerations involved in the development and use of new technologies (e.g., whether or not to take living samples, or use weapons in space)
• describe contributions of Canadians to exploration technologies	❑ describe in detail the function of Canadian technologies involved in exploration of extreme environments (e.g., international space station, Canadarm, Newt Suit, satellite telecommunications, robotics, and ocean mapping) ❑ illustrate with accurate, detailed drawings a range of Aboriginal technologies (e.g., Inuit sleds, Haida ocean canoes, Algonquin/Cree snowshoes)



CLASSROOM ASSESSMENT MODEL

The Classroom Assessment Model outlines a series of assessment units for Science K to 7. These units have been structured by grade level and according to the curriculum organizers

- Life Science
- Physical Science
- Earth and Space Science

Processes of Science are integrated throughout the other three organizers. These units collectively address all of the prescribed learning outcomes for Science K to 7.

This organization is not intended to prescribe a linear means of course delivery. Teachers are encouraged to address the learning outcomes in any order, and to combine and organize the units to meet the needs of their students and to respond to local requirements. Some students with special needs may have learning outcomes set for them that are modified and documented in their Individualized Education Plan (IEP). For more information, see the section on Inclusion, Equity, and Accessibility for All Learners in the Introduction to this IRP.

Considerations for Instruction and Assessment in Science K to 7

It is highly recommended that parents and guardians be kept informed about all aspects of Science K to 7. For suggested strategies for involving parents and guardians, refer to the Introduction to this IRP.

Teachers are responsible for setting a positive classroom climate in which students feel comfortable learning about and discussing topics in Science K to 7. Guidelines that may help educators establish a positive climate that is open to free inquiry and respectful of various points of view can be found in the section on Establishing a Positive Classroom Climate in the Introduction to this IRP.

Teachers may also wish to consider the following:

- Involve students in establishing guidelines for group discussion and presentations. Guidelines might include using appropriate listening and speaking skills, respecting students who are reluctant to share personal information in group settings, and agreeing to maintain confidentiality if sharing of personal information occurs.
- Promote critical thinking and open-mindedness, and refrain from taking sides on one point of view.
- Develop and discuss procedures associated with recording and using personal information that may be collected as part of students' work for the purposes of instruction and/or assessment (e.g., why the information is being collected, what the information will be used for, where the information will be kept; who can access it—students, administrators, parents; how safely it will be kept).
- Ensure students are aware that if they disclose personal information that indicates they are at risk for harm, then that information cannot be kept confidential. For more information, see the section on Confidentiality in the Introduction to this IRP.

Classroom Assessment and Evaluation

Teachers should consider using a variety of assessment techniques to assess students' abilities to meet the prescribed learning outcomes. Tools and techniques for assessment in Science K to 7 can include:

- teacher assessment tools such as observation checklists, rating scales, and scoring guides
- self-assessment tools such as checklists, rating scales, and scoring guides
- peer assessment tools such as checklists, rating scales, and scoring guides
- journals or learning logs
- video (to record and critique student demonstration)
- written tests, oral tests (true/false, multiple choice, short answer)
- worksheets
- portfolios
- student-teacher conferences.

Assessment in Science K to 7 can also occur while students are engaged in, and based on the product of, activities such as:

- case studies and simulations
- group and class discussions
- brainstorms, clusters, webs
- research projects
- role plays
- charts and graphs
- posters, collages, models, web sites
- oral and multimedia presentations
- peer teaching
- personal pledges or contracts.

For more information about student assessment, refer to the section on Student Achievement.

Information and Communications Technology

The Science K to 7 curriculum requires students to be able to use and analyse the most current information to make informed decisions on a range of topics. This information is often found on the Internet as well as in other information and communications technology resources. When organizing for instruction and assessment, Science K to 7 teachers should consider how students will best be able to access the relevant technology, and ensure that students are aware of school district policies on Internet and computer use.

Teaching Science in Multi-Grade Classrooms

Teachers often have a multi-grade teaching assignment whereby it is necessary to teach all of the prescribed learning outcomes for the different grade levels in one classroom. Here are some suggestions

- teamwork with colleagues to develop a two-year alternating program with topics unique to the combined classrooms; topics can be designated for Year A (even) and Year B (odd)
- development of topics from commonalities within the prescribed learning outcomes
- selection of topics that would facilitate school planning and cross-grade articulation for students and teachers
- using an approach that integrates learning in other subject areas.

Contents of the Model

Assessment Overview Table

The Assessment Overview Table provides teachers with suggestions and guidelines for assessment of each grade of the curriculum. This table identifies the domains of learning and cognitive levels of the learning outcomes, along with a listing of suggested assessment activities and a suggested weight for grading for each curriculum organizer.

Key Elements

This section includes a brief description of the unit, identifying relevant vocabulary, knowledge, skills, and attitudes.

Suggested Timeframe

The suggested time indicates the average number of hours needed to address the prescribed learning outcomes identified in that unit; it does not necessarily indicate the time required to implement the suggested instructional and assessment activities listed.

Prescribed Learning Outcomes and Suggested Achievement Indicators

Each set of prescribed learning outcomes identifies the content standards for that unit. The corresponding achievement indicators provide additional information about the expected level or degree of student performance and can be used as the basis for assessment.

Suggested Planning and Assessment Activities

Planning and assessment activities have been included for each prescribed learning outcome and set of corresponding achievement indicators. Each suggested assessment activity directly corresponds to a particular planning activity as indicated by the order and arrangement of these activities.

A wide variety of planning (instructional) activities has been included to address a variety of learning and teaching styles. The assessment activities describe a variety of tools and methods for gathering evidence of student performance.

These strategies are suggestions only, designed to provide guidance for teachers in planning and carrying out assessment to meet the prescribed learning outcomes.

Recommended Learning Resources

This section lists the Science K to 7 recommended learning resources that relate to the specific learning outcomes in each topic. The resources listed do not necessarily relate to the suggested instruction and assessment. Teachers may choose to use these resources, or they may use other locally approved resources. See the section on Recommended Learning Resources in this IRP for more information.

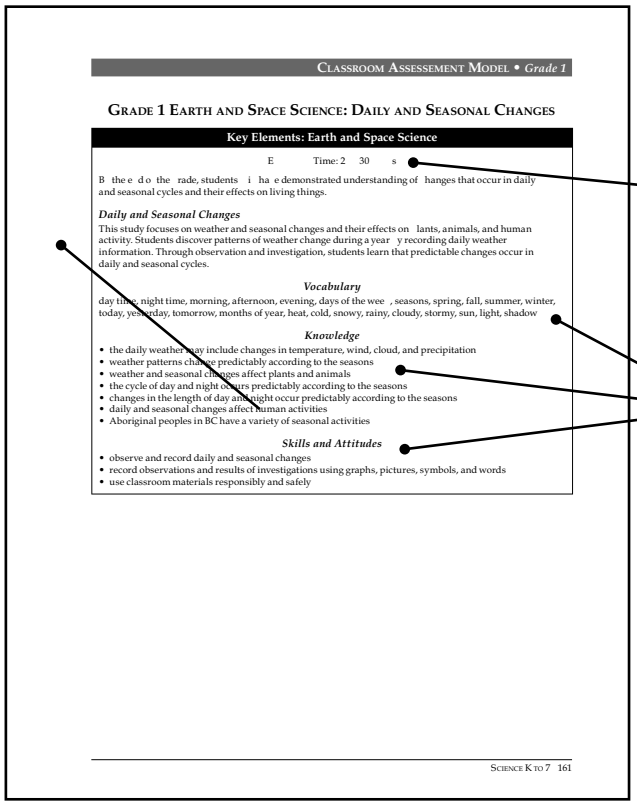
As new resources are recommended, information will be posted on the ministry web site: http://www.bced.gov.bc.ca/irp_resources/lr/resource/consub.htm

Assessment Instruments

Sample assessment instruments have been included at the end of each unit, and are provided to help teachers determine the extent to which students are meeting the prescribed learning outcomes. These instruments contain criteria specifically keyed to one or more of the suggested assessment activities contained in the unit.

USING THE CLASSROOM ASSESSMENT MODEL

The following two pages illustrate how all the elements of the Classroom Assessment Model relate to each other



CLASSROOM ASSESSEMENT MODEL • *Grade 1*

GRADE 1 EARTH AND SPACE SCIENCE: DAILY AND SEASONAL CHANGES

Key Elements: Earth and Space Science

E Time: 2 30 s

B the e d o the rade, students i ha e demonstrated understanding of hanges that occur in daily and seasonal cycles and their effects on living things.

Daily and Seasonal Changes

This study focuses on weather and seasonal changes and their effects on lants, animals, and human activity. Students discover patterns of weather change during a year y recording daily weather information. Through observation and investigation, students learn that predictable changes occur in daily and seasonal cycles.

Vocabulary

day time, night time, morning, afternoon, evening, days of the wee , seasons, spring, fall, summer, winter, today, yesterday, tomorrow, months of year, heat, cold, snowy, rainy, cloudy, stormy, sun, light, shadow

Knowledge

- the daily weather may include changes in temperature, wind, cloud, and precipitation
- weather patterns change predictably according to the seasons
- weather and seasonal changes affect plants and animals
- the cycle of day and night occurs predictably according to the seasons
- changes in the length of day and night occur predictably according to the seasons
- daily and seasonal changes affect human activities
- Aboriginal peoples in BC have a variety of seasonal activities

Skills and Attitudes

- observe and record daily and seasonal changes
- record observations and results of investigations using graphs, pictures, symbols, and words
- use classroom materials responsibly and safely

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Suggested Timeframe

The suggested time indicates the approximate number of hours needed to deliver the prescribed learning outcomes identified in the unit.

Key Elements

Key elements provide an overview of content in each curriculum organizer. They can be used to determine the expected depth and breadth of the prescribed learning outcomes.

Prescribed Learning Outcomes

Prescribed learning outcomes are arranged by suborganizer.

Suggested Achievement Indicators

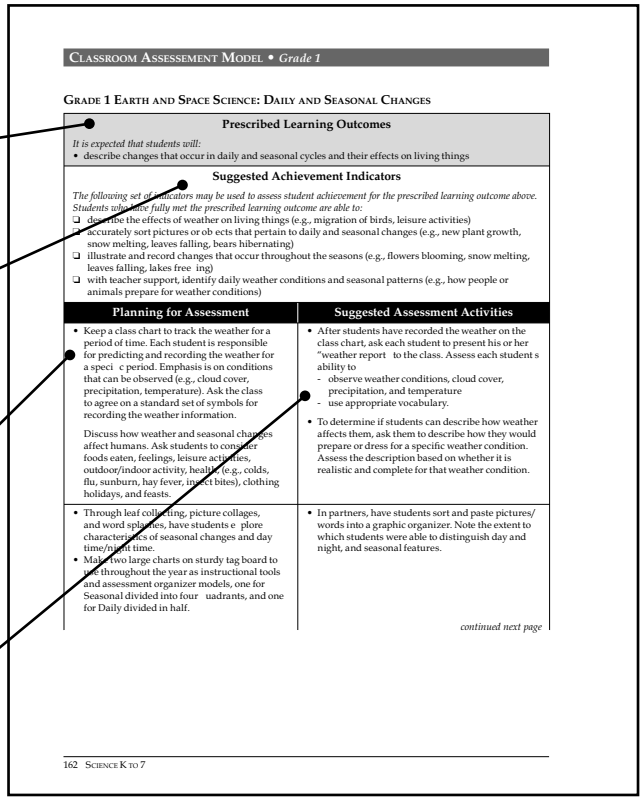
Each set of suggested achievement indicators corresponds to the prescribed learning outcomes for that suborganizer.

Planning for Assessment

This section is designed to provide guidance for teachers in helping students meet the prescribed learning outcomes.

Suggested Assessment Activities

Each suggested assessment activity directly corresponds to a particular planning activity as indicated by the order and arrangement of these activities.



CLASSROOM ASSESSMENT MODEL • *Grade 1*

GRADE 1 EARTH AND SPACE SCIENCE: DAILY AND SEASONAL CHANGES

Prescribed Learning Outcomes

It is expected that students will:

- describe changes that occur in daily and seasonal cycles and their effects on living things

Suggested Achievement Indicators

The following set of indicators may be used to assess student achievement for the prescribed learning outcome above. Students who have fully met the prescribed learning outcome are able to:

- ❑ describe the effects of weather on living things (e.g., migration of birds, leisure activities)
- ❑ accurately sort pictures or ob ects that pertain to daily and seasonal changes (e.g., new plant growth, snow melting, leaves falling, bears hibernating)
- ❑ illustrate and record changes that occur throughout the seasons (e.g., flowers blooming, snow melting, leaves falling, lakes free ing)
- ❑ with teacher support, identify daily weather conditions and seasonal patterns (e.g., how people or animals prepare for weather conditions)

Planning for Assessment	Suggested Assessment Activities
• Keep a class chart to track the weather for a period of time. Each student is responsible for predicting and recording the weather for a speci c period. Emphasis is on conditions that can be observed (e.g., cloud cover, precipitation, temperature). Ask the class to agree on a standard set of symbols for recording the weather information. Discuss how weather and seasonal changes affect humans. Ask students to consider foods eaten, feelings, leisure activities, outdoor/indoor activity, health (e.g., colds, flu, sunburn, hay fever, insect bites), clothing holidays, and feasts.	• After students have recorded the weather on the class chart, ask each student to present his or her "weather report to the class. Assess each student s ability to - observe weather conditions, cloud cover, precipitation, and temperature - use appropriate vocabulary. • To determine if students can describe how weather affects them, ask them to describe how they would prepare or dress for a specific weather condition. Assess the description based on whether it is realistic and complete for that weather condition.
• Through leaf collecting, picture collages, and word splashes, have students e plore characteristics of seasonal changes and day time/night time. • Make two large charts on sturdy tag board to use throughout the year as instructional tools and assessment organizer models, one for Seasonal divided into four uadrants, and one for Daily divided in half.	• In partners, have students sort and paste pictures/ words into a graphic organizer. Note the extent to which students were able to distinguish day and night, and seasonal features.

continued next page

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Daily and Seasonal Changes (continued)

Planning for Assessment	Suggested Assessment Activities
• Choose one local deciduous tree to observe throughout the year. Take photos and make a pictorial record of the tree in each season.	• Give students a graphic of a circle divided into four quadrants, and have them draw to represent their understanding (e.g., "In Spring, my tree...."). Look for evidence that students have placed the seasons in the correct quadrant and that they have included seasonal characteristics in their drawings.
• In small groups, have students create seasonal murals or dioramas using pictures, words, and objects from a prepared tub.	• hen students have created their representations, work together to establish criteria for assessing their work, such as: seasonal murals/dioramas show • possible weather conditions • appropriate clothing • recreation activity • phases of plant growth • animal activity.
Recommended Learning Resources • Discovery Works Modules for B.C. Grade 1 (Weather and Seasons) • Earth Watch (an Canadian Science Place) • Everyday Life • Glide Into Winter with Math and Science (AIMS Activities) • Hands-on Science (Daily and Seasonal Changes) • Project WET • Seasons • Spring Into Math and Science (AIMS Activities)	

Recommended Learning Resources

This section lists the recommended learning resources that relate to the specific learning outcomes in each suborganizer or cluster of learning outcomes. See the section on Learning Resources in this IRP for more information.

Assessment Instruments

Sample assessment instruments are provided at the end of each unit, and contain criteria specifically keyed to one or more of the suggested assessment activities contained in the unit.

HOW WE WORKED TOGETHER

My name is: _____ The date is: _____

Other group members: _____

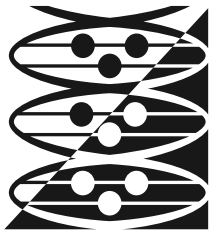
_____

Our task was: _____

GROUP MEMBERS:	Not Yet (not yet within expectations)	Sometimes (meets expectations)	Yes (fully meets expectations)	Always (exceeds expectations)
Everyone participated				
We listened to each other				
We encouraged each other (Yeah… Great…. I like that idea….)				
We took turns sharing ideas				
The group stayed together				
We accomplished our task				

NEEDS OF LIVING THINGS

1 - not yet within expectations	2 - meets expectations	3 - fully meets expectations	4 - exceeds expectations
limited understanding of the needs of living things	basic understanding of the needs of living things	good understanding of the needs of living things	solid understanding of the needs of living things
one basic need identified	two basic needs identified	three basic needs identified	four basic needs (food, water, air and shelter) identified
explanation unclear or incomplete	explanation may or may not be clear	clear explanation with consistent examples	clear and complete explanation
confusion with non-living	clear distinction between living and non-living	clear distinction between living and non-living	clear distinction between living and non-living



Classroom Assessment Model

Grade 6

Assessment Overview Table for: Grade 6

The purpose of this table is to provide teachers with suggestions and guidelines for classroom-based formative and summative assessment and grading of Science K to 7.

Curriculum Organizers	Suggested Timeframe	Suggested Assessment Activities	Suggested Weight for Grading	Number of Outcomes	Number of Outcomes by Cognitive Level *		
	Average # of hours				K	U & A	HMP
Processes Of Science	Integrated	Integrated	Integrated	2		1	1
Life Science	25-30	• drawing • science log • demo • presentation • written report • diagram	33⅓ %	3	1	1	1
Physical Science	25-30	• oral summary • demo • lab report • model • quiz • diagram • critique • summative project	33⅓ %	4		2	2
Earth And Space Science	25-30	• quiz • model • presentation • drawing • portfolio • written report • picture gallery • game	33⅓ %	3	1	1	1
Totals	75-90		100 %	12	2	5	5

* The following abbreviations are used to represent the three cognitive levels: K = Knowledge; U& A = Understanding and Application; HMP = Higher Mental Processes

GRADE 6: PROCESSES OF SCIENCE

Key Elements: Processes of Science

Estimated Time: integrate with other curriculum organizers

Controlling Variables

Discovering and then deliberately controlling the conditions that influence the outcome of an experiment are needed to avoid drawing incorrect conclusions from observations. It requires that all factors and influences be identified first and then manipulated in a systematic manner. Students must ensure that only one variable is changed (or tested) at a time. Those variables not changed are called the control. Important conditions to consider while experimenting might include

- determining equal measures by mass or volume of the test objects
- setting standard conditions for light, temperature, and water
- identifying other variables or factors that could affect the outcome
- limiting or removing those other variables not involved in the study
- following the experimental design by controlling relevant variables
- repeating the experiment many times to yield consistent results
- using the recorded data as evidence of a "cause" relationship.

When assessing students' understanding and ability to apply controls to the variables, consider how the independence of the variables was restricted. Observe how the procedures followed during the investigation were uniformly applied to all similar components or test items throughout the experiment. By conducting fair tests, the cause and effect is best inferred from the results gathered. Observe how many recorded events were repeated to obtain consistent results before they were accepted.

Problem Solving

The process of scientific problem solving is a critical thinking response to observed experiences in which a science problem is solved. It combines all the activities of asking questions, gathering evidence, designing and proposing solutions, and testing those solutions by making a prototype. This grade level sees the beginning of technical design work, and problems are solved by practical methods. Problem solving includes these stages

- determine the humans needs involved in the situation (or assigned task)
- identify the task, and observe the key attributes involved
- establish the criteria for use of the prototype (set limits)
- plan creatively a possible set of solutions
- determine the available materials or equipment, and select a course of action
- draw a series of possible solutions for building
- build a prototype or model
- test and evaluate the model according to the criteria
- evaluate the results and redo if necessary
- communicate success to others.

When assessing students' understanding and ability to apply solutions to a technical problem, consider how well they identify the problem, design possible solutions, construct a product or answer, test and evaluate the results, and communicate success. Students may not initially understand the concepts involved, but as the process continues, consider the extent to which the details are accurately identified and modifications made for a suitable outcome.

Grade 6 Processes of Science

Prescribed Learning Outcomes	Suggested Achievement Indicators
It is expected that students will:	*The following set of indicators may be used to assess student achievement for each corresponding prescribed learning outcome.* *Students who have fully met the prescribed learning outcome are able to:*
• manipulate and control a number of variables in an experiment	❑ identify quantities of key factors (e.g., light, water, nutrition, temperature) as relevant variables in a test (e.g., of biological growth) ❑ suggest and systematically implement controls on variables directly related to the outcome of an experiment (e.g., amount, quality, length) ❑ explain, with reference to possible consequences, the importance of a consistent and standardized approach to dealing with variables
• apply solutions to a technical problem (e.g., malfunctioning electrical circuit)	❑ make adjustments in technique when immediate results are not obtained (e.g., adjust microscope settings) ❑ use a persistent and organized approach to determine why a technical product (e.g., an electrical circuit) is not working, and modify it to make it work ❑ suggest effective and practical ways to modify a technological instrument or tool (vehicles, clothes, food, buildings, wrenches) to permit its function in an extreme environment

GRADE 6 LIFE SCIENCE: DIVERSITY OF LIFE

Key Elements: Life Science

Estimated Time: 25 – 30 hours

By the end of the grade, students will have observed and classified various organisms according to their form and function.

Diversity of Life

The study of the diversity of life is an introduction to micro-organisms and biological classification systems. Students use appropriate tools to observe plants, animals, and micro-organisms. Students also use classification systems to group organisms according to features of form and function.

Vocabulary

microscopes, slide, cover slip, magnify, micro-organism, species, kingdom, Plantae, Animalia, Monera, Protista, Fungi, invertebrate, vertebrate, mammals, birds, reptiles, amphibians, fish, classification systems, cell, cell membrane, nucleus, chloroplasts, chlorophyll, colouration, mimicry, camouflage, behaviour

Knowledge

- cells are the basic units of life and carry on all the functions needed for survival
- living things may be unicellular or multicellular
- plant cells differ from animal cells in their structure
- scientists classify organisms into groups according to internal and external features
- scientists traditionally use a five-kingdom system to classify organisms
- the kingdoms are: Animalia, Plantae, Protista, Monera, and Fungi
- each of the kingdoms has its own set of characteristics

Skills and Attitudes

- classify organisms using attributes
- demonstrate the use of a microscope to view a prepared slide
- demonstrate safe practices in investigations
- show respect for all living organisms
- use appropriate tools and techniques to gather, analyse, interpret, and share scientific ideas

Grade 6 Life Science: Diversity of Life

Prescribed Learning Outcomes

It is expected that students will:

- demonstrate the appropriate use of tools to examine living things that cannot be seen with the naked eye

Suggested Achievement Indicators

The following set of indicators may be used to assess student achievement for each corresponding prescribed learning outcome. Students who have fully met the prescribed learning outcome are able to:

- ❑ correctly use tools such as a magnifying glass or microscope to observe a variety of microscopic organisms
- ❑ precisely draw various characteristics of microscopic organisms on the basis of their own observations

Planning for Assessment	Suggested Assessment Activities
• Prior to using microscopes to observe living micro-organisms, teach students about the microscope - handling the microscope (parts and functions) - adjusting the light - preparing a wet mount slide - focusing - determining the total magnification.	• Observe student use of microscopes throughout the unit - safe caring and storage - small ocular to large lens - coarse to fine focus - commercial prepared slide use - student made slide use - adjusting the field of view.
• Have students explain the difference between a single letter (e.g., "g" "k") cut from a newspaper and seen through a microscope, and one seen with the naked eye. Ask students, "What happens to the letter when moving the slide left, right, up, down?"	• Observe student drawings of the letter, looking for - clarity - magnification - labelling - correct letter reversal.
• Have students examine microscopic organisms and plants by collecting more samples of water from ditches, puddles, tidal pools and examining the samples under a microscope or magnifier. Students should record their observations with special attention to the identifying cell characteristics.	• Have students use their science logs to record observations. Check to determine whether or not student entries addressed - scale and size observations - colour and appearance features - how thing move (locomotion) - duration of movement. • Include self-assessment questions at the end of criteria sheets or descriptions of performance tasks so students can reflect on their learning. For example - What features changed when viewed using more magnification? - How accurately does your work on this assignment show what you know about classification of organisms? - What part do you think you will remember the longest and why? - What part will be the most difficult to remember?

continued next page

Diversity of Life (continued)

Planning for Assessment	Suggested Assessment Activities
• Have students create wet slides using fresh or brackish pond water (or live specimens) and make observations using a microscope. Discuss identification of living things seen according to single-cell characteristics. (Note for some specimens a quieting solution will be needed to slow movements.)	• Ask students to draw and label what they can see and identify according to specific characteristics such as - method of motion (e.g., flagellum) - animal or plant (e.g., types of cell matter) - colour, shape, and comparative size - cell structure (e.g., cell membrane) - name of known organisms (e.g., Plankton, Paramecium, Hydra, Amoeba, Daphnia).

Recommended Learning Resources

- BC Science 6
- BC Science Probe 6
- Cells and Life
- McDougal Littell Science (Diversity of Living Things)
- Nelson Science & Technology Skills Handbook
- Once Upon a Seashore
- Parasites & Partners
- Science Detective™ Beginning: Higher-Order Thinking, Reading, Writing in Science
- Thinking Connections: Concept Maps for Life Science

Grade 6 Life Science: Diversity of Life

Prescribed Learning Outcomes

It is expected that students will:

- analyse how different organisms adapt to their environments

Suggested Achievement Indicators

The following set of indicators may be used to assess student achievement for each corresponding prescribed learning outcome. Students who have fully met the prescribed learning outcome are able to:

- ❑ identify two or more specific adaptations of various life forms (e.g., colouration or other physical characteristics, mimicry or other behaviour)
- ❑ suggest a plausible explanation of how particular adaptations help life forms interact in their environments
- ❑ create a detailed report describing the symbiosis between two organisms

Planning for Assessment	Suggested Assessment Activities
• Using various pictures of wild birds, ask students to examine how the shapes of beaks have adapted to pick up the different types of foods eaten. Then, have students use various pliers and cutting tools (or forceps, tongs, and needle nose pliers) to pick up/stab/crack/tear different types of food (e.g., jelly bean, sunflower seeds, 'gummy worms', and sprouted wheat grass).	• Have students match which tool picks up the food item, according to a type of beak shape and food source: - short hooked and strong (meat eaters) - slender and sharp pointed (insect eaters) - thick and wedged (seed crackers) - long slender and bent (mud probing) - broad and serrated (plant tearing and grazing). • Have students determine the best beak shape for specific feeding purposes. They can answer these questions and draw beak profiles matched with the pliers tool - Which position in the pliers is best for crushing food? Holding and carrying? - Which beaks are suited to cracking seeds? - How is the beak shape related to strong jaw muscles? Or to tearing large pieces of flesh? - Which beak shape is best for spearing wiggly food? What about straining food from muddy water or tearing out grass shoots?
• Most of the adaptation in animals is related to form and function. Challenge students to create an alien life form, labelling all the parts with a specific set of functions (purposes) matching the form (design). Most will begin with how the alien: feeds, moves, sees its environment, is covered, and interacts in a habitat (e.g., moves, feeds, sees, hears, and protects itself from the elements). The class should first agree on the specific alien environment and describe the ecosystem these life forms live in so reasonable limits are placed on the task.	• Using a diorama and written instructions, ask students to explain how all parts of the alien life form are specific adaptations to help it survive in the class's chosen environment. Look for evidence that student explanations address close connection between form and function, plus the - abiotic and biotic factors in its living environment - food habits and hunting methods - survival adaptations to body surfaces - survival adaptations from predators - survival adaptations for its environment - locomotion in the terrain. *continued next page*

Diversity of Life (continued)

Planning for Assessment	Suggested Assessment Activities
• Ask students to compare the adaptations of plant and animal species living in a single biome (habitat). Students should use a Venn diagram to represent their findings. • The Earth's six Biomes each have a set of similar plant, animal and climate features. Within biomes there are vanishing habitats, which contribute to extinction of certain species. Challenge students to prepare a visual display or presentation to include plant and animal adaptations, climate and weather details, vanishing habitats, and interesting facts.	• Ensure that the student presentations include: - differences between the habitats if more than one is shown (e.g., salt/freshwater) - physical adaptations in animals (e.g., skin colouration) - animal behaviour adaptations (e.g., landlocked/ ocean going) - plant adaptations to environmental changes - plant adaptations for moisture - plant adaptations for temperature (seasons) - interesting facts for soil, elevation, and "acts of nature" (e.g., fire, flood, erosion) - connection between extinction and vanishing habitats (e.g., non-adaptation).
• Choose for students a biologically diverse environment (e.g., rainforest, one geoclimactic zone). Then ask students to locate at least one example of mutualism, commensalism, and parasitism.	• Challenge students to propose a set of safe and practical procedures to ethically study a symbiotic relationship in its natural environment. Students should - indicate at least one symbiotic relationship - describe advantages and disadvantages to each organism in the relationship - explain each species' basis needs (e.g., nutrition, shelter, climate) - pose questions for further study.

Recommended Learning Resources

- BC Science 6
- BC Science Probe 6
- Butterflies: Amazing Insects
- Cool Creatures: Reptiles
- Cycle of Life/Recycle Handbook for Educators
- Discovering Spiders, Snails and Other Creepy Crawlies
- Ecology: Communities
- Forests in Focus
- Hands-on Science (Diversity of Living Things)
- Kokanee of British Columbia
- McDougal Littell Science (Diversity of Living Things)
- OceanNews
- Once Upon a Seashore
- Our Wonderful World (AIMS Activities)
- Parasites & Partners
- Project WET
- Project WILD
- Salmonids in the Classroom
- Science Detective™ Beginning: Higher-Order Thinking, Reading, Writing in Science
- Scientific Inquiry: Steps, Skills & Action
- Thinking Connections: Concept Maps for Life Science
- Urban Stewards
- The Watershed Works

Grade 6 Life Science: Diversity of Life

Prescribed Learning Outcomes

It is expected that students will:

- distinguish between life forms as single or multi-celled organisms and belonging to one of five kingdoms: Plantae, Animalia, Monera, Protista, Fungi

Suggested Achievement Indicators

The following set of indicators may be used to assess student achievement for each corresponding prescribed learning outcome. Students who have fully met the prescribed learning outcome are able to:

- ❑ accurately list the characteristics that define all living things, including ability to reproduce, grow, respire, use energy, respond to stimuli
- ❑ identify and distinguish Plantae, Animalia, Monera, Protista, and Fungi as kingdoms of life
- ❑ correctly sort micro-organisms according to their characteristics, with teacher support (e.g., a descriptive key for Monera, Protista, and Fungi)

Planning for Assessment	Suggested Assessment Activities
• Bring potatoes (tubers or seeds) to class and discuss whether they are living or non-living. Then establish what characteristics are required to enable the living potato to grow. Provide water, light, and temperature to the potatoes to allow them to grow. Teachers may choose to bring in other objects to discuss, asking - From where did the potato get its food? (stored energy) - Would these plants develop new potatoes? - How are dormant seeds, tubers and eggs similar or different living things?	• Have students add water, light, and temperature (necessities for life) for the potato to grow. Demonstrate successful growth after a period of time. Ask students to draw and label a flow-chart showing the major stages of the potato growth including applied factors (e.g., water light), and resulting changes over several days. Criteria for assessment could include documentation of - amount of light and temperature used - visible evidence of growth - observed evidence of decay. • Have students design a controlled experiment for one of the three factors (water, light, and temperature). Set-up a growing station for two tuber (potato) pieces. Provide all three factors to one piece, and for the other tuber piece change the degree of one of the factors somehow. Grow both tubers with all other factors identically applied. On their reports, students should: - write a question (hypothesis) that states the purpose of the experiment in qualifying terms (e.g., Does a potato grow with only two hours of daily light?) - observe changes for both pieces - make connections to the outcomes seen - describe how the factors were kept unchanged (controlling variables) - explain their inferences about the growth - write concluding statements based on the facts and thinking applied to the report hypothesis.

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Diversity of Life (continued)

<table>
<tr><th>Planning for Assessment</th><th>Suggested Assessment Activities</th></tr>
<tr><td>• Use a set of items such as buttons or garden seeds, or gather new non-living materials from which students create their own dichotomous key. Discuss with the class the common visible features of the items so 8-10 characteristic groupings are understood. Have students organize their items according to one of the 8-10 pre-established categories. Give students a container of the categorized materials to further sort into groups.
• Using a single phylum, such as Arthropoda, have students research four example creatures. Students each prepare a scientific booklet detailing four distinct classes within this phylum showing various pieces of information and demonstrating their understanding of the classification system according to each creature's kingdom, phylum, class, order, family, genus, and species. (e.g., five commonly used Arthropoda classes = Diplopoda (millipedes) Crustacea (crabs) Insecta (grasshopper), Arachnida (spiders) Chilopoda (centipedes).</td><td>• For the buttons, ask students to develop their own classification key on paper. Consider the extent to which the key
- is based on obvious, observable, and measurable characteristics
- matches common characteristics precisely
- is not based on subjective characteristics (e.g., pretty)
- shows how a division of items at each stage builds a branching network of family membership
- uses features that are consistent in their similarities and differences across and within branches.
• See the sample assessment tool provided at the end of this grade (Arthropod Booklets).</td></tr>
<tr><td>• Provide students with coloured images of monera, protista, and fungi and teacher-supplied print materials. Then have students create a classification for these living things and prepare a descriptive matrix (e.g., colour, size, shapes, habitat, location, locomotion, cell complexity). Each row of the matrix represents one of the kingdoms.

<table><tr><th></th><th>habitat</th><th>colour</th><th>size</th><th>shapes</th><th>cells</th></tr><tr><td>monera</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>protista</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>fungi</td><td></td><td></td><td></td><td></td><td></td></tr></table></td><td>• Using pond water samples, have students prepare live slides and inventory life forms observed, identifying some of the characteristics that define all living things (e.g., reproduce, grow, respire, use energy, respond to stimuli).
• Ask students to classify organisms in the three kingdoms based on the descriptive matrix discussed in class.

• When assessing students' understanding of classification systems, consider the extent to which students recognize that
- classification systems are based on similarities in form and function
- there are variations within species
- plant and animal membership is defined at a cellular level.</td></tr>
</table>

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Diversity of Life (continued)

Recommended Learning Resources

- BC Science 6
- BC Science Probe 6
- Cells and Life
- Cool Creatures: Reptiles
- Cycle of Life/Recycle Handbook for Educators
- Discovering Spiders, Snails and Other Creepy Crawlies
- Forests in Focus
- Hands-on Science (Diversity of Living Things)
- McDougal Littell Science (Diversity of Living Things)
- Once Upon a Seashore
- Our Wonderful World (AIMS Activities)
- Salish Sea
- Science Detective™ Beginning: Higher-Order Thinking, Reading, Writing in Science
- Salmonids in the Classroom
- Thinking Connections: Concept Maps for Life Science

GRADE 6 PHYSICAL SCIENCE: ELECTRICITY

Key Elements: Physical Science

Estimated Time: 25 – 30 hours

By the end of the grade, students will have gained a basic understanding of electricity.

Electricity

In this study, students gain a basic understanding of how electricity works. They explore the characteristics of static and current electricity. Students discover the characteristics of conductors, insulators, switches, batteries, light bulbs, and electromagnets. Students test, design, construct, and evaluate various combinations of circuits, switches, batteries and bulbs. Students examine the production and transmission of electricity in British Columbia.

Vocabulary

atom, electron, static electricity and current electricity, electrical current, closed and open circuit, conductor, insulator, battery, magnetism, parallel circuit, series circuit, switch, voltage, geothermal, nuclear, tidal, solar, wind power, biomass power, coal, gas, fossil fuels, hydro, hydro-electric dams, renewable, non-renewable, consumption, conservation, electrocution, direct current, bulb, positive, negative, electrical energy

Knowledge

- static electricity is the result of the accumulation of excess charge on an object
- an electron is a negatively charged particle
- the presence of excess electrons produces a net negative charge, and the lack of electrons produces a net positive charge
- unlike electric charges attract, and like charges repel
- electric current is the movement of electrons through a conductor
- conductors permit a flow of electric current, while insulators block the flow of electric current
- chemicals can be used to transfer electrical energy (e.g., dry cell batteries)
- electric currents have magnetic fields
- electricity may flow in series or parallel circuits
- electrical energy can be transferred to produce heat, light, motion, and chemical activity (e.g., inside the standard light bulb is a filament that glows because it gives off heat and light energy); likewise, heat, light, motion, and chemical activity can be transferred to produce electrical energy
- different sources of energy can be transferred to produce electrical energy (e.g., wind, water, steam, solar, tidal, etc.)

Skills and Attitudes

- demonstrate curiosity, creativity, open mindedness, accuracy, precision, persistence, and appreciate their importance as scientific attributes
- manipulate, construct, and test electrical circuits that use batteries
- show increasing confidence as scientific problem solvers by asking questions, solving problems, and making decisions
- demonstrate the safe use of electricity
- demonstrate the safe use and handling of home electrical appliances

Grade 6 Physical Science: Electricity

Prescribed Learning Outcomes

It is expected that students will:

- evaluate various methods for producing small electrical charges

Suggested Achievement Indicators

The following set of indicators may be used to assess student achievement for each corresponding prescribed learning outcome. Students who have fully met the prescribed learning outcome are able to:

- ❑ identify the charges (like, unlike, or no charge) of pairs of statically charged objects (e.g., charged through rubbing various fibres and solid materials) by systematically and accurately testing their attractions
- ❑ describe and distinguish between friction-produced electrical charge (static) and chemically produced electric charge (batteries)
- ❑ with teacher support, test and evaluate the effectiveness of various grounding techniques for preventing static charge build-up on objects

Planning for Assessment	Suggested Assessment Activities
• Have students explore making various static electrical charges using cloth, fur, hair, wool, and paper. Ask them to rub a plastic object (e.g., plastic spoon) or a glass object (e.g., glass rod) with these materials. • Place the charged object next to loose paper punches (confetti) and ask students to observe the effect on the paper.	• Consider how well students can explain where the build up of excess electrons must be to cause the attractive (like and unlike) forces. Excess electrons (or deficient electrons) on an object move or pull things, showing the observer which attractive force is present: Negatively and positively charged materials attract one another; materials of the same charge repel one another. • This is the introduction to the unit. Observe whether or not students use the correct terms and know when they have "charged" things, produced an "attractive force," and neutralized or 'grounded" the objects.
• To show students that static charges move along objects, make an aluminium foil static indicator by suspending a small strip of folded foil on the end of a straw. Place a juice-box straw through a lid of a jar with the foil folded inside. Have students touch the end of the straw and observe how the foil strips respond inside the jar. When electrons move down the straw and reach the foil the charges force the foil strips away from each other. Note that this can be a teacher demonstration. Only one foil jar needs to be made.	• Have students explain answers when the items from above are placed near the end of the straw: - Where did the excess electron charges go? - What happens to the strips of foil? - If the object attracted things before, why do the foil strips move apart? - Touch the straw and see what happens. • In a dry room have students rub feet on a rug (shoes on) and create a static charge on their bodies. Placing their hands near the foil jar experiment, allow them to discover by watching the foil strip moving apart whether or not they have a charge. Students should now be able to detail the electron path - from the rug - to their shoes and along their bodies - to their hands and onto the straw in the lid. These details can be demonstrated with a drawing, orally, or on a simple written test.

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Electricity (continued)

Planning for Assessment	Suggested Assessment Activities
• Have students rub a comb or plastic spoon on a piece of wool and test to determine if there is an attraction to a variety of loose, small materials (e.g., paper confetti, yarn, dried rice). Then have students write a lab report explaining the reaction of the loose materials. • Have students experiment with various materials and complete simple diagrams showing which of the three attractive forces were seen first. Make single changes to the process of producing a charge to determine which effect is directly connected to the materials.	• Lab reports must have labelled diagrams showing the students' understanding of the variables and the following questions - Which part do they find is rubbing on or off electrons for the type of static charge (like, unlike, neutral)? - Does changing the fabric change the type of attractive force? - Can a plastic spoon be hung and paper rubbed to produce an attractive force?
• Ask students to investigate batteries and bulbs using long strips of aluminium foil, using the foil as the pathway connecting the battery (stored charge) to light the bulb. Instruct students on the nature of continuous charge from a stored electrical battery, versus the nature of a sudden, once-only static discharge.	• Observe student investigations, considering whether or not students - can light the bulb - make the light more intense, given two batteries - know how to prevent shorting out the battery, when asked.

Recommended Learning Resources

- BC Science 6
- BC Science Probe 6
- Discovery Works for Grade 6: Unit D – Magnetism and Electricity
- Electricity
- Electromagnetism and Electronics
- Hands-on Science (Electricity)
- McDougal Littell Science (Electricity and Magnetism)
- Science Detective™ Beginning: Higher-Order Thinking, Reading, Writing in Science
- Science, Please! (Parts 1 & 2)
- Static Electricity (Revised)
- Turn It On! (Pan Canadian Science Place)

Grade 6 Physical Science: Electricity

Prescribed Learning Outcomes

It is expected that students will:

- test a variety of electrical pathways using direct current circuits

Suggested Achievement Indicators

The following set of indicators may be used to assess student achievement for each corresponding prescribed learning outcome. Students who have fully met the prescribed learning outcome are able to:

- ❑ proficiently assemble a working electrical circuit with a switch
- ❑ correctly explain the solution for fixing an improperly arranged circuit (short-circuit)
- ❑ demonstrate the difference between parallel and series circuits when using batteries

Planning for Assessment	Suggested Assessment Activities
• Ask students to explore working electrical circuits using simple flashlight batteries and bulbs. Have them make predictions on how the charges from the batteries can travel through a metal pathway to light the bulb (see previous unit activity with aluminium strips).	• Have students bring to class a flashlight and then disassemble it, drawing a detailed diagram of all the inside parts. Student diagrams must be able to show a flow of charge from beginning to end (battery to bulb and return).
• Using a set of battery and bulb kits from a science supply house, build examples for hands-on activities. Students identify arrangements of the electrical circuit. Some should produce a light or sound buzz; others need switches and two lights. Circuits should go from simple stage to complex ones and should include - two wires, two batteries, one light - four wires, two batteries, one light - four wires, two batteries two lights.	• Have students build the various circuits. Assess student achievement using the following checklist - Are the wrong ends touching? - Is the circuit open (broken) or closed? - Are the right parts connected in the best order? - Is the bulb still good? Can it be checked? - Are any wires touching that should not be? - Does the circuit allow a complete one-way flow of electrical charges?
• Provide students with materials to make and build electrical circuits. Have students use their circuits to - determine the characteristics of series and parallel circuits - test a selection of materials to identify conductors, insulators, and resistors - make simple switches in the wire of the circuit (e.g., paperclips and thumbtacks).	• Using diagrams of simple circuits and components, and ask students to predict which combinations would result in lighting a bulb. Students should be able to: - trace a continuous pathway - tell where the source of electric energy is - see if switches are open or closed - locate any short-circuits. • Given a battery, bulb, wires, and student-made switches, have students construct the following circuits - simple with one light bulb - series with two light bulbs - parallel with two light bulbs.

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Electricity (continued)

Recommended Learning Resources

- BC Science 6
- BC Science Probe 6
- Discovery Works for Grade 6: Unit D – Magnetism and Electricity
- Electricity
- Electromagnetism and Electronics
- Hands-on Science (Electricity)
- McDougal Littell Science (Electricity and Magnetism)
- Science Detective™ Beginning: Higher-Order Thinking, Reading, Writing in Science
- Science, Please! (Parts 1 & 2)
- Turn It On! (Pan Canadian Science Place)

Grade 6 Physical Science: Electricity

Prescribed Learning Outcomes

It is expected that students will:

- demonstrate that electricity can be transformed into light, heat, sound, motion, and magnetic effects

Suggested Achievement Indicators

The following set of indicators may be used to assess student achievement for each corresponding prescribed learning outcome. Students who have fully met the prescribed learning outcome are able to:

- ❑ create circuits that reliably produce light, heat, sound, motion, and magnetic effects
- ❑ transfer electrical energy into multiple other forms of energy (e.g., light, heat, sound, motion energy), safely and reliably
- ❑ produce demonstrable magnetic effects using electric current

Planning for Assessment	Suggested Assessment Activities
• Allow students to make light and sound circuits showing complete electrical pathways. Later, consider adding small electrical motors and electromagnets for more involved projects (e.g., Lighthouse with a flashing beacon). Recyclable parts may be substituted, such as flashlight parts, musical greeting cards, small wires, and Light Emitting Diodes (LEDs).	• Have students build a simple circuit that has two batteries and two working switches. It must ring a bell or turn on the bulb, but not both at the same time. Assessment would cover the following range: - circuit is attempted but does not work - circuit is connected and one of the electric parts works (ring or light) - circuit works with all on or all off ring and light - circuit works but one of the components doesn't (2 switches 1 light OR light, ringer and 1 switch, etc.) - circuit works completely. One switch changes ring bell for working light; other switch turns all on or all off.
• Challenge students to construct a hypothesis for what happens when a length of aluminium foil 1 cm by 15 cm made into a folded ribbon touches each end of a D-cell battery for 5 seconds and then 10 seconds. Students should be able to answer these questions - Why did the ribbon get hot? - Is there a complete pathway? (circuit) - If there is no light or ringing, where does the electrical power go? - What question best describes what is being investigated in this experiment? (e.g., What happens to a circuit when electrons travel through it and do no work?)	• Look for evidence that students noticed - different lengths and width affect light brightness - very small foil strips yield best illumination - battery contact must be maintained equally - torn or small tears in foil, disrupt output - wrong connects/shorts cause foil to heat up - shorts cause no light illumination.
• Ask students to prepare a poster identifying the dangers associated with static charges and electric current.	• Ensure that the poster clearly demonstrates safety issues and that any pictures and text are easy to see from a distance.

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Electricity (continued)

Recommended Learning Resources

- BC Science 6
- BC Science Probe 6
- Electricity
- Electromagnetism and Electronics
- Hands-on Science (Electricity)
- Magnetism (Revised)
- McDougal Littell Science (Electricity and Magnetism)
- Science Detective™ Beginning: Higher-Order Thinking, Reading, Writing in Science
- Science, Please! (Parts 1 & 2)
- Turn It On! (Pan Canadian Science Place)

Grade 6 Physical Science: Electricity

Prescribed Learning Outcomes

It is expected that students will:

- differentiate between renewable and non-renewable methods of producing electrical energy

Suggested Achievement Indicators

The following set of indicators may be used to assess student achievement for each corresponding prescribed learning outcome. Students who have fully met the prescribed learning outcome are able to:

- ❑ compile a comprehensive list of ways in which electricity is produced
- ❑ summarize the main advantages and disadvantages of the various methods used to produce the electricity used in our daily lives

Planning for Assessment	Suggested Assessment Activities
• Using various pictures of everyday life, ask students to identify the types of uses communities have for energy and electricity. Work with students to classify electrical energy used to produce light, energy to produce heat, and to create motion. • Have students identify sources of electricity used in their community. Take students on a school building walk and then around the local block to identify how all these forms of energy relate back to an electrical source (e.g., wall outlet to breaker panel, roof wires to hydro pole, pole to larger poles).	• Consider the number of examples of electrical energy use students can come up with. Ask students to informally assess how important energy is in their lives. Consider the extent to which they support their opinions with good examples of energy use.
• Have students examine how electrical energy is produced throughout Canada. Include a review of coal and gas powered plants, nuclear, hydro-electric and thermal waste plants. Then have students prepare a class project on the costs and benefits to show advantages and disadvantages. (Choose whether or not students do this in groups. The class project could be a poster of one method or a debate using a Not-In-My-Backyard [NIMBY] simulation.)	• In the student's project, each advantage must be matched with at least one disadvantage. The presentation must show both an understanding of the science of production and some of the ethical considerations - cost to the environment now - cost to people now - cost to people and the environment in the future - economic costs - local efficiencies.
• Watch an educational video or conduct a field trip to research how hydroelectric dams work. Invite BC Hydro to make a presentation of power lines and transformer, or visit a BC Hydro facility in your community.	• Using their field-trip notes ask students to construct a model to show how electricity is generated and/or transported in their community. Use standard poster- or model-making criteria to assess student work.

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Electricity (continued)

Planning for Assessment	Suggested Assessment Activities
• Have students investigate how much electrical energy their home appliances use annually (i.e., using the rating on each appliance) and the cost. Students record their findings in chart form. Share and discuss results. • Ask students to create a graph that measures weekly electrical power consumption, using the household electrical meter as a source of data.	• Have students design a media campaign on "Energy Conservation is Everyone's Responsibility" to present in school or the community. Assess if campaigns include - past electrical usage patterns - current trends in electricity management - global electricity production and consumption - Provincial resource considerations - environmental considerations.
• Working in groups, have students research sources of energy that could be used more extensively in the future (e.g., geothermal heat, nuclear fission, tidal, solar, wind power, biomass energy).	• When assessing the group project about sources of energy, consider the accuracy and clarity of the description and look for evidence that students have taken account of factors such as supply, cost, environmental impact, and location.
Recommended Learning Resources • BC Science 6 • BC Science Probe 6 • Hands-on Science (Electricity) • Science Detective™ Beginning: Higher-Order Thinking, Reading, Writing in Science • Science, Please! (Part 2) • Scientific Inquiry: Steps, Skills & Action • Turn It On! (Pan Canadian Science Place)	

Grade 6 Earth and Space Science: Exploration of Extreme Environments

Key Elements: Earth and Space Science

Estimated Time: 25 – 30 hours

By the end of the grade, students will have demonstrated how exploration technologies help understand extreme environments and described Canada's role in researching and developing such technologies.

Exploration of Extreme Environments

The study of extreme environments includes space, polar regions, oceans, deserts, caves, and volcanoes. Through discussions, observations, and research, students define extreme environments and explain obstacles to their exploration. Knowledge of past and present explorations is important in developing a greater understanding of extreme environments. Students may research the history of flight or evaluate either space or ocean exploration. Students discuss Canadian contributions to exploration technologies and consider how future technologies may affect them. In this unit, students demonstrate their knowledge and scientific skills when they design and construct models, prepare research reports, and conduct demonstrations and simulations.

Vocabulary

environment, extreme, technology, exploration, Canadarm, recycling, life-support (other vocabulary will depend on the specific extreme environment chosen by the teacher/class)

Knowledge

- there are living things naturally inhabiting many extreme environments, but much about them is still unknown
- technologies such as boats, clothing, and space ships have allowed humans to live in environments to which they are not fully adapted
- humans need more complicated technology to survive in and explore more extreme environments, which may have conditions such as high or low temperature or pressure, or the absence of an atmosphere or gravity
- Canadians have contributed to technological advancement in the exploration of extreme environments

Skills and Attitudes

- ask questions and exchange ideas to solve problems related to the exploration of extreme environments
- evaluate information and ideas encountered during investigations of extreme environment
- use appropriate tools to gather, analyse, interpret, and share scientific ideas
- formulate hypotheses
- appreciate the cumulative nature of technological advancement
- explain reasons for an adaptive technology and how it compensates for the extreme condition(s)
- construct models of exploration technologies

Grade 6 Earth and Space Science: Exploration of Extreme Environments

Prescribed Learning Outcomes

It is expected that students will:

- explain obstacles unique to exploration of a specific extreme environment

Suggested Achievement Indicators

The following set of indicators may be used to assess student achievement for each corresponding prescribed learning outcome. Students who have fully met the prescribed learning outcome are able to:

- ❑ identify the salient characteristics of an extreme environment (e.g., space, polar ice, oceans, volcanoes, and the atmosphere—a place that humans do not naturally inhabit but choose to explore)
- ❑ give several examples of resources and knowledge that can be obtained from distant explorations
- ❑ give several examples of how technology can be used by humans to travel to and explore an unknown environment

Planning for Assessment	Suggested Assessment Activities
This unit is about the exploration of ONE specific extreme environment. As such, it is expected that teachers choose activities applicable to that specific environment. • Have students pick one area of interest, and use a Know-Wonder-Learn strategy to discover elements of an unknown environment (e.g., deep ocean, solar system, Antarctic glaciers).	• Suggested questions re determining important elements: - Does the environment allow humans to visit easily? What vehicles are needed? - Can the environment be studied from a long distance? - What tools and instruments help humans study it? How do these tools work? - What are the harmful conditions that humans need to be protected from? How is this done? - What is known so far about this environment? What are the interesting unknowns? - What limits are currently challenging humans about exploring this environment? *continued next page*

Exploration of Extreme Environments (continued)

Planning for Assessment	Suggested Assessment Activities
• Ask students to conduct Internet research (Web Quest) on their selected environment. Pose questions such as the following to guide the search for answers and images **Ocean** - What is neutral and negative buoyancy? - How do humans breathe in diving suits? - What tools can divers use and hold? - How are Remote Operated Vehicles (ROVs) controlled? - How are samples picked up? - Can living samples be collected without being destroyed? **Space** - What is the range of gravity? - What is important to understand about working in zero gravity? - How do humans get oxygen to breath? - How do astronauts hold and grip tools? - Does radio communication work in space? - Can tests be done or should samples be collected? - How do astronauts go outside the ship?	• Ask each student to present "expert" reports to the class on her or his selected environment, using information from the Web Quest and including related principals of science. Work with students to develop criteria for assessing presentations according to the science of the environment and how experts study it. **Ocean** environment research can address - buoyancy, - Bathyal and Abyssal Zone life forms - seafloor maps and geography - fluid and pressure at various depths - guyots and seamounts - salinity - ocean currents - oceanographic ships and vessels. **Space** environment experts can consider - vacuum and zero gravity - sources of food, water, and air - collecting and storing samples - space hazards (e.g., meteorites, solar flares) - sending data over great distances - working in space or on planet surfaces.
• Have students choose an extreme environment and prepare a timeline of developments and major events occurring in a technology during the past 100 years (e.g., 100 years of flight, 50 years of scuba diving). • Have students pick a current technology and make a cut-away model (3D) of their design improvements.	• Consider the extent to which timelines use clear images and point form facts, including - intervals, which show dates and decades - facts that relate major successes/achievements - images that profile the technology - labels that enhance information. • Models should not be excessively large (shoe box size). Model must show an understanding of the scientific features related to exploring this environment. Written or labelled diagrams show further understanding that cannot easily be modelled. Criteria to consider - limits of human made materials - conditions affecting human travel in the environment - conditions affecting human communication - the nature and size of the physical environment - the dynamics of the extreme environment - reasons for human exploration.

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Exploration of Extreme Environments (continued)

Recommended Learning Resources

- BC Science 6
- BC Science Probe 6
- Biomes Atlases (Rivers, Lakes, Streams, and Ponds; Oceans and Beaches)
- Cycle of Life/Recycle Handbook for Educators
- Discovery Works for Grade 6: Unit E – Oceanography
- Hands-on Science (The Solar System)
- Heroes and Heroines – Explorers Past and Present
- McDougal Littell Science (Earth's Waters)
- McDougal Littell Science (Space Science)
- OceanNews
- The Sky's The Limit (AIMS Activities)
- Wonderwise: Women in Science Learning Series (Space Geologist)

Grade 6 Earth and Space Science: Exploration of Extreme Environments

Prescribed Learning Outcomes

It is expected that students will:

- assess technologies used for extreme environments

Suggested Achievement Indicators

The following set of indicators may be used to assess student achievement for each corresponding prescribed learning outcome. Students who have fully met the prescribed learning outcome are able to:

- ❑ identify several types of equipment and methods currently used to explore extreme environments (e.g., scuba, fibre optics, Mars Lander)
- ❑ accurately describe the stages of development for a previously created technology (e.g., kites, balloons, planes, rockets, submarines, space suits)
- ❑ design a complete model for travelling into a specific extreme environment (e.g., submarines, sonic-aircraft, spaceships)
- ❑ coherently defend a position with respect to the ethical considerations involved in the development and use of new technologies (e.g., whether or not to take living samples, or use weapons in space)

Planning for Assessment	Suggested Assessment Activities
This unit is about the continued exploration of one specific extreme environment studied in the previous unit. As such, it is expected that teachers choose activities applicable to that specific environment. • Introduce examples of technology that extend human exploration. Use a mechanical litter picker to show the principal of extended reach. Use images to show additional technology such as those for extending sight, grasping and holding, power and super strength, and manual/remote control, all used in a variety of environments.	• Ask students to produce a working drawing of a full-size mechanical device that could extend human reach when visiting an extreme environment. Student drawings should show - control of movement for grasping and holding - mechanical sensitivity for good pressure - strength and power for lifting items - guidance from the human operator. Several views will be needed to show actual parts and how they interact. Project could use found materials and model-making parts to be built later. *continued next page*

Exploration of Extreme Environments (continued)

Planning for Assessment	Suggested Assessment Activities
• Using the history of space exploration, show students how extreme exploration of our solar system and the moon has developed by key stages. Many stages are dependent on our tools and technologies at a particular time in history. (Construct a planet model with several dark side volcanoes, a light side impact crater, and a dark side rift valley; and a south pole with ice. Keep the planet model hidden from students throughout the space program.) 1. Hang your one-metre diameter "planet" at the end of the field from the goal posts. 2. The class starts one day by using their eyes to look across the field at the unknown object. What is it? 3. Next space day, class uses binoculars to study it closer. What details can be made out? 4. Day 3: use a stronger telescope to collect data. 5. Day 4: a space probe student is allowed to travel halfway to get a look (escorted by the teacher). 6. Day 5: first flyby several individual students get to run up to the object but cannot stop. They report what they saw. 7. Day 6: a single student with note pad is allowed to circle the object 5 times without stopping. Must make note while walking. Reports back to class. 8. Day 7: flyby with camera taking several pictures. 9. Day 8: first moon landing. Two students visit the planet on one side only and collect data. 10. Day 9: second moon landing. Two students visit the dark side of the planet and report back to class. 11. Finished portfolios or models completed.	• This is a classic schoolyard Space Program to study an unknown planet hanging at the end of the soccer field. Students will experience stages of a "space program" and collect their own evidence of the discoveries. The finished evidence can be a portfolio of data, including writings, drawings and photographs. Another way to collect the final evidence is for the students to model their own stages of discovery. Three different planet models are made from the collected data. Criteria could include - early model shows colour, some shape characters and matches the first probe reports - middle model has the right size and shape, with three key features showing; matches the flyby drawings and correctly shows one key landform. - final stages: the model details the dark side and light side accurately; the landing details are shown. *continued next page*

Exploration of Extreme Environments (continued)

Planning for Assessment	Suggested Assessment Activities
• Introduce scientific concepts related to a variety of extreme environments, such as - oceans: fluid, pressure, dark, pressurized environment - skies: aerodynamics drag, lift, gravity, speed, payload, acceleration - space: vacuum, micro gravity, contained atmosphere, airlocks, gravitational pull. • Have students pick one of the extreme environments and complete a Know-Wonder-Learn chart for all of these scientific concepts before beginning a project.	• Ask students to design and build a 3-D model of a transportation vehicle to travel in an extreme environment. Finished models should address these criteria - scientific principals were incorporated into the design (e.g., pressurized hull) - external devices and accessories extend human reach - scientific data is gathered - guidance and control are managed - power and propulsion are achieved. • Have students evaluate each other's designs for viability according to the scientific concepts indicated (e.g., oceans are a fluid, skies need aerodynamic designs, and space is a vacuum).
• Discuss with the class the responsible use of any technology and the potential for misuse by society. • Discuss significant events in recent history that have involved ethical decisions about new technologies (e.g., atomic bombs, wonder drugs, radar detectors, office surveillance).	• Once any technology has been discussed in class activities, students should be able to create a chart to compare the pros and cons associated with the design and use of the selected technology. • For a final assessment, supply students with the key features of a single technology (e.g., death star satellite) without associating pros and con values. Allow them to analyse the information and place key features into a Venn diagram format. Features should be sorted by - equal benefits for people and science - good for defence but costly for some humans - not good for people and costly for science.

Recommended Learning Resources

- BC Science 6
- BC Science Probe 6
- Below Zero
- Discovery Works Modules for B.C. Grade 6 (Oceanography)
- Hands-on Science (The Solar System)
- Heroes and Heroines – Explorers Past and Present
- McDougal Littell Science (Earth's Waters)
- McDougal Littell Science (Space Science)
- OceanNews
- The Sky's The Limit (AIMS Activities)

Grade 6 Earth and Space Science: Exploration of Extreme Environments

Prescribed Learning Outcomes

It is expected that students will:

- describe contributions of Canadians to exploration technologies

Suggested Achievement Indicators

The following set of indicators may be used to assess student achievement for each corresponding prescribed learning outcome. Students who have fully met the prescribed learning outcome are able to:

- ❑ describe in detail the function of Canadian technologies involved in exploration of extreme environments (e.g., international space station, Canadarm, Newt Suit, satellite telecommunications, robotics, and ocean mapping)
- ❑ illustrate with accurate, detailed drawings a range of Aboriginal technologies (e.g., Inuit sleds, Haida ocean canoes, Algonquin/Cree snowshoes)

Planning for Assessment	Suggested Assessment Activities
This unit focuses on Canadian Research and Development contributions in many extreme environment. As such, it is expected that teachers choose activities applicable to several exploration technologies. • Ask students to investigate the research and development history of various Canadian technologies and the people involved. • In teams, have students determine how to incorporate teaching this history by designing a board game with chance events similar to those stages indicated by the research. Teams determine board elements according to - resources used by the technology - environment being explored - random events both positive and negative - key features based on the history of the development of the technology - important people to be included.	• Ask student to design the "Canadian Extreme Exploration" Board game where players travel through different Canadian technologies. The players develop successes and pitfalls based on challenges faced by the real development of these fields. Consider whether students have - combined technologies - included chance events and obstacles based upon an understanding of the extreme environment. *continued next page*

Exploration of Extreme Environments (continued)

Planning for Assessment	Suggested Assessment Activities
• Have students hypothesize how Aboriginal knowledge assists exploration of extreme environments. Then, invite an Aboriginal Elder to discuss Aboriginal technologies. Contact the district Aboriginal Education coordinator or resource teacher for assistance in drawing on the local Aboriginal community.	• Have students collect pictures or replicas of technologies used traditionally by local Aboriginal peoples for transportation, shelter, and clothing (e.g., the stalks of sea onion were dried and cured, then spliced or plaited together to make fishing lines, nets, ropes, and harpoon lines). Arrange pictures as a gallery walk. Ask students to describe how each object was used, identify the key principals involved (e.g., extending reach), and suggest how it might assist exploration of extreme environments. This would be a good test of students understanding of concepts so far, such as - humans extend their reach with a tool - local materials were used to make the needed technology - methods were used for improving strength or mass of the tool - humans developed the technologies in stages.

Recommended Learning Resources

- BC Science 6
- BC Science Probe 6
- Discovery Works for Grade 6: Unit E – Oceanography
- OceanNews
- Shared Learnings: Integrating BC Aboriginal Content K-10
- Wonderwise: Women in Science Learning Series (Space Geologist)

ARTHROPODS BOOKLETS

Four Creatures: _____ _____ _____ _____

Kingdom (= Animalia) Phylum (= arthropoda) Class Order Family Genus Species

(mnemonic) Kings play cards on fat green stools

BASIC BOOKLET APPEARANCE CRITERIA

- ❏ The booklet is accurate, interesting and informative.
- ❏ All parts listed in the handout for the contents were used in your layout.
- ❏ Four classes of arthropods are described according to their unique characteristics.
- ❏ Scientific names for all four creatures are given and explained
- ❏ Colourful pictures are drawn (or magazine photographs are well glued).
- ❏ Classroom quality guidelines are fully followed
- ❏ A checklist and peer review were completed for the finished booklet.
- ❏ The booklet was submitted with the correct page size and bindings.
- ❏ Your project was finished on time by due date.

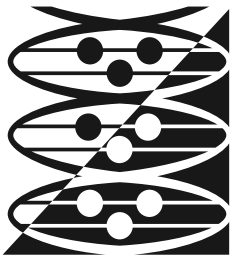
BOOKLET SECTIONS BASIC CONTENTS CRITERIA

A majority of these 10 things are explained in your booklet:

❏ four different arthropods ❏ habitats, colonies, and homes each prefers ❏ body characteristics ❏ habits ❏ food and enemies ❏ movement methods ❏ information about the arthropod's environment	❏ stages of the life cycle for each of the four arthropods ❏ how other animals interact with these arthropods ❏ other interesting facts ❏ recommendations for keeping creatures alive ❏ four families of the Arthropoda class are shown with diagrams

FINAL BOOKLET CRITERIA

- ❏ cover includes all names and title
- ❏ all sections are gathered into a final product
- ❏ table of contents is arranged in correct order
- ❏ glossary is included at the end of the booklet
- ❏ frequently asked questions are included and answered
- ❏ pages appear clear and easy to read
- ❏ facts and information presented are scientifically correct
- ❏ pictures and diagrams are properly labelled
- ❏ each section provides details about the creatures physical body
- ❏ a bibliography of references that were used in the research is included



LEARNING RESOURCES

This section contains general information on learning resources and provides the titles, descriptions, and ordering information for the recommended learning resources in the Science K to 7 Grade Collection.

What Are Recommended Learning Resources?

Recommended learning resources are resources that have undergone a provincial evaluation process using teacher evaluators and have Minister's Order granting them provincial recommended status. These resources may include print, video, software and CD-ROMs, games and manipulatives, and other multimedia formats. They are generally materials suitable for student use, but may also include information aimed primarily at teachers.

Information about the recommended resources is organized in the format of a Grade Collection. A Grade Collection can be regarded as a "starter set" of basic resources to deliver the curriculum. In many cases, the Grade Collection provides a choice of more than one resource to support curriculum organizers, enabling teachers to select resources that best suit different teaching and learning styles. Teachers may also wish to supplement Grade Collection resources with locally approved materials.

What Kinds of Resources Are Found in a Grade Collection?

Learning resources in a Grade Collection are categorized as either comprehensive or additional. Comprehensive resources provide a broad coverage of a significant number of the learning outcomes. Additional resources are more topic-specific and support individual curriculum organizers or clusters of outcomes.

The ministry updates the Grade Collections on a regular basis on the ministry web site http://www.bced.gov.bc.ca/irp_resources/lr/resource/gradcoll.htm

Please check this site for the most current list of recommended learning resources in the Grade Collection for each IRP.

How Can Teachers Choose Learning Resources to Meet Their Classroom Needs?

Teachers must use either:

- provincially recommended resources
  OR
- resources that have been evaluated through a local, board-approved process.

Prior to selecting and purchasing new learning resources, an inventory of those resources that are already available should be established through consultation with the school and district resource centres. The Ministry also works with school districts to negotiate cost-effective access to various learning resources.

Information about Ministry initiatives to support resource acquisition can be found at: http://www.bced.gov.bc.ca/irp_resources/lr/resource/res_main.htm

What Are the Criteria Used to Evaluate Learning Resources?

The Ministry of Education evaluates learning resources that support BC curriculum, and that will be used by teachers and/or students for instructional and assessment purposes. Evaluation criteria focus on content, instructional design, technical considerations, and social considerations.

Additional information concerning the review and selection of learning resources is available from the ministry publication, *Evaluating, Selecting and Managing Learning Resources: A Guide* (Revised 2002) http://www.bced.gov.bc.ca/irp/resdocs/esm_guide.pdf

What Funding is Available for Purchasing Learning Resources?

As part of the selection process, teachers should be aware of school and district funding policies and procedures to determine how much money is available for their needs. Funding for various purposes, including the purchase of learning resources, is provided to school districts. Learning resource selection should be viewed as an ongoing process that requires a determination of needs, as well as long-term planning to co-ordinate individual goals and local priorities.

SCIENCE K TO 7 GRADE COLLECTIONS

The Science K to 7 Grade Collection chart for each grade lists the recommended learning resources by media format, showing links to the curriculum organizers. The chart is followed by an annotated bibliography. Teachers should check with suppliers for complete and up-to-date ordering information. Most suppliers maintain web sites that are easy to access.

Web Sites

Due to their transitory nature, web sites are not typically evaluated as part of the provincial evaluation process. However, in some cases, the Internet is the most up-to-date source of information relevant to students in Science K to 7. As with all supplementary resources, local approval is required before use. Teachers should preview the sites in order to select those that are appropriate for use by their students, and must also ensure that students are aware of school district policies on Internet and computer use.

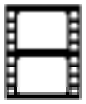
MEDIA ICONS KEY

The following icons identify the media formats of the recommended resources in the annotated bibliographies of the Grade Collections. Not all media formats are found in each Grade Collection.

Audio Cassette

CD-ROM

DVD



Film

Games/Manipulatives

Kit

Multimedia

Music CD

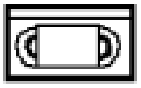
Print Materials

Print Series

Record

Slides

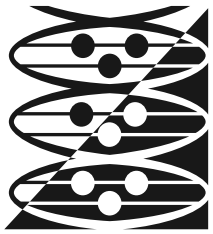
Software



Video

Video Series

Web Site



LEARNING RESOURCES

Grade 6

SCIENCE – GRADE 6
GRADE COLLECTION

Current as of December 2005. For latest updates go to
http://www.bced.gov.bc.ca/irp_resources/lr/resource/gradcoll.htm

	Life Science	Physical Science	Earth and Space Science
	Diversity of Life	*Electricity*	*Exploration of Extreme Environments*
Comprehensive Resources			
B.C. Science Probe 6			
BC Science 6			
Additional Resources – Print			
Below Zero			✓
Cycle of Life/Recycle Handbook for Educators	✓		✓
Discovering Spiders, Snails and Other Creepy Crawlies	✓		
Discovery Works Modules for B.C. Grade 6			✓
Electricity		✓	
Forests in Focus	✓		
Hands-On Science: Diversity of Living Things	✓		
Hands-On Science: Electricity			
Hands-On Science: The Solar System			✓
Kokanee of British Columbia	✓		
Nelson Science & Technology Skills Handbook	✓		
Once Upon a Seashore			
Our Wonderful World (AIMS Activities)	✓		
Project WET	✓		
Project WILD	✓		
Salish Sea	✓		
Salmonids in the Classroom	✓		
Science Detective™ Beginning: Higher-Order, Thinking, Reading, Writing in Science			
The Sky's The Limit (AIMS Activities)			✓
Thinking Connections: Concept Maps for Life Science			
Turn It On! (Pan Canadian Science Place)			

Indicates satisfactory to good support for the majority of the learning outcomes within the curriculum organizer.

✓ Indicates support for one or more learning outcomes within the curriculum organizer.

Indicates minimal or no support for the prescribed learning outcomes within the curriculum organizer.

	Life Science	Physical Science	Earth and Space Science
	Diversity of Life	***Electricity***	***Exploration of Extreme Environments***
Additional Resources – Print (con't)			
Urban Stewards	✓		
The Watershed Works	✓		
Additional Resources – Print Series			
Biomes Atlases			✓
Discovery Works for Grade 6		✓	✓
McDougal Littell Science Grade 6		✓	✓
Parasites & Partners Series	✓		
Additional Resources – Video			
Butterflies: Amazing Insects	✓		
Cells and Life	✓		
Cool Creatures: Reptiles	✓		
Ecology: Communities	✓		
Electromagnetism and Electronics		✓	
Heroes and Heroines - Explorers Past and Present			✓
Magnetism (Revised)		✓	
Science, Please!		✓	
Scientific Inquiry: Steps, Skills & Action	✓	✓	
Static Electricity (Revised)		✓	
Additional Resources – Video Series			
Wonderwise: Women in Science Learning Series			✓
Additional Resources – Multimedia			
OceanNews	✓		✓
Additional Resources – Kit			
British Columbia's Mountain Pine Beetle	✓		✓

B.C. Science Probe 6

Author(s): *Doyle, S.*
General Description:
This 284-page comprehensive student text fully supports the Grade 6 BC curriculum. The visuals are well chosen, and in many instances, reflect BC content and highlight Canada in general. Key vocabulary is boldly highlighted. This resource considers different styles of learning (e.g., visual learner). The applications and activities are easy-to-use and engaging. This resource contains a skills handbook reference for scientific investigations (i.e. lab reports, microscope skills, designing fair test). Aboriginal content is included. The 506-page teacher's resource binder supports, enhances, and amplifies the student text. This binder contains blackline masters and assessment tools.

Audience: *General*

Category: *Student, Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
						✓						

Supplier: *Thomson Nelson*

1120 Birchmount Road
Scarborough, ON M1K 5G4

Telephone: (416) 752-9448

Fax: (416) 752-8101

Toll Free: 1-800-268-2222/1-800-668-067

Web Address: www.nelson.com

Price: Not available

ISBN/Order No: Student Text: 0-17-627176-7
Teacher's Resource Binder:
0-17-627177-5

Copyright: 2005

Year Recommended in Grade Collection: 2005

BC Science 6

Author(s): *Mason, A. et al.*
General Description:
This BC Science student book fully supports the BC Grade 6 curriculum. Key science vocabulary is boldly highlighed. This resource comprehensively covers Diversity of Life, Electricity, and Extreme Environments. Both Canadian and BC examples are used throughout. Aboriginal content is included. Hands-on student activities are varied and promote investigations and applications. Scientific processes are appropriate for Grade 6. A skillpower section included in the student text supports scientific investigations.

Audience: *General*

Category: *Student, Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
						✓						

Supplier: *McGraw-Hill Ryerson Ltd. (Ontario)*

300 Water Street
Whitby, ON L1N 9B6

Telephone: (905) 430-5000

Fax: (905) 430-5194

Toll Free: 1-800-565-5758 (orders)

Web Address: www.mcgrawhill.ca

Price: $49.95

ISBN/Order No: 0-07-095900-5

Copyright: 2005

Year Recommended in Grade Collection: 2005

Below Zero

General Description:
Below Zero is based on the *Project Wild* model. Instructional activities are designed for easy integration into K-7 school subjects. The teacher resource materials concentrate on the understanding and conservation of wildlife in a frozen environment. Goal of the resource is to help learners develop awareness, knowledge, skills, and commitment to make informed decisions, responsible behaviour, with wise actions concerning wildlife in winter and frozen environments.

Audience: *General*

Category: *Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
✓	✓	✓	✓		✓	✓	✓					

Supplier: *Wild BC*

P.O. Box 9354, St. Prov. Gov.
200A-333 Quebec Street
Victoria, BC V8W 9M1

Telephone: (250) 356-7111

Fax: (250) 952-6684

Toll Free: 1-800-387-9853

Web Address: http://www.hctf.ca/wild.htm

Price: $25.00 with workshop

ISBN/Order No: 1-55029-146-7

Copyright: 2003

Year Recommended in Grade Collection: 2005

Biomes Atlases

General Description:
Biologists divide the living world into major zones called biomes, such as deserts, mountains and highlands, oceans, waterways, the Arctic tundra, and polar deserts. This series is an excellent addition to the Grade 6 study of the extreme environments listed above, making solid connections between the earth's climate and the plants and animals that live in each biome.

Audience: *General*

Category: *Student, Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
						✓						

Supplier: *J. Appleseed*

PO Box 129
Collingwood, ON L9Y 3Z7

Telephone:

Fax:

Toll Free: 1-866-575-5007

Web Address: www.jappleseed.ca

Price: $14.25 each

ISBN/Order No: Arctic Tundra and Polar Deserts:
1-4109-0020-7
Deserts and Semideserts:
1-4109-0021-5
Mountains and Highlands:
1-4109-0012-6

Copyright: 2003

Year Recommended in Grade Collection: 2005

British Columbia's Mountain Pine Beetle

General Description:
This resource package deals with a current British Columbia epidemic, the infestation of mountain pine beetles which are devastating the BC interior pine forests. This kit contains an engaging and informative video, CD-ROM, overheads, PowerPoint® presentation, poster, activity sheets as well as, a bark sample and a sample of pine beetles (in a vial). Lesson plans are clear and concise and can be adapted to suit grade levels from 4 through to 7. A glossary is included.

Audience: *General*

Category: *Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
				✓	✓	✓	✓					

Supplier: *BC Market Outreach Network*

1130 West Pender Street, Suite 1200
Vancouver, BC V6E 4A4

Telephone: 604-685-7507

Fax: 604-685-5373

Web Address:

Price: Free to schools

ISBN/Order No: Not available

Copyright: 2005

Year Recommended in Grade Collection: 2005

Butterflies: Amazing Insects

General Description:
This 20-minute video/support package presents the butterfly as an example of a highly adapted organism with a diversity of 150,000 species. Both structural and behaviour adaptations are presented through superb close-ups and time-enhanced photography. Migration patterns of the Monarch butterfly are shown. Respectful tips on how to attract and observe butterflies are included.

Caution: *Explicit butterfly sex scene.*

Audience: *General*

Category: *Student, Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
						✓						

Supplier: *Canadian Learning Company Inc.*

95 Vansittart Avenue
Woodstock, ON N4S 6E3

Telephone: (519) 537-2360

Fax: (519) 537-1035

Toll Free: 1-800-267-2977

Web Address: www.canlearn.com

Price: $39.95

ISBN/Order No: 1-2278F-1#58

Copyright: 1999

Year Recommended in Grade Collection: 2005

Cells and Life

General Description:
Sixteen-minute video examines the functions and structures of plant and animal cells through micro-photography. Time-lapse photography illustrates movement, feeding, and reproduction of unicellular organisms.

Audience: *General*
ESL - intermediate to advanced language proficiency; mid to late - intermediate grade level; specialized vocabulary; well explained; illustrated

Category: *Student, Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
						✓						

Supplier: *Visual Education Centre Ltd.*

Unit 3 - 41 Horner Avenue
Etobicoke, ON M8Z 4X4

Telephone: (416) 252-5907

Fax: (416) 251-3720

Toll Free: 1-800-668-0749

Web Address:
http://www.kftv.com/company-33221.html

Price: Check with supplier

ISBN/Order No: Not available

Copyright: 1990

Year Recommended in Grade Collection: 2005

Cool Creatures: Reptiles

General Description:
Twenty-two-minute video examines four reptile groups in detail: crocodilians, snakes, lizards, and turtles. Focus is on their movement, hunting abilities, and defense mechanisms. Includes a comprehensive teacher's guide with objectives, review questions, script, glossary, and bibliography.

Audience: *General*

Category: *Student, Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
						✓						

Supplier: *McIntyre Media Ltd.*

75 First St., Suite 203
Orangeville, ON L9W 5B6

Telephone: (519) 942-9640

Fax: (519) 942-8489

Toll Free: 1-800-565-3036

Web Address: www.mcintyre.ca

Price: Check with supplier

ISBN/Order No: Not available

Copyright: 1994

Year Recommended in Grade Collection: 2005

Cycle of Life/Recycle Handbook for Educators

Author(s): *Arntzen, H. et al.*
General Description:
This 276-page teacher resource is divided into five sections: Introduction, Music, Biology, Recycling, and Resources. Through songs and activities, Kindergarten to Grade 7 students learn about at-risk Canadian plants and animals species. Topics include sustainability of resources, life cycles, food chains and webs, ecological footprints, the interrelated nature of living things, and Aboriginal practices. There is a music CD, *Cycle of Life*, with 14 ecology/nature songs. Lyrics are included in print material.

Caution: *See Author's caution re: p. 83, Stan Rodger's song, lyrics refer to "beer" and "hell."*

Audience: *General*

Category: *Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
✓	✓	✓	✓	✓	✓	✓	✓					

Supplier: *Artist Response Team Inc. (ART)*

P.O. Box 91
Brentwood Bay, BC V8M 1R3

Telephone: (250) 544-4006

Fax: (250) 544-4075

Price: $35.00

ISBN/Order No: 0-9736-847

Copyright: 2004

Year Recommended in Grade Collection: 2005

Discovering Spiders, Snails and Other Creepy Crawlies

Author(s): *Brillon, G.*
General Description:
Book introduces earthworms, slugs, snails, arachnids, centipedes, and sowbugs, detailing how to trap, house, and care for them. Includes numerous related activities.

Caution: *Although there is a warning about the black widow, other dangers such as the recluse spider, anephalectic shock, and infections from bites are not mentioned (i.e., centipedes).*

Audience: *General*

Category: *Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
						✓						

Supplier: *Quintin Publishers / Éditions Michel Quintin*

Box 340
4818 Foster Road
Waterloo, QC J0E 2N0

Telephone: (450) 539-3774

Fax: (450) 539-4905

Price: Not available

ISBN/Order No: 2-920438-53-0

Copyright: 1992

Year Recommended in Grade Collection: 2005

Discovery Works for Grade 6

General Description:
Unit D: Magnetism and Electricity - This 38-page resource moderately investigates the properties of magnetism and electricity and their applications. Hands-on experiments are basic and follow a clear scientific process. *Unit E: Oceanography* - This 48-page resource moderately investigates the ocean, its ecosystems, and the technology used to explore this extreme environment. It includes hands-on experiments which emphasize the scientific process.

Caution: *Unit D: does not address all the PLOs, children portrayed do not seem 'modern' or Grade 6 age. Unit E: does not cover all PLOs.*

Audience: *General*

Category: *Student, Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
						✓						

Supplier: *Thomson Nelson*

1120 Birchmount Road
Scarborough, ON M1K 5G4

Telephone: (416) 752-9448

Fax: (416) 752-8101

Toll Free: 1-800-268-2222/1-800-668-067

Web Address: www.nelson.com

Price: Not available

ISBN/Order No: Unit D: 0-618-00255-3
Unit E: 0-618-00268-5

Copyright: 2003

Year Recommended in Grade Collection: 2005

Discovery Works Modules for B.C. Grade 6

General Description:
This American multimedia resource, organized by modules across several grades, consists of an annotated teaching guide, a student book with text and activities, a science notebook, a teacher's edition of the science notebook, a teacher resource book, an assessment guide, and a science processor (CD-ROM and teacher/user guide) that provides supplementary science investigation formats, by module and by U.S. grade match. Transparencies, videos, and videodisks have not been evaluated.

Audience: *General*

Category: *Student, Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
						✓						

Supplier: *Thomson Nelson*

1120 Birchmount Road
Scarborough, ON M1K 5G4

Telephone: (416) 752-9448

Fax: (416) 752-8101

Toll Free: 1-800-268-2222/1-800-668-067

Web Address: www.nelson.com

Price: Not available

ISBN/Order No: Student Book: 0-382-33436-1
Teaching Guide: 0-382-33488-4
Unit Science Processor: 0-382-38732-5

Copyright: 1996

Year Recommended in Grade Collection: 2005

Ecology: Communities

General Description:
Twelve-minute video presents several examples of communities and describes relationships of mutualism, commensalism, and parasitism. Includes a brief discussion guide with objectives, vocabulary, and activities.

Audience: *General*

Category: *Student, Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
						✓	✓					

Supplier: *Magic Lantern Communications (Ontario)*

1075 North Service Road West - Unit 27
Oakville, ON L6M 2G2

Telephone: (905) 827-2755

Fax: (905) 827-2655

Toll Free: 1-800-263-1717

Price: Check with supplier

ISBN/Order No: Not available

Copyright: 1992

Year Recommended in Grade Collection: 2005

Electricity

Author(s): *Goodyear, J. et al.*
General Description:
The *Electricity* student and teacher guides provide a clear and step-by-step introduction to the concepts of electricity. It is appropriate as a teacher resource rather than whole-class textbook sets.

Audience: *General*

Category: *Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
						✓						

Supplier: *GTK Press*

18 Wynford Drive, Unit 109
Don Mills, ON M3C 3S2

Telephone: (416) 385-1313

Fax: (416) 385-1319

Toll Free: 1-866-485-7737

Web Address: www.gtkpress.com

Price: Student Journal: $6.00
Teacher's Guide: $20.00

ISBN/Order No: Student Journal: 1-894318-24-2
Teacher's Guide: 1-894318-23-4

Copyright: 1999

Year Recommended in Grade Collection: 2005

Electromagnetism and Electronics

General Description:
Short, effective video on physical facts for electricity, electromagnets, and electric motors. Suitable for Grade 6, not highly engaging, but factually correct.

Audience: *General*

Category: *Student, Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
						✓						

Supplier: *B.C. Learning Connection Inc.*

#4 - 8755 Ash Street
Vancouver, BC V6P 6T3

Telephone: (604) 324-7752

Fax: (604) 324-1844

Toll Free: 1-800-884-2366

Web Address: www.bclc.bc.ca

Price: $26.00

ISBN/Order No: SC0332

Copyright: 2000

Year Recommended in Grade Collection: 2005

Forests in Focus

General Description:
Forests in Focus is an 85-page activity book on the BC forest environment. It consists of 34 activities, a glossary, stories (for activities), and appendices containing detailed BC information. It is designed for K-12 use but not all activities are appropriate for all grades. Organizers and suggested themes are included in the introduction. All activities are organized 'lab style' with objectives, materials, method, and evaluation. Content is based upon forest process and ecosystem, and does not emphasize harvesting issues.

Audience: *General*

Category: *Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
✓	✓	✓	✓	✓	✓	✓	✓					

Supplier: *Wild BC*

P.O. Box 9354, St. Prov. Gov.
200A-333 Quebec Street
Victoria, BC V8W 9M1

Telephone: (250) 356-7111

Fax: (250) 952-6684

Toll Free: 1-800-387-9853

Web Address: http://www.hctf.ca/wild.htm

Price: $26.00
$22.00 with workshop

ISBN/Order No: 0-7726-3966-3

Copyright: 1999

Year Recommended in Grade Collection: 2005

Hands-On Science: Diversity of Living Things

Author(s): *Lawson, J. et al.*
General Description:
Good resource for teachers to use in preparing student lessons and assessment tasks. Many ready-made blackline masters are provided to guide students through open-ended activities. Other black and white masters provide graphic organizers useful to all students, including ESL, gifted, and LD learners. More material is provided than required for curriculum outcomes. Much of the additional activities provide good teacher background of the concepts explored.

Audience: *General*
ESL - frameworks and Graphic organizers provide good concept support
Gifted - offers extension
LD - frames and organizers helpful

Category: *Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
						✓						

Supplier: *Portage & Main Press*

100 - 318 McDermot Avenue
Winnipeg, MB R3A 0A2

Telephone: (204) 987-3500

Fax: 1-866-734-8477

Toll Free: 1-800-667-9673

Web Address:
www.portageandmainpress.com

Price: $22.00

ISBN/Order No: 1-894110-81-1

Copyright: 2001

Year Recommended in Grade Collection: 2005

Hands-On Science: Electricity

Author(s): *Lawson, J. et al.*
General Description:
Program investigates electrical energy, including static electricity, electromagnetism, and current electricity. Hands-on activities construct a variety of electrical devises and models to show how electrical energy is transformed and controlled.

Audience: *General*
ESL - frames and organizers provide good support
Gifted - offer extensions and enrichment explorations
LD - frame and graphic organizers helpful to master concepts

Category: *Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
						✓						

Supplier: *Portage & Main Press*

100 - 318 McDermot Avenue
Winnipeg, MB R3A 0A2

Telephone: (204) 987-3500

Fax: 1-866-734-8477

Toll Free: 1-800-667-9673

Web Address:
www.portageandmainpress.com

Price: $22.00

ISBN/Order No: 1-894110-85-4

Copyright: 2001

Year Recommended in Grade Collection: 2005

Hands-On Science: The Solar System

Author(s): *Lawson, J. et al.*

General Description:
The Solar System develops students' scientific literacy through active inquiry, problem solving, and decision making. The text is clearly laid out and the scope and range of topics are appropriate for Grade 6 learners. ESL, gifted, and LD students would find appropriate material, as well as general audiences. Teacher background knowledge is provided for each unit.

Audience: *General*
ESL - clear and simple blackline masters
Gifted - a variety of extensions with an in-depth component are included
LD - clear and simple blackline masters

Category: *Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
						✓						

Supplier: *Portage & Main Press*

100 - 318 McDermot Avenue
Winnipeg, MB R3A 0A2

Telephone: (204) 987-3500

Fax: 1-866-734-8477

Toll Free: 1-800-667-9673

Web Address:
www.portageandmainpress.com

Price: $22.00

ISBN/Order No: 1-894110-89-7

Copyright: 2001

Year Recommended in Grade Collection: 2005

Heroes and Heroines - Explorers Past and Present

General Description:
This 21-minute video examines the past and present explorers of Antarctica. It is a comparison of historical and contemporary researchers and research technology.

Caution: *Support material is scant.*

Audience: *General*

Category: *Student, Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
						✓						

Supplier: *Canadian Learning Company Inc.*

95 Vansittart Avenue
Woodstock, ON N4S 6E3

Telephone: (519) 537-2360

Fax: (519) 537-1035

Toll Free: 1-800-267-2977

Web Address: www.canlearn.com

Price: Check with supplier

ISBN/Order No: 5-5035F-1#2

Copyright: 2001

Year Recommended in Grade Collection: 2005

Kokanee of British Columbia

General Description:
Activities and researched facts for the study and class investigation of landlocked salmonids called Kokanee. This is very appropriate for Interior waterways where Kokanee are mostly found. The teacher resource is organized to present all the same elements of the BC Salmon programs for Coastal BC using the Kokanee instead. Nine activities cover historical evolution life cycle, habitat, and human impacts so students will understand the relationship between Kokanee and the Interior environment. Field studies and observations are detailed in well organized units.

Caution: *This resource covers several learning outcomes at the Primary level, but it is more suitable for the Intermediate level.*

Audience: *General*

Category: *Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
	✓	✓		✓	✓	✓	✓					

Supplier: *Wild BC*

P.O. Box 9354, St. Prov. Gov.
200A-333 Quebec Street
Victoria, BC V8W 9M1

Telephone: (250) 356-7111

Fax: (250) 952-6684

Toll Free: 1-800-387-9853

Web Address: http://www.hctf.ca/wild.htm

Price: $22.00

ISBN/Order No: 0-7726-5130-2

Copyright: 2004

Year Recommended in Grade Collection: 2005

Magnetism (Revised)

Author(s): *Colgren, J.*
General Description:
Magnets are shown, discussed, and demonstrated. The relationship between magnets and electricity are presented. Suitable for studying magnetic forces and magnetic poles. Properties of magnetism are shown and the basic relationships between magnetism and electricity is explored. Print materials include blackline masters.

Audience: *General*

Category: *Student, Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
						✓						

Supplier: *Marlin Motion Pictures Ltd.*

211 Watline Avenue
Mississauga, ON L4Z 1P3

Telephone: (905) 890-1500

Fax: (905) 890-6550

Toll Free: 1-800-865-7617

Price: $59.95

ISBN/Order No: 76526

Copyright: 2003

Year Recommended in Grade Collection: 2005

McDougal Littell Science Grade 6

General Description:
An excellent teacher resource and advanced student text. Can be used to broaden key understandings of the Grade 6 outcomes for all science curriculum topics. Titles include: *Electricity and Magnetism, Diversity of Living Things, Earth's Waters,* and *Space Science.* It is an excellent learning reference for gifted Grade 6 students who find the more traditional Grade 6 textbooks limited in scope and content.

Audience: *Gifted - advanced learners at grade level*

Category: *Student, Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
						✓						

Supplier: *Thomson Nelson*

1120 Birchmount Road
Scarborough, ON M1K 5G4

Telephone: (416) 752-9448

Fax: (416) 752-8101

Toll Free: 1-800-268-2222/1-800-668-067

Web Address: www.nelson.com

Price: Modules: $26.95 each

ISBN/Order No: Electricity and Magnetism: 0-618-33440-8
Diversity of Living Things: 0-618-33434-3
Earth's Waters: 0-618-33417-3
Space Science: 0-618-33421-1

Copyright: 2004

Year Recommended in Grade Collection: 2005

Nelson Science & Technology Skills Handbook

Author(s): *Alldred, N. et al.*
General Description:
Nelson Skills Handbook is an excellent student and teacher resource for the skills and processes of Science at both Grade 6 and 7 levels. Contains diagrams for steps in various science processes and can be used as a resource for classes needing support for student hands-on activities. Shows the clear difference between scientific inquiry and technological problem-solving.

Audience: *General*
ESL

Category: *Student, Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
						✓	✓					

Supplier: *Thomson Nelson*

1120 Birchmount Road
Scarborough, ON M1K 5G4

Telephone: (416) 752-9448

Fax: (416) 752-8101

Toll Free: 1-800-268-2222/1-800-668-067

Web Address: www.nelson.com

Price: $19.45

ISBN/Order No: 0-17-612020-3

Copyright: 2000

Year Recommended in Grade Collection: 2005

OceanNews

General Description:
OceanNews is a series of learning resource packages developed by the Public Education Program of the Bamfield Marine Station to promote marine education. Each issue of *OceanNews* covers a theme of marine science: Exploring the Fluid Frontier, Marine Mammals, Seabirds, and Marine Pollution. Each theme issue comprises a newsletter, a teacher's guide, and an Ocean Explorer computer disk. Provides background concepts and current research in marine science. Activities in the teacher's guides extend concepts. Software programs enhance and extend activities. Systems Requirement: Installed Acrobat Reader®

Audience: *General*

Category: *Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
					✓	✓	✓					

Supplier: *Bamfield Marine Sciences Centre*

Bamfield, BC V0R 1B0

Telephone: (250) 728-3301

Fax: (250) 728-3452

Web Address: www.bms.bc.ca

Price: 5 copies of each newsletter + 1 CD: $53.00
30 copies + 1 CD: $73.00

ISBN/Order No: Not available

Copyright: 1994

Year Recommended in Grade Collection: 2005

Once Upon a Seashore

Author(s): *Snively, G.*
General Description:
This 304-page adult reference was designed to help teachers in their study of the seashore. It contains clear illustrations, photos, a glossary, transparencies, activity sheets, and offers ideas for drama, creative writing, and art. An excellent resource for field trips to the seashore.

Audience: *General*

Category: *Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
	✓	✓	✓	✓	✓	✓						

Supplier: *BCTF Lesson Aids Service*

100 - 550 West 6th Avenue
Vancouver, BC V5Z 4P2

Telephone: (604) 871-2182

Fax: (604) 871-2295

Toll Free: 1-800-663-9163

Web Address:
http://www.bctf.bc.ca/lessonaids

Price: Not available

ISBN/Order No: 0-9687811-0-1/LA S65

Copyright: 2001

Year Recommended in Grade Collection: 2005

Our Wonderful World (AIMS Activities)

General Description:
Book investigates our relationship with the environment through numerous hands-on activities that integrate math, science, language arts, and social studies. Detailed support materials accompany each project. Some non-metric references.

Audience: *General*

Category: *Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
						✓	✓					

Supplier: *Spectrum Educational Supplies Ltd. (Ontario)*
125 Mary St.
Aurora, ON L4G 1G3
Telephone: (905) 841-0600
Fax: (905) 727-6265
Toll Free: 1-800-668-0600
Web Address: http://www.spectrumed.com

Price: $35.95

ISBN/Order No: 1-881431-08-8/20133

Copyright: 1987

Year Recommended in Grade Collection: 2005

Parasites & Partners Series

General Description:
The series provides good content for Grade 6 and 7 Life Sciences. Explains the close relationship between various animals, plants, and other creatures. From tiny bacteria living inside or on other organisms to survive. Detailed look at some of the most bizarre and surprising organisms and their parasitic relationships.

Audience: *General*
ESL
LD - high interest, but will need vocabulary support

Category: *Student, Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
						✓	✓					

Supplier: *J. Appleseed*
PO Box 129
Collingwood, ON L9Y 3Z7
Telephone:
Fax:
Toll Free: 1-866-575-5007
Web Address: www.jappleseed.ca

Price: $12.00 each

ISBN/Order No: Feeders: 1-4109-0355-9
Hitchers and Thieves: 1-4109-0356-7
Lodgers and Cleaners: 1-4109-0358-3

Copyright: 2003

Year Recommended in Grade Collection: 2005

Project WET

General Description:
The 500-page detailed teacher resource includes directions and extensions for 120 activities related to water, wetlands, and water resource management. Each activity includes objectives, method, background, materials, procedures, variations, extensions and evaluation. A wealth of teaching ideas for Grades K to 7. A global perspective, but produced from Montana State University.

Caution: *Not much Canadian or BC highlights. Images are mostly global but some captions are US locations. Dual temperature references, i.e. Fahrenheit/Celsius.*

Audience: *General*

Category: *Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
✓	✓	✓	✓	✓	✓	✓	✓					

Supplier: *Wild BC*

P.O. Box 9354, St. Prov. Gov.
200A-333 Quebec Street
Victoria, BC V8W 9M1

Telephone: (250) 356-7111

Fax: (250) 952-6684

Toll Free: 1-800-387-9853

Web Address: http://www.hctf.ca/wild.htm

Price: $30.00 with workshop

ISBN/Order No: Not available

Copyright: 1995

Year Recommended in Grade Collection: 2005

Project WILD

General Description:
Teacher resource contains directions and extensions for approximately 80 activities that are related to wildlife and resource management. Each activity includes objectives, method, background, materials, procedure, variations, extension, and evaluation.

Audience: *General*

Category: *Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
				✓	✓	✓	✓					

Supplier: *Wild BC*

P.O. Box 9354, St. Prov. Gov.
200A-333 Quebec Street
Victoria, BC V8W 9M1

Telephone: (250) 356-7111

Fax: (250) 952-6684

Toll Free: 1-800-387-9853

Web Address: http://www.hctf.ca/wild.htm

Price: $25.00 with workshop

ISBN/Order No: Not available

Copyright: 1998

Year Recommended in Grade Collection: 2005

Salish Sea

Author(s): *Arntzen, H. et al.*

General Description:
This 108-page detailed teacher resource includes background directions, activities, and extensions related to ecosystems, both land and marine, which are specific to the West Coast. This cross-curricular resource contains many Aboriginal references and suggests activities, songs, and projects to amplify student appreciation of historical stewardship and respect for the delicate balance of a coastal ecosystem. There are many references and web links as back-up material. A CD of eco-songs, one in Cowichan language, accompanies this resource which contains a wealth of teaching, learning, and hands-on activities for Grades K to 7.

Audience: *General*

Category: *Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
✓	✓	✓	✓	✓	✓	✓	✓					

Supplier: *Parks Canada*

711 Broughton St., 2nd Floor
Victoria, BC V8W 1E2

Telephone: (250) 363-3511

Fax: (250) 363-8552

Price: $30.00

ISBN/Order No: 0-660-18596-2

Copyright: 2001

Year Recommended in Grade Collection: 2005

Salmonids in the Classroom

General Description:
Salmonids in the Classroom (either Primary or Intermediate versions) is a comprehensive collection of resource materials for the study of Pacific salmonids in British Columbia. The programs are divided into clearly organized and paced 10 units following the life cycle habitats of the salmon. Each unit in the guide includes suggested activities. Content is primarily science-oriented but the development of the units has a language arts approach incorporating unifying themes. The programs would allow the integration of science, social studies and language for extensive periods of time.

Caution: *The material has limited assessment devices explained. It make suggestions for assessment activities but doesn't give any 'how to do' assessment resources.*

Audience: *General*
ESL - late primary to early intermediate; good key visuals; variety of student activities

Category: *Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
✓	✓	✓		✓	✓	✓	✓					

Supplier: *BCTF Lesson Aids Service*

100 - 550 West 6th Avenue
Vancouver, BC V5Z 4P2

Telephone: (604) 871-2182

Fax: (604) 871-2295

Toll Free: 1-800-663-9163

Web Address:
http://www.bctf.bc.ca/lessonaids

Price: Primary: $71.10
Intermediate: $66.60

ISBN/Order No: Primary: S33
Intermediate: S39

Copyright: 2001

Year Recommended in Grade Collection: 2005

Science Detective™ Beginning: Higher-Order, Thinking, Reading, Writing in Science

Author(s): *Fischer, S. et al.*
General Description:
Teacher resource for ESL or Learning Assistance programs includes simplified pages of science concepts in all strands. Basic teaching strategy of read and complete sheet. Good collection of key visuals and graphic organizers.

Audience: *ESL - key visuals and basic one page text per topic*
LD - key visuals and frames can be used to help learn concepts

Category: *Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
			✓	✓	✓	✓	✓					

Supplier: *The Critical Thinking Co.*

P.O. Box 1610
1069 Broadway Ave.
Seaside, CA 93955-1610

Telephone: (831) 393-3288

Fax: (831) 393-3277

Toll Free: 1-800-458-4849

Web Address: www.criticalthinking.com

Price: $18.99 US

ISBN/Order No: 0-89455-834-X

Copyright: 2004

Year Recommended in Grade Collection: 2005

Science, Please!

General Description:
Fast, factual explanations of scientific phenomena and discoveries, who said science can't be fun? A poster with excellent questions and an extensive interactive web site support these videos (Part 1 and Part 2). Although the DVDs were not available for the reviewers, they felt DVD format would be more easily used as this is a series of science mini-clips.

Caution: *Teacher should preview Part 1, clip 3, for questionable humour.*

Audience: *General*
Gifted - fast-paced, attention-grabber

Category: *Student, Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
				✓	✓	✓	✓					

Supplier: *National Film Board of Canada*

200-1385 West 8th Avenue
Vancouver, BC V6H 3V9

Telephone: (604) 666-3838

Fax: (604) 666-1569

Toll Free: 1-800-267-7710

Web Address: www.nfb.ca

Price: Set of two tapes: $97.95
Each: $49.95

ISBN/Order No: Set of two tapes: C 9101 197
Part 1 or Part 2: C9101 195

Copyright: 2001

Year Recommended in Grade Collection: 2005

Scientific Inquiry: Steps, Skills & Action

General Description:
Scientific Inquiry is a valuable tool that will cover the Processes and Skills of Science from Grade 4 to 7. This video brings excitement and precision of scientific inquiry into the classroom through a series of case studies, real scientists are interviewed. Insightful description of the scientific processes of an experiment.

Audience: *General*

Category: *Student, Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
						✓						

Supplier: *McIntyre Media Ltd.*

75 First St., Suite 203
Orangeville, ON L9W 5B6

Telephone: (519) 942-9640

Fax: (519) 942-8489

Toll Free: 1-800-565-3036

Web Address: www.mcintyre.ca

Price: Check with supplier

ISBN/Order No: 600303

Copyright: 2003

Year Recommended in Grade Collection: 2005

The Sky's The Limit (AIMS Activities)

General Description:
Book investigates aspects of flight through numerous hands-on activities that integrate math, science, language arts, and social studies. Detailed support materials accompany each project.

Audience: *General*

Category: *Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
						✓						

Supplier: *Spectrum Educational Supplies Ltd. (Ontario)*

125 Mary St.
Aurora, ON L4G 1G3

Telephone: (905) 841-0600

Fax: (905) 727-6265

Toll Free: 1-800-668-0600

Web Address: http://www.spectrumed.com

Price: $35.95

ISBN/Order No: 1-881431-44-4/20128

Copyright: 1994

Year Recommended in Grade Collection: 2005

Static Electricity (Revised)

Author(s): *Colgren, J.*
General Description:
This program helps to explain situations related to the effects of static electricity. Describes the atomic structures and the movement of electrons. It shows how objects can pickup a static electric charge and how that can attract or repel other charged objects. Demonstrations are shown with balloons, water, house carpets, pith balls, and a Van de Graaf generator. Lightning is explained according to static discharge.

Audience: *General*

Category: *Student, Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
						✓						

Supplier: *Marlin Motion Pictures Ltd.*

211 Watline Avenue
Mississauga, ON L4Z 1P3

Telephone: (905) 890-1500

Fax: (905) 890-6550

Toll Free: 1-800-865-7617

Price: $59.95

ISBN/Order No: 78583

Copyright: 2003

Year Recommended in Grade Collection: 2005

Thinking Connections: Concept Maps for Life Science

Author(s): *Burggraf, F.*
General Description:
Teacher resource for ESL or Learning Assistance programs with simplified pages of Science concepts in Grades 4 to 7 intermediate strands. Basic teaching strategy of read and complete sheets, and a reinforcement of vocabulary and concepts. Good collection of key visuals and graphic organizers.

Audience: *ESL - key visuals and basic one page text per topic*
LD - key visuals and frames can be used to help learn concepts

Category: *Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
				✓	✓	✓	✓					

Supplier: *The Critical Thinking Co.*

P.O. Box 1610
1069 Broadway Ave.
Seaside, CA 93955-1610

Telephone: (831) 393-3288

Fax: (831) 393-3277

Toll Free: 1-800-458-4849

Web Address: www.criticalthinking.com

Price: $23.99 US

ISBN/Order No: 0-89455-702-5

Copyright: 2001

Year Recommended in Grade Collection: 2005

Turn It On! (Pan Canadian Science Place)

General Description:
The text and teacher's guide progress from answering basic facts about electricity to exploring uses of electricity in society, to an engaging end product — designing a simple electrical toy.

Audience: *General*

Category: *Student, Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
						✓						

Supplier: *Scholastic Canada/Les éditions Scholastic*

175 Hillmount Road
Markham, ON L6C 1Z7

Telephone: (905) 887-7323

Fax: (905) 887-1131

Toll Free: 1-800-268-3860/1-800-625-858

Web Address: www.scholastic.ca

Price: Student Text: $9.00
Teacher's Guide: $35.00
Program and Assessment Guide: $50.00

ISBN/Order No: Student Text: 0-7791-0087-5
Teacher's Guide: 0-7791-3510-5
Program and Assessment Guide: 0-7791-0093-X

Copyright: 2005

Year Recommended in Grade Collection: 2005

Urban Stewards

Author(s): *Keetch, T.*
General Description:
Engages students in stimulating hands-on science and environmental education activites in the classroom and outside. Match to the learning outcomes in a cross-curricular fashion.

Audience: *General*

Category: *Student, Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
				✓	✓	✓	✓					

Supplier: *Stanley Park Ecology Society*

PO Box 5167
2nd Floor, Stanley Park Dining Pavilion
Vancouver, BC V6B 4B2

Telephone: 604-257-6908

Fax: 604-257-8378

Web Address: www.stanleyparkecology.ca

Price: Not available

ISBN/Order No: Not available

Copyright: 2004

Year Recommended in Grade Collection: 2005

The Watershed Works

Author(s): *Bermbach, L. et al.*

General Description:
This booklet is an extensive guide for the study of the Fraser River Basin in BC. It includes student activities and teaching strategies that promote awareness and understanding of the social, economic, and environmental issues that are relevant to this area.

Caution: *These are photocopied pages in a binder.*

Audience: *General*

Category: *Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
				✓	✓	✓	✓					

Supplier: *BCTF Lesson Aids Service*

100 - 550 West 6th Avenue
Vancouver, BC V5Z 4P2

Telephone: (604) 871-2182

Fax: (604) 871-2295

Toll Free: 1-800-663-9163

Web Address:
http://www.bctf.bc.ca/lessonaids

Price: Not available

ISBN/Order No: Not available

Copyright: 1998

Year Recommended in Grade Collection: 2005

Wonderwise: Women in Science Learning Series

General Description:
Set of two 18-minute videos highlighting women in science: Adriana Ocampo, a space geologist; and Carmen Cid, an urban ecologist. The videos follow the women as they observe, measure, and demonstrate scientific processes and investigation.

Audience: *General*

Category: *Student, Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
						✓	✓					

Supplier: *Canadian Learning Company Inc.*

95 Vansittart Avenue
Woodstock, ON N4S 6E3

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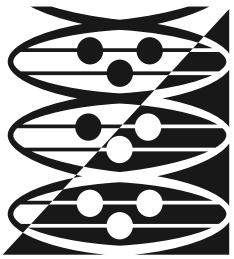

GLOSSARY

This glossary includes terms used in this Integrated Resource Package, defined specifically in relation to how they pertain to Science K to 7 topics. It is provided for clarity only, and is not intended to be an exhaustive list of terminology related to Science K to 7 topics. Entries in this glossary have been adapted with permission from the Recommended Resources published by

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A

acid
A compound that produces hydrogen ions (H+) in water. Strong Acids can cause serious burns on skin. Acidic solutions turn blue litmus paper red and will have a pH value smaller than 7.

acidic
A term used to describe a solution that has a value below 7 on the pH scale; the more acidic a solution, the lower its pH value.

adaptation
The physical characteristic, or behaviour trait that helps an organism survive in its local environment.

amphibian
A class of vertebrates that is born in water and lives both in water and on land. Amphibians begin life in water with gills; later, they develop lungs and legs so they can walk on land as adults. Examples include frogs, toads, and salamanders.

Animalia
One of the Kingdoms of Life (which are part of the scientific system of classification). This Kingdom includes insects, birds, fish, and mammals.

arch
An arch is a curved structure. The separate parts of the curve all push against one another and hold up the arch.

arteries
Thick, muscular vessels that carry blood away from the heart to the rest of the body.

attract
When objects are pulled together by a physical force that combines to unite the surfaces of the objects.

axis
A straight line that runs through the centre of an object.

B

balanced forces
When the total of all forces on an object equals zero and the object's motion does not change.

base
A compound that produces hydroxide (OH-) in water. A solution that is basic turns red litmus paper blue because it has less hydrogen ions.

basic
A term used to describe a solution that has a value above 7 on the pH scale; the more basic a solution, the higher its pH value.

battery
An energy source that uses a chemical reaction to create an electric current.

biodegradable
Material that is able to be broken down or decomposed by natural processes into simpler compounds. Natural processes include exposure to sun, water, and air.

biomass energy
Energy created by burning any type of plant or animal tissue to heat water and create steam, which turns turbines and generates electricity.

biomass
An ecology term for the total mass of living organisms in a certain area.

biomes
Large regions of Earth where temperature and precipitation are distinct and certain types of plants and animals are found.

biosphere
The parts of Earth where life can be found, from mountaintops to the deepest parts of the ocean.

buoyancy
The ability to float in water; the upward force of water on any object placed in water.

C

calculate
To figure out by using mathematics the number for quantities, amounts, sizes, lengths, or mass of items.

camouflage
The colouring of an animal that allows it to blend into its environment to survive better.

Canadarm
A robotic manipulator arm developed by the Canadian Space Agency. The arm is controlled by astronauts inside the space shuttle.

carnivore
A consumer that eats other animals. For example, wolves and orca are carnivores.

cell
A microscopic structure that is the basic unit of all living things. Organisms can be made of as little as one cell (some types of bacteria) or as many as several trillion cells (human beings).

cell cytoplasm
The thick liquid inside the cell; area where the work of the cell is done, as directed by the nucleus.

cell membrane
A thin layer that surrounds the cell cytoplasm and controls which materials enter and leave the cell.

cell nucleus
The cell structure that acts as the control centre by directing all of the cell's activities, such as movement and growth.

cell wall
In plant cells the protective outer layer that surrounds the cell membrane and some protists. It provides protection and support for the cell.

chlorophyll
A green pigment found in chloroplasts that gives plants and some Protista their green colour. It captures sunlight used for photosynthesis.

chloroplast
A plant cell structure containing chlorophyll, found in all green plant cells and some Protista.

classify
Grouping and labelling a collections of items, objects, or living things. The grouping arrangements match a set of classification rules and common characteristics indicating their similarities and differences. [see SORT]

climate
The weather pattern for a geographical region over a long period of time.

cloud
Water vapour in the atmosphere that has cooled and come into contact with tiny particles of dust.

colouration
An adaptation of an organism's colour to help it survive in its environment. Mimicry and camouflage are examples of colouration.

compare
To look and identify two or more objects and see how they are different and how they are the same.

compound machine
Any machine containing two or more simple machines.

compound
A pure substance that is made up of two or more different elements and consists of only one kind of particle.

compression
An engineering term used opposite to tension; any of the forces applied towards the centre of structural objects.

concentration
The quantity of solute that is dissolved in a certain quantity of solvent; the more solute dissolved, the greater the concentration.

condensation
The process of changing from a gas or a vapour to a liquid.

conductor
A material that lets electricity flow through it easily; for example, most metals are good conductors.

conservation
Preserving and carefully managing natural resources so that they can be used by present and future generations. We conserve resources by using them more efficiently, with minimum waste.

construct
To make or build a model or to build a simple structure by joining materials together.

consumer
An organism, such as an animal, that must obtain its food by eating other organisms in its environment; can be a herbivore, carnivore, or omnivore.

consumption
The amount of resources or energy used by a household.

continental crust
The parts of Earth's crust that have continents on them.

continental shelf
A shallow underwater ledge located between a continent and the deep ocean crust.

cover slip
A small, thin piece of glass used to cover a specimen on a microscope slide.

crust
The thin, outer layer of Earth; made of solid rock. The crust "floats" on the inner layers of Earth because it is made of lighter materials than the lower layers.

D

decomposer
An organism that breaks down (decomposes) dead or waste materials, such as rotting wood, dead animals, or animal waste and returns important nutrients to the environment.

design-process
The sequence of steps that take an idea to a completed plan; can be the planning and building processes where prototypes are created and evaluated to solve technological problems.

detrivore
An organism that feeds on large bits of dead and decaying plant and animal matter. For example, earthworms, dung beetles, and wolverines are detrivores.

dilute
A solution that has a low concentration of the dissolved substance (the solute).

dissolve
To completely mix one substance (the solute) in another (the solvent) to form a solution. For example, if you add sugar to water, the sugar dissolves in the water.

E

Earth's inner core
The innermost layer of Earth, which is made up of iron and nickel.

echo
Repetition of sound produced by reflection of sound waves from a surface.

ecosystem
The network of interactions that link together the living and non-living parts of an environment.

effort force
The concept used to describe the force going into moving a simple machine a certain distance; used to describe the degree of effort someone applies to operate a machine.

electric current
A continuous flow of electric charges moving from one place to another along a pathway; required to make all electrical devices work; measured in amperes (A).

electrical energy
The better term for electricity; the form of energy that consists of a flow of electric charges as the energy is transferred through a conductor.

electrical switch
A device that controls the flow of electric current through a circuit. In an open circuit, a light will be off; in a closed circuit, a light will be on.

electricity
See electrical energy.

electromagnet
A magnet that is created by using electricity in a circuit placed around a piece of metal conductor such as steel or lead.

electromagnetism
A magnetic force caused by electric charges in motion; also, the relationship between magnetism and electricity where one can make the other.

electron
A negatively charged particle that is found outside the nucleus of an atom.

element
A pure substance that cannot be broken down into any other pure substance; made up of one type of atom.

emulsion
A special kind of suspension that has been treated to prevent the parts of the mixture from separating. For example, homogenized milk is an emulsion.

energy
Energy cannot be seen or touched. Energy is a property of all matter. Energy comes in many forms and can be transferred from one object to another, but it cannot be created or destroyed; written as the symbol E.

environmental impact
The effect, usually negative, of a human activity on a local area.

equilibrium
A condition where structures or systems are in complete balance. A state of rest or balance, in which all opposing forces are equal. [see BALANCED FORCES]

erosion
The loosening, dissolving, wearing away, or moving of soil and rock from one place to another by wind or water.

estimate
A math and science term for referring to how students use prior knowledge to make a reasonable and sensible decision about amounts. Amounts can be quantity, number, volume, length, weight, or size.

estuary
The region where a river flows into the ocean and fresh river water mixes with saltwater.

evaporate
To change into a gas or vapour.

exploration
Travelling some distance to observe a place or region to learn more about it.

extraction
Removing rock or minerals from the earth.

extreme environment (1)
A place where the conditions are so harsh that human survival is difficult or impossible without technology. For example, deserts, volcanoes, and space are extreme environments for humans to spend long periods of time.

extreme environment (2)
An environment that is difficult to reach, and that has extreme conditions such as high or low temperatures, high or low pressure, or little atmosphere or gravity. Space, deep oceans, the high arctic, the upper stratosphere, polar regions, and deep caves are extreme environments.

F

fair test
A test of a single variable when all the experimental actions around it are applied equally. During a scientific investigation, accurate fair testing involves isolating variables, eliminating bias, repeating the results, and analysing the intended experiment for errors.

fasteners
Special materials used for *joining* structural parts in construction. Fasteners are of differing types (e.g., fixed, rotating, rigid, flexible, and adjustable) and can serve different purposes. Nails, pins, bolts, glue, string, tape, sleeves, and screws are examples of fasteners used to join construction parts together.

food chain
A method for describing how food energy passes from organism to organism. The description establishes a hierarchy of organisms where each feeds on those below and is the source of food for those above.

food web
A network of interconnected food chains in an ecosystem.

force
The physics term used to describe the energy applied in various ways to move objects or change their position. Force usually involve a push or a pulling and is either balanced or unbalanced by other forces.

fossil fuels
Fuel formed over millions of years from compression of the decayed remains of living matter. Coal, oil, and natural gas are fossil fuels.

friction
The resistance a body meets when moving over a surface or through a gas or liquid; the force that resists the motion of two surfaces that are touching each other.

fulcrum
The point on which a lever rests or turns.

Fungi
One of the Kingdoms of Life (which are part of the scientific system of classification). Fungi are a life form consisting of a single or many-celled organisms, which have cell walls, do not have chlorophyll, get food from the environment, and reproduce by spores.

G

geothermal
Energy obtained from the natural heat of the Earth.

gravity
The forces of attraction which the Earth has for objects on its surface; also the force of attraction between any two objects.

H

habitat
The place where an animal or a plant naturally lives or grows and that provides it with everything it needs to grow.

heat
The transfer of thermal energy to other substances that are at a different temperature. Cold things still have heat energy.

herbivores
An animal that eats only plants. (also see CARNIVORE, OMNIVORE)

hydrometer
A device that reads specific gravity and is used to determine density of liquids.

I

inclined plane
A sloping surface; a simple machine that can be used to alter the effort and distance involved in doing work.

insulator
Material that does not transfer heat readily; also, a substance that does not allow any electric current to transfer to other objects.

invertebrate
An animal that does not have a backbone or spinal column. Examples of invertebrates include insects, worms, and crabs.

L

lava
The term used for magma, or molten rock, when it breaks through Earth's crust and reaches the surface, as in a volcanic eruption.

leaching
The process by which soluble materials in the soil, such as nutrients, pesticide chemicals, or contaminants, are washed into a lower layer of soil or are dissolved and carried away by water.

lever
One of the simplest machines; a rigid beam that rotates around a fixed support point called the fulcrum. Levers changes the direction and effort force needed to move a load.

life cycle
All the stages in the life of a plant or animal organism, between life and death.

life-support
Any human-built system that provides air, water, food, and environmental conditions to sustain humans or other living things.

light absorption
To soak up visible and invisible electromagnetic radiation energy ranging in wavelength from about 400 to 700 nanometers. Light is usually absorbed by rough, dark surfaces.

light refraction
The bending of light into a different direction where it follows a new straight-line path.

light
Visible and invisible electromagnetic radiation energy, ranging in wavelength from about 400 to 700 nanometers and travels at a speed of 299, 972 km/s.

load
The mass (weight) of an object to be moved.

local environment
All the influences and conditions in which organisms live, including the actual place, circumstances, soil, water, air, and climate that surround and affect plants and animals in a particular area, and which determine their form and survival.

loudness
Amount of energy that a sound carries.

M

magma
Hot melted rock formed deep below Earth's crust by high temperatures and pressures; cools to form igneous rock.

mantle
The layer of Earth between the crust and the outer core; a hot, thick layer of solid and partly melted rock.

mass
The amount of matter in something, which is measured in grams (g).

materials
The collection of physical and chemical attributes for the objects used to build structures. "Construction materials" refers to the type of substance and its properties.

measure
Using special tools to accurately determine the amount of an object without guessing or estimating. The measured amount must be described relative to a standard unit system.

micro-organism
A living thing that is too small to be seen without the help of a microscope. For example, bacteria and some algae are micro-organisms.

mid-ocean ridge
A raised part of the sea floor, which can become large enough to be considered an underwater mountain range.

migration
The seasonal movement of animals to a less-harsh environment. For example, the elk moves from the mountains to spend the winter in the lowlands.

mimicry
Adaptations that let one animal look or behave like another animal for survival reasons.

mixture
A combination of two or more different types of matter that can be separated by physical changes.

model
A method for showing an idea using objects and/or pictures. When students build a model, they make a physical structure to represent their idea.

Monera
One of the Kingdoms of Life forms; comprises the bacteria, blue-green algae, and various primitive micro-organisms.

N

natural gas
A fossil fuel formed by the decomposition of microscopic plants and animals over millions of years.

net charge
No static charge available as the amount of excess (+) electrons is equal to the amount of deficient (-) electrons.

neutral charge
No static charge and no excess electron or missing electrons.

neutral pH
Neither an acid nor a base. On the pH scale, a neutral substance or solution has a pH value of 7. Pure distilled water has a pH of 7.

niche
The way that an organism fits into an ecosystem, in terms of where it lives, how it obtains its food, and how it interacts with other organisms.

non-renewable
Something that cannot be replaced once it is used or that may take many hundreds of years to be replaced.

nuclear energy
Energy that uses uranium as a fuel to heat water and produce steam, which turns a turbine and produces electricity.

O

observation
Activities where the senses are used to collect and record how objects or events behave. Students record what they see, smell, touch, or read from measuring tools. They do not state opinions about these events.

oceanic crust
The parts of Earth's crust that have only ocean floor on them; thinner and denser than the continental crust.

omnivore
An animal that eats both plants and animals. (see HERBIVORE, CARNIVORE)

opaque
Matter that does not allow any light to pass through.

orbit
A circular path that one object travels around another object.

organ
A body part composed of a collection of differing cells and tissues organized to perform a specific function.

P

parallel circuit
A circuit in which the current travels along two or more separate paths to different devices. The current travels through each part of the circuit devices at the same time.

pH scale
A scale that measures the acidity of substances in solution; has numbers from 0 (strongly acidic) to 7 (neutral) to 14 (strongly basic).

photosynthesis
The process in which the Sun's energy is used by plants to make sugar (food) from carbon dioxide and water. Oxygen is released in this process.

Plantae
One of the Kingdoms of Life (which are part of the scientific system of classification). This Kingdom includes all land plants.

plate tectonics
The theory that the surface of Earth consists of large plates that are continually moving.

predator
An organism that hunts another living thing for food. [see CARNIVORE]

predict
Thinking by using prior knowledge about what a student knows to work out what is going to probably happen next, in a pattern of events.

pressure
A force applied equally to all surfaces of objects or surfaces. Air pressure is the force of all the atmosphere gases pushing down on people at the Earth's surface.

prey
An organism that is hunted by a predator.

producer
An organism that creates its own food rather than eating other organisms to obtain food; for example, a plant. (see also CONSUMER)

Protista
One of the Kingdoms of Life (which are part of the scientific system of classification). This Kingdom includes complex one-celled micro-organisms, such as amoeba, protozoa, slime molds, and algae.

pure substance
A substance that is composed of only one type of atomic particle and therefore always has the same properties. There are two kinds of pure substances: elements and compounds.

R

radar
An acronym for RAdio Detection And Ranging. A device that sends out radio waves and picks up any echoes that are bounced back off objects to tell the distance, speed, direction of motion, and shape of objects.

ramp
Interchangeable with term meaning an incline plane or sloping surface.

recording
To describe (an observation) by using words, numbers, writing, or pictures. To only describe what has been seen, measured, or calculated without any subject judgments.

renewable resources
Natural resources that can be renewed or replaced by nature within 100 years.

rift
An opening in the oceanic crust as plates move away from each other, where molten materials from Earth's mantle can escape.

rotate
To spin around on an axis.

S

saturated
A solution that contains as much of one substance (the solute) as can be dissolved in another substance (the solvent). For example, when you cannot dissolve any more drink crystals in water, the solution is saturated.

scavenger
Any animal that preys on food predators have killed, or food recently discarded.

screw
A simple machine consisting of an incline plane wrapped around a cylinder.

scuba
An acronym for Self-Contained Underwater Breathing Apparatus; allows divers to carry their air supply on their backs.

sediment
Small pieces of material that have broken off of rocks and have been deposited by water, wind, or ice.

sedimentary rock
Layered rock formed when sediment is compressed and forced together naturally over millions of years.

seismic wave
An energy wave that is released by an earthquake and travels outward from its focus.

series circuit
A circuit in which the current travels along a single path to two or more electric devices; the current must travel though each part of the circuit, one device after the other, in turn.

SI system
The most widely used and accepted version of the metric system of measurement employed by all scientists (SI is an abbreviation of *Le Système International d'Unités*); includes the units metre, litre, and gram.

simple machine
One of the basic devices used to redirect forces for a useful function: lever, wedge, ramp, screw, wheel, axle, and pulley.

solubility
The ability of a substance (the solute) to dissolve in another substance (the solvent). Temperature plays an important role in solubility. For example, you can dissolve more orange-drink crystals in warm water than in cold water.

solute
The smaller part that is put into a solution. A solute is mixed with a solvent to form a solution.

solution
A homogeneous mixture of two or more substances that combine so that the mixture is the same throughout and the properties of the substances blend.

sonar
An acronym for SOund NAvigation and Range; a device that ships use to chart the depth of oceans using the echoes of sound waves.

sort
Separating a collection of items, drawings, objects, ideas, or numbers into categories of attributes. [see CLASSIFY]

sound absorption
To soak up audible noise. Sound is usually absorbed by thick, dense materials.

sound waves
A movement of particles that transfers sound from one place to another.

sound
A form of energy that you can hear when something vibrates.

species (1)
A term used to describe a group of organisms that can mate and produce offspring that can in turn produce more offspring.

species (2)
Form *Scientific Names:* species is a specific division in the classification system of organisms. It is the category below genus.

spin-off technology
An everyday use of a technology that was first developed for another purpose. For example, bar codes used in grocery stores were first developed by NASA for space exploration.

static-electric charge
A type of electricity where the electric charges build up on an object by rubbing another object. The movement of the charge off the charged object is called a static discharge. For example, electric charges built up in rubbing a balloon against your pet's fur.

static-electric discharge
A form of electrical energy moving unbalanced charged electrons on an object back to a balanced condition.

subduction zone
A place on Earth's crust where high pressure pushes an oceanic plate under another, converging tectonic plate.

sunlight
Full spectrum electromagnet radiation carrying energy from the nearest star to our planet.

supersaturated
A solution that is more than saturated; using temperature changes, a solution is forced to dissolved more of the substance (the solute) than would normally be found in a saturated solution.

surface runoff
Precipitation that travels over the soil surface to the nearest stream. It does not soak into the soil surface.

suspension
A cloudy mixture in which clumps of a solid or droplets of a liquid are scattered throughout a liquid or gas. For example, muddy water is a suspension.

sustainability
The ability of ecosystems to bear the impact of the human population over a long period of time, through the replacement of resources and the recycling of waste.

T

technology
Any method or tools that are made using scientific principles to solve problems. Science and technology make it possible to survive in challenging environments.

temperature
The measure of how hot or cold something is. In relative terms, it is a measure of the amount of heat present.

tidal energy
Energy created by filling a reservoir with ocean water at high tide, and later releasing the water through hydroelectric turbines as the tide ebbs to produce electricity.

U

unbalanced forces
Forces pulling or pushing each other in which one is greater than all others; when the net force on an object does not equal zero.

unicellular
Made of only one cell; a characteristic of organisms in the Monera Kingdom.

V

veins
Thin tubes that carry blood back to the heart from every part of the body.

verify
To double check by working out the answer or solution again. Usually another way is used to show that the first answer is correct because the second method yields an identical result.

vertebrate
Animal with a backbone, or spinal column; birds, fish, and mammals are examples of vertebrates.

vibration
The back and forth or up and down movement of an object.

voltage
A measure of the energy available to move charges in a circuit between positively-charged and negatively-charged terminals of a battery: measured in volts (V).

W

water pressure
The application of force by water that increases with depth; measured in atmospheres.

weigh
To determine the mass of...

weight
Term often used as a synonym for mass in commercial and everyday use; in scientific and technical work, this term should be replaced by mass or force, depending on the application.

weights
Objects made from steel or metal, manufactured to be used for standard mass sets.

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