

SCIENCE GRADE 4

From Integrated Resource Package 2005

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ACKNOWLEDGMENTS

Acknowledgments.....4

PREFACE: USING THIS INTEGRATED RESOURCE PACKAGE

Preface5

INTRODUCTION TO SCIENCE GRADE 4

Curriculum Overview9
 Rationale9
 Goals for Scientific Literacy9
 Curriculum Organizers.....10
 Aboriginal Content in the Science Curriculum10
 Organizing for Instruction and Assessment.....11
 Science K to 7: Topics at a Glance12
 Getting the Most out of this IRP.....13
 Considerations for Program Delivery14

PRESCRIBED LEARNING OUTCOMES

Prescribed Learning Outcomes by Curriculum Organizer..... 24
 Prescribed Learning Outcomes by Grade..... 30

STUDENT ACHIEVEMENT

Classroom Assessment and Evaluation33
 Grade 4.....38

CLASSROOM ASSESSMENT MODEL

Considerations for Instruction and Assessment.....49
 Contents of the Model50
 Using the Classroom Assessment Model.....52
 Grade 4: Processes of Science57
 Life Science59
 Physical Science.....66
 Earth and Space Science70

LEARNING RESOURCES

General Information.....77
 Science K to 7 Grade Collections.....78
 Media Icons Key78
 Grade 4.....80

GLOSSARY

Glossary..... 101

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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/pserr/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.

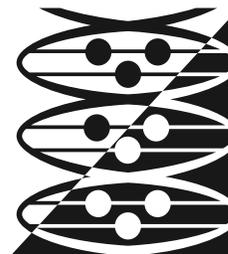
Each unit includes the prescribed learning outcomes, suggested achievement indicators, key elements, a suggested timeframe, a sequence of suggested instruction and assessment activities, recommended learning resources, selected relevant web sites, and sample assessment instruments.

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.

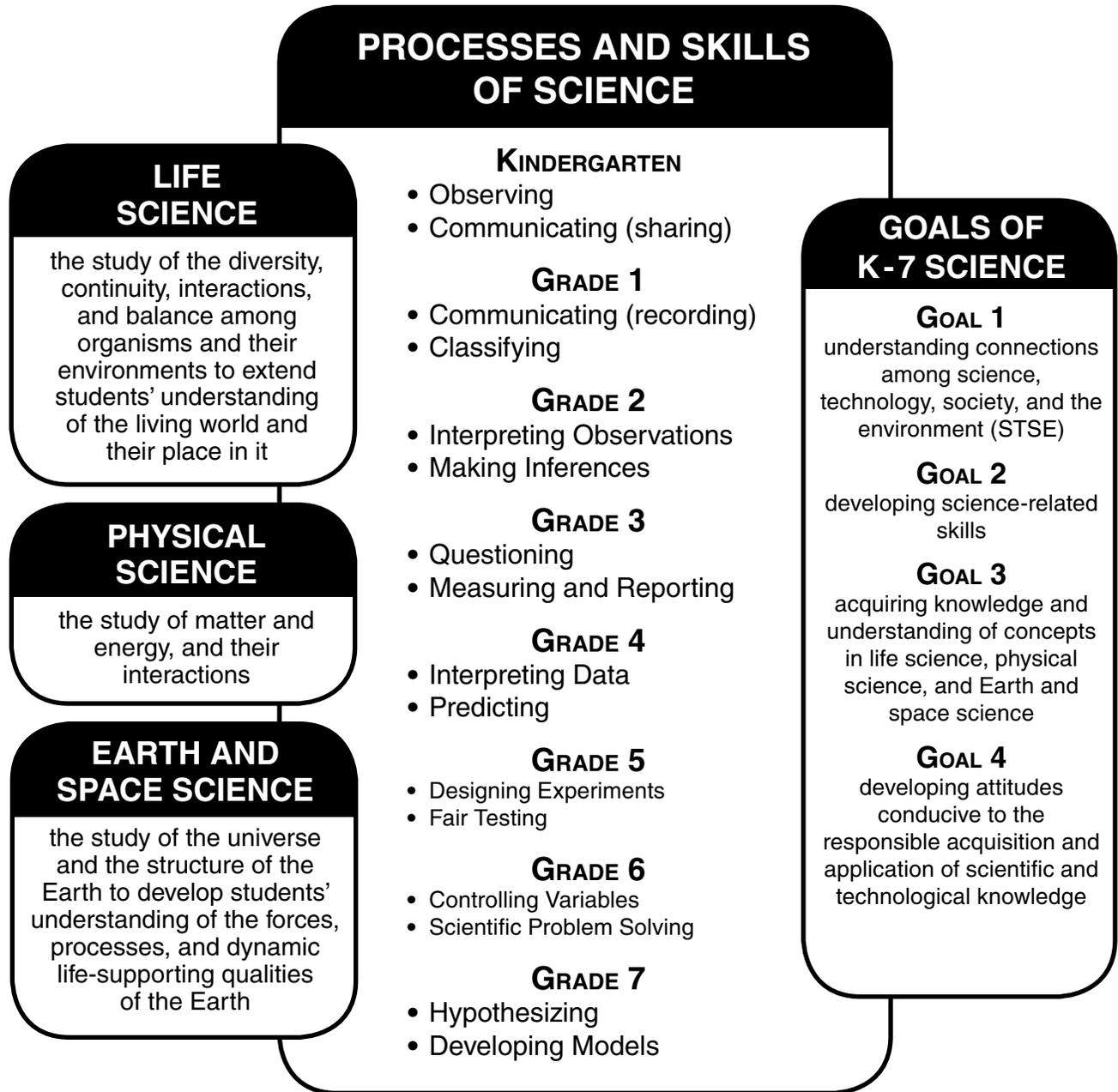
Curriculum Organizer	Suggested Time
Applications of Science	integrated with other organizers
Life Science	25-30 hours
Physical Science	25-30 hours
Earth and Space Science	25-30 hours

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	<ul style="list-style-type: none"> • Observing • Communicating (sharing) 	Characteristics of Living Things	Properties of Objects and Materials	Surroundings
Grade 1	<ul style="list-style-type: none"> • Communicating (recording) • Classifying 	Needs of Living Things	Force and Motion	Daily and Seasonal Changes
Grade 2	<ul style="list-style-type: none"> • Interpreting Observations • Making Inferences 	Animal Growth and Changes	Properties of Matter	Air, Water, and Soil
Grade 3	<ul style="list-style-type: none"> • Questioning • Measuring and Reporting 	Plant Growth and Changes	Materials and Structures	Stars and Planets
Grade 4	<ul style="list-style-type: none"> • Interpreting Data • Predicting 	Habitats and Communities	Light and Sound	Weather
Grade 5	<ul style="list-style-type: none"> • Designing Experiments • Fair Testing 	Human Body	Forces and Simple Machines	Renewable and Non-Renewable Resources
Grade 6	<ul style="list-style-type: none"> • Controlling Variables • Scientific Problem Solving 	Diversity of Life	Electricity	Exploration of Extreme Environments
Grade 7	<ul style="list-style-type: none"> • 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.

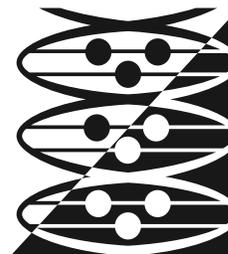
In order to respect copyright it is necessary to understand the law. It is unlawful to do the following, unless permission has been given by a copyright owner:

- 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).

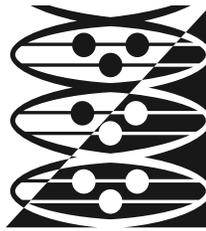
The **cognitive domain** deals with the recall or recognition of knowledge and the development of intellectual abilities. The cognitive domain can be further specified as including three cognitive levels: knowledge, understanding and application, and higher mental processes. These levels are determined 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

<p><i>Kindergarten</i></p> <ul style="list-style-type: none"> • use the five senses to make observations • share with others information obtained by observing
<p><i>Grade 1</i></p> <ul style="list-style-type: none"> • communicate their observations, experiences, and thinking in a variety of ways (e.g., verbally, pictorially, graphically) • classify objects, events, and organisms
<p><i>Grade 2</i></p> <ul style="list-style-type: none"> • use their senses to interpret observations • infer the probable outcome of an event or behaviour based on observations
<p><i>Grade 3</i></p> <ul style="list-style-type: none"> • ask questions that foster investigations and explorations relevant to the content • measure objects and events
<p><i>Grade 4</i></p> <ul style="list-style-type: none"> • make predictions, supported by reasons and relevant to the content • use data from investigations to recognize patterns and relationships and reach conclusions
<p><i>Grade 5</i></p> <ul style="list-style-type: none"> • identify variables that can be changed in an experiment • evaluate the fairness of a given experiment • describe the steps in designing an experiment
<p><i>Grade 6</i></p> <ul style="list-style-type: none"> • manipulate and control a number of variables in an experiment • apply solutions to a technical problem (e.g., malfunctioning electrical circuit)
<p><i>Grade 7</i></p> <ul style="list-style-type: none"> • 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

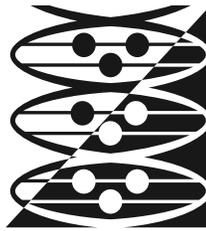
<p>Kindergarten</p> <ul style="list-style-type: none"> • describe features of local plants and animals (e.g., colour, shape, size, texture) • compare local plants • compare common animals
<p>Grade 1</p> <ul style="list-style-type: none"> • classify living and non-living things • describe the basic needs of local plants and animals (e.g., food, water, light) • describe how the basic needs of plants and animals are met in their environment
<p>Grade 2</p> <ul style="list-style-type: none"> • 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
<p>Grade 3</p> <ul style="list-style-type: none"> • 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
<p>Grade 4</p> <ul style="list-style-type: none"> • 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
<p>Grade 5</p> <ul style="list-style-type: none"> • 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
<p>Grade 6</p> <ul style="list-style-type: none"> • 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
<p>Grade 7</p> <ul style="list-style-type: none"> • 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

<p>Kindergarten</p> <ul style="list-style-type: none"> • 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
<p>Grade 1</p> <ul style="list-style-type: none"> • 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
<p>Grade 2</p> <ul style="list-style-type: none"> • 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
<p>Grade 3</p> <ul style="list-style-type: none"> • 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
<p>Grade 4</p> <ul style="list-style-type: none"> • 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)
<p>Grade 5</p> <ul style="list-style-type: none"> • 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
<p>Grade 6</p> <ul style="list-style-type: none"> • 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
<p>Grade 7</p> <ul style="list-style-type: none"> • 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

<p><i>Kindergarten</i></p> <ul style="list-style-type: none"> • demonstrate the ability to observe their surroundings • describe features of their immediate environment
<p><i>Grade 1</i></p> <ul style="list-style-type: none"> • 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
<p><i>Grade 2</i></p> <ul style="list-style-type: none"> • 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
<p><i>Grade 3</i></p> <ul style="list-style-type: none"> • 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
<p><i>Grade 4</i></p> <ul style="list-style-type: none"> • measure weather in terms of temperature, precipitation, cloud cover, wind speed and direction • analyse impacts of weather on living and non-living things
<p><i>Grade 5</i></p> <ul style="list-style-type: none"> • 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
<p><i>Grade 6</i></p> <ul style="list-style-type: none"> • explain obstacles unique to exploration of a specific extreme environment • assess technologies used for extreme environments • describe contributions of Canadians to exploration technologies
<p><i>Grade 7</i></p> <ul style="list-style-type: none"> • 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 4

GRADE 4

Processes and Skills of Science

It is expected that students will:

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

Life Science: Habitats and Communities

It is expected that students will:

- 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

Physical Science: Sound and Light

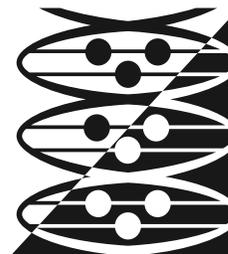
It is expected that students will:

- 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)

Earth and Space Science: Weather

It is expected that students will:

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



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 <i>for</i> Learning	Assessment <i>as</i> Learning	Assessment <i>of</i> Learning
<p>Formative assessment <i>ongoing in the classroom</i></p> <ul style="list-style-type: none"> • 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 	<p>Formative assessment <i>ongoing in the classroom</i></p> <ul style="list-style-type: none"> • 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 	<p>Summative assessment <i>occurs at end of year or at key stages</i></p> <ul style="list-style-type: none"> • 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

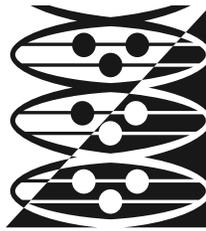
To support teachers in assessing provincially prescribed curricula, this IRP includes sets of achievement indicators in relation to each learning outcome.

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 4

GRADE 4: PROCESSES OF SCIENCE**Key Elements: Processes of Science**

Estimated Time: integrate with other curriculum organizers

Interpreting Data

Interpreting data is a critical-thinking process used by scientific researchers to review the data gathered in the course of an investigation. Scientists explain the data to others and communicate a reasonable explanation about the trends and relationships they see. They also point out any inconsistencies they believe the evidence holds. For the data to be fully analysed in meaningful ways it requires prior scientific knowledge, mathematics, graphing techniques, and clear communication skills. At this stage, it is an extension of the process skills learned earlier – interpreting observations and making inferences (Grade 2). Interpreting data involves identifying patterns, thinking about missing data (errors), questioning if the data fits the estimates, finding one-to-one relations, sorting objects into useful arrangements, explaining the similarities and differences in the data, and summarizing what the facts and data might mean.

Predicting

Predicting involves making an objective guess about a future event, based upon what has been observed in the past and what might be expected to happen. Scientists always test whether their predictions might be correct or not. (Often, mathematics and graphing can be used to *extrapolate* into the future). Predictions should not involve guessing wildly, but should be based on prior knowledge and prior observations. These prior activities often produce questions that engage scientific curiosity. To make predictions that help them explore and test their observations, students must pay close attention to patterns and order within the previous data. They must also rely on all their previously acquired process skills such as measuring, inferring, and questioning to compare their expectations with the observed results. Good predictions seek to logically anticipate how future events might occur. Making a prediction, and determining how to test it with the right question constitute the beginning point for designing later experiments.

GRADE 4 PROCESSES OF SCIENCE

Prescribed Learning Outcomes	Suggested Achievement Indicators
<p><i>It is expected that students will:</i></p>	<p><i>The following set of indicators may be used to assess student achievement for each corresponding prescribed learning outcome.</i></p> <p><i>Students who have fully met the prescribed learning outcome are able to:</i></p>
<ul style="list-style-type: none"> • make predictions, supported by reasons and relevant to the content 	<ul style="list-style-type: none"> <input type="checkbox"/> carefully observe a pattern of events (e.g., changes in vibration, pitch, weather patterns) <input type="checkbox"/> make initial predictions and refine them, based on test results (e.g., path light travels)
<ul style="list-style-type: none"> • use data from investigations to recognize patterns and relationships and reach conclusions 	<ul style="list-style-type: none"> <input type="checkbox"/> gather and correctly organize comprehensive data (e.g., weather charts) <input type="checkbox"/> accurately interpret what a given graph shows, using detailed examples

Processes and Skills of Science							
Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7
<ul style="list-style-type: none"> • Observing • Communicating (sharing) 	<ul style="list-style-type: none"> • Communicating (recording) • Classifying 	<ul style="list-style-type: none"> • Interpreting Observations • Making Inferences 	<ul style="list-style-type: none"> • Questioning • Measuring and Reporting 	<ul style="list-style-type: none"> • Interpreting Data • Predicting 	<ul style="list-style-type: none"> • Designing Experiments • Fair Testing 	<ul style="list-style-type: none"> • Controlling Variables • Scientific Problem Solving 	<ul style="list-style-type: none"> • Hypothesizing • Developing Models

GRADE 4 LIFE SCIENCE: HABITATS AND COMMUNITIES**Key Elements: Life Science**

Estimated Time: 25 – 30 hours

By the end of the grade, students will have understood the structure and interactions of local ecosystems and shown respect for the environment.

Habitats and Communities

The study of habits and communities focuses on how organisms are adapted to an environment and interact with other living and non-living things. Students research or investigate organisms in two or more different habitats and identify which adaptations help organisms survive. The diversity and interactions of the living and non-living things in different habitats and communities can be compared. Students also develop an understanding of food chains. The relationship between humans and their environment is examined with particular emphasis on the relationship that Aboriginal peoples have with the environment.

Vocabulary

habitat, adaptation, population, community, food chain, food web, organism, producer, consumer, herbivore, omnivore, carnivore, predator, prey, scavenger, conservation, threatened, endangered, extinct

Knowledge

- living things find in particular environments the items and conditions that they need to grow and survive
- living things interact with each other in many ways and may depend on each other for food and shelter
- changes in habitat can affect the survival of an individual organism or an entire species
- food chains play an important role in population changes
- human choices and actions have a big impact on the environment

Skills and Attitudes

- observe animals and plants sharing a habitat (e.g., terrarium, aquarium)
- record observations and investigations using a variety of mediums such as journals, words, charts, and graphs
- infer why particular organisms, animals, and plants are able to share a habitat
- predict the effect of a change in the environment to the habitat and the organisms living there
- demonstrate respect for Aboriginal peoples
- demonstrate respect for living things and environments and a commitment for their care

GRADE 4 LIFE SCIENCE: HABITATS AND COMMUNITIES

Prescribed Learning Outcomes	Suggested Achievement Indicators
<i>It is expected that students will:</i>	<p><i>The following set of indicators may be used to assess student achievement for each corresponding prescribed learning outcome.</i></p> <p><i>Students who have fully met the prescribed learning outcome are able to:</i></p>
<ul style="list-style-type: none"> • compare the structures and behaviours of local animals and plants in different habitats and communities 	<ul style="list-style-type: none"> <input type="checkbox"/> explain in detail why organisms are found in specific local habitats, based on their structures and behaviours <input type="checkbox"/> identify the structural adaptations of two or more organisms <input type="checkbox"/> with teacher support, infer and justify what communities might interact in a particular environment
<ul style="list-style-type: none"> • analyse simple food chains 	<ul style="list-style-type: none"> <input type="checkbox"/> construct and explain the elements of a simple food chain <input type="checkbox"/> interpret population changes from data in one- or two-factor graphs (e.g., rabbit only; rabbit/coyote)
<ul style="list-style-type: none"> • demonstrate awareness of the Aboriginal concept of respect for the environment 	<ul style="list-style-type: none"> <input type="checkbox"/> describe in detail how to show respect for the environment (e.g., clean up school yard, recycle, weed garden) <input type="checkbox"/> create accurate, detailed drawings to illustrate stories that demonstrate the relationship Aboriginal peoples have with the land, water, animals, plants, and sky (e.g., respect for water, earth)
<ul style="list-style-type: none"> • determine how personal choices and actions have environmental consequences 	<ul style="list-style-type: none"> <input type="checkbox"/> document the steps involved in supporting actions that positively affect the school environment (such as those involved in a garbage-less lunch campaign), using detailed checklists, group projects <input type="checkbox"/> prepare and illustrate a simple, local habitat improvement plan that shows which plants and animals benefit from the plan

GRADE 4 PHYSICAL SCIENCE: LIGHT AND SOUND

Key Elements: Physical Science

Estimated Time: 25 – 30 hours

By the end of the grade, students will have described sources and investigated the properties of sound and light.

Light and Sound

Students become familiar with the properties of natural and artificial light by observing how light interacts with various objects in the environment. Through investigations, they gain understanding of light sources. Students discover that light travels in a straight path, and the type of material it strikes determines whether it is absorbed, reflected, or refracted. They also learn that forms of light are either visible or non-visible.

Students explore the properties of sound by discovering how sounds are made, how they change, and how sound travels. Through experimentation with a variety of objects, they discover how different materials transmit, reflect and absorb sound. They produce sounds and control frequency and pitch in the sound made.

Vocabulary

Light - reflect, refract, absorb, transmit, natural, artificial, light beam, transparent, translucent, opaque, spectrum

Sound - vibration, vocal cords, pitch, frequency, loudness, sound waves, reflect, absorb, transmit, echo

Knowledge

- light carries energy
- brighter light carries more energy
- forms of light can be either visible or invisible
- natural and artificial light have measurable properties (e.g., colour, wavelength, brightness)
- light can travel in a straight path (rays)
- light rays change direction (bend, refract) as they pass from one medium to another
- materials may transmit, absorb, or reflect light sound carries energy
- loud sounds carry more energy
- forms of sound can be either audible and inaudible
- sound is caused by vibrations in a medium
- sound can travel through many substances (e.g., air, water, metal)
- the shaking (oscillation) of objects is called vibrating
- vibrations are measured in the number of oscillations per time (called the frequency)
- higher (faster) the frequency corresponds to higher pitch sounds
- lower (slower) the frequency corresponds to lower pitch sounds
- materials may transmit, reflect, or absorb sound (an echo is reflected sound)
- sound travels through gas, liquid, and solids

Skills and Attitudes

- use appropriate vocabulary to describe observations, explorations, and experiments
- predict the results of light and sound experiments
- compile and interpret data to record and present results using tally charts, tables, and graphs
- communicate the procedures and results of investigations by using oral presentations, written notes and descriptions, drawings, and diagrams
- handle a variety of materials safely

GRADE 4 PHYSICAL SCIENCE: LIGHT AND SOUND

Prescribed Learning Outcomes	Suggested Achievement Indicators
<p><i>It is expected that students will:</i></p>	<p><i>The following set of indicators may be used to assess student achievement for each corresponding prescribed learning outcome.</i></p> <p><i>Students who have fully met the prescribed learning outcome are able to:</i></p>
<ul style="list-style-type: none"> • identify sources of light and sound 	<ul style="list-style-type: none"> <input type="checkbox"/> accurately sort various sources of light within their environment as natural or artificial <input type="checkbox"/> relate vibrations to the production of sound (e.g., the human voice relies on the vibrations of vocal cords)
<ul style="list-style-type: none"> • explain properties of light (e.g., travels in a straight path, can be reflected) 	<ul style="list-style-type: none"> <input type="checkbox"/> predict, demonstrate, and report on how light travels in a straight path and through different materials (e.g., reflects, refracts; is transparent, translucent, opaque) <input type="checkbox"/> with teacher support, conduct an experiment to demonstrate how white light can be separated into colours
<ul style="list-style-type: none"> • explain properties of sound (e.g., travels in waves, travels in all directions) 	<ul style="list-style-type: none"> <input type="checkbox"/> demonstrate and report on how various materials will absorb, reflect, or transmit sound <input type="checkbox"/> predict and record changes in vibration and pitch (e.g., by using a ruler) and describe the relationship between pitch and vibration

GRADE 4 EARTH AND SPACE SCIENCE: WEATHER**Key Elements: Earth and Space Science**

Estimated Time: 25 – 30 hours

By the end of the grade, students will have observed and measured weather conditions and analysed their impact on living and non-living things.

Weather

An important part of the study of weather is gaining understanding of the properties of air, its movement, and its ability to hold water. Students study various aspects of weather such as temperature, wind speed, precipitation, air pressure, and clouds, and begin to recognize the role these aspects play in weather systems. Students use appropriate tools and instruments to complete investigations. They investigate basic components of weather through observations, predictions, hypotheses, measurements, and recording data. Students examine the impact of weather on living and non-living things.

Vocabulary

temperature, wind speed, wind direction, water cycle, cloud, evaporation, condensation, precipitation, erosion, barometer, anemometer, thermometer, rain gauge, weather vane

Knowledge

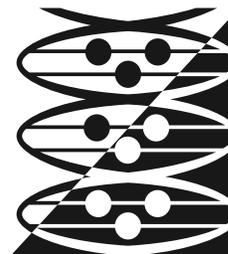
- the surface of the planet Earth is surrounded by a blanket of air called the atmosphere
- most of the Earth's surface is covered by water and circulates through the water cycle
- the Earth's surface is heated by energy from the Sun
- weather conditions that can be observed and/or measured include temperature, wind speed, wind direction, precipitation, air pressure, and cloud formations
- weather conditions affect living things (e.g., growth, behaviour, food, shelter)
- weather conditions (e.g., erosion) affect non-living things

Skills and Attitudes

- observe weather conditions and record using graphs, tables, and charts
- interpret data from recorded observations
- predict weather conditions
- construct simple instruments

GRADE 4 EARTH AND SPACE SCIENCE: WEATHER

Prescribed Learning Outcomes	Suggested Achievement Indicators
<p><i>It is expected that students will:</i></p>	<p><i>The following set of indicators may be used to assess student achievement for each corresponding prescribed learning outcome.</i></p> <p><i>Students who have fully met the prescribed learning outcome are able to:</i></p>
<ul style="list-style-type: none"> • measure weather in terms of temperature, precipitation, cloud cover, wind speed and direction 	<ul style="list-style-type: none"> <input type="checkbox"/> systematically chart daily temperatures using a thermometer <input type="checkbox"/> design, build and test a simple rain gauge, weather vane, and anemometer <input type="checkbox"/> identify, chart, and illustrate daily cloud cover <input type="checkbox"/> make a detailed local weather report based on collected data
<ul style="list-style-type: none"> • analyse impacts of weather on living and non-living things 	<ul style="list-style-type: none"> <input type="checkbox"/> predict and report on how freezing and thawing affect a variety of materials (e.g., water and soil) <input type="checkbox"/> accurately predict and test various materials for water resistance and insulation from cold (e.g., slow down the rate of a melting ice cube) <input type="checkbox"/> research and create a comprehensive report on the effects of erosion, drought, or other local weather impacts (e.g., sand table rivers, effects of run-off)



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
- brainstorming, 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 ASSESSMENT MODEL • Grade 1

GRADE 1 EARTH AND SPACE SCIENCE: DAILY AND SEASONAL CHANGES

Key Elements: Earth and Space Science

E Time: 2 30 s

By the end of the study, students will have demonstrated understanding of changes 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 plants, animals, and human activity. Students discover patterns of weather change during a year by recording daily weather information. Through observation and investigation, students learn that predictable changes occur in daily and seasonal cycles.

Vocabulary
day, time, night, morning, afternoon, evening, days of the week, 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 changes 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

SCIENCE K TO 7 161

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 fully meet 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 objects 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 freezing)
- 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
<ul style="list-style-type: none"> 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 specific 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. Through leaf collecting, picture collages, and word splashes, have students explore 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 quadrants, and one for Daily divided in half. 	<ul style="list-style-type: none"> 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: <ul style="list-style-type: none"> 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. 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

162 SCIENCE K TO 7

CLASSROOM ASSESSMENT MODEL • Grade 1

Daily and Seasonal Changes (continued)

Planning for Assessment	Suggested Assessment Activities
<ul style="list-style-type: none"> Choose one local deciduous tree to observe throughout the year. Take photos and make a pictorial record of the tree in each season. In small groups, have students create seasonal murals or dioramas using pictures, words, and objects from a prepared tub. 	<ul style="list-style-type: none"> 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. When students have created their representations, work together to establish criteria for assessing their work, such as: seasonal murals/dioramas show <ul style="list-style-type: none"> 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)

SCIENCE K TO 7 163

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.

CLASSROOM ASSESSMENT MODEL • Grade 1

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				

166 SCIENCE K TO 7

Assessment Instruments

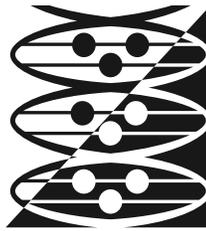
Sample assessment instruments are provided at the end of each unit, and contain criteria specifically keyed to one or more of the suggested assessment activities contained in the unit.

CLASSROOM ASSESSMENT MODEL • Grade 1

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

SCIENCE K TO 7 16



CLASSROOM ASSESSMENT MODEL

Grade 4

ASSESSMENT OVERVIEW TABLE FOR: GRADE 4

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 *		
					K	U & A	HMP
	Average # of hours						
PROCESSES OF SCIENCE	Integrated	Integrated	Integrated	2		1	1
LIFE SCIENCE	25-30	<ul style="list-style-type: none"> • pair/share • summative project • graph • science journal • chart • drawing • oral summary 	33 $\frac{1}{3}$ %	4	1	1	2
PHYSICAL SCIENCE	25-30	<ul style="list-style-type: none"> • science journal • written summary • diagram • model 	33 $\frac{1}{3}$ %	3	1	2	
EARTH AND SPACE SCIENCE	25-30	<ul style="list-style-type: none"> • quiz • chart • written report • oral summary • poster • presentation 	33 $\frac{1}{3}$ %	2		2	
TOTALS	75-90		100 %	11	2	6	3

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

GRADE 4: PROCESSES OF SCIENCE**Key Elements: Processes of Science**

Estimated Time: integrate with other curriculum organizers

Interpreting Data

Interpreting data is a critical-thinking process used by scientific researchers to review the data gathered in the course of an investigation. Scientists explain the data to others and communicate a reasonable explanation about the trends and relationships they see. They also point out any inconsistencies they believe the evidence holds. For the data to be fully analysed in meaningful ways it requires prior scientific knowledge, mathematics, graphing techniques, and clear communication skills. At this stage, it is an extension of the process skills learned earlier – interpreting observations and making inferences (Grade 2). Interpreting data involves identifying patterns, thinking about missing data (errors), questioning if the data fits the estimates, finding one-to-one relations, sorting objects into useful arrangements, explaining the similarities and differences in the data, and summarizing what the facts and data might mean.

Predicting

Predicting involves making an objective guess about a future event, based upon what has been observed in the past and what might be expected to happen. Scientists always test whether their predictions might be correct or not. (Often, mathematics and graphing can be used to *extrapolate* into the future). Predictions should not involve guessing wildly, but should be based on prior knowledge and prior observations. These prior activities often produce questions that engage scientific curiosity. To make predictions that help them explore and test their observations, students must pay close attention to patterns and order within the previous data. They must also rely on all their previously acquired process skills such as measuring, inferring, and questioning to compare their expectations with the observed results. Good predictions seek to logically anticipate how future events might occur. Making a prediction, and determining how to test it with the right question constitute the beginning point for designing later experiments.

Grade 4 Processes of Science

Prescribed Learning Outcomes	Suggested Achievement Indicators
<p><i>It is expected that students will:</i></p>	<p><i>The following set of indicators may be used to assess student achievement for each corresponding prescribed learning outcome.</i></p> <p><i>Students who have fully met the prescribed learning outcome are able to:</i></p>
<ul style="list-style-type: none"> • make predictions, supported by reasons and relevant to the content 	<ul style="list-style-type: none"> <input type="checkbox"/> carefully observe a pattern of events (e.g., changes in vibration, pitch, weather patterns) <input type="checkbox"/> make initial predictions and refine them, based on test results (e.g., path light travels)
<ul style="list-style-type: none"> • use data from investigations to recognize patterns and relationships and reach conclusions 	<ul style="list-style-type: none"> <input type="checkbox"/> gather and correctly organize comprehensive data (e.g., weather charts) <input type="checkbox"/> accurately interpret what a given graph shows using detailed examples

GRADE 4 LIFE SCIENCE: HABITATS AND COMMUNITIES**Key Elements: Life Science**

Estimated Time: 25 – 30 hours

By the end of the grade, students will have understood the structure and interactions of local ecosystems and shown respect for the environment.

Habitats and Communities

The study of habits and communities focuses on how organisms are adapted to an environment and interact with other living and non-living things. Students research or investigate organisms in two or more different habitats and identify which adaptations help organisms survive. The diversity and interactions of the living and non-living things in different habitats and communities can be compared. Students also develop an understanding of food chains. The relationship between humans and their environment is examined with particular emphasis on the relationship that Aboriginal peoples have with the environment.

Vocabulary

habitat, adaptation, population, community, food chain, food web, organism, producer, consumer, herbivore, omnivore, carnivore, predator, prey, scavenger, conservation, threatened, endangered, extinct

Knowledge

- living things find in particular environments the items and conditions that they need to grow and survive
- living things interact with each other in many ways and may depend on each other for food and shelter
- changes in habitat can affect the survival of an individual organism or an entire species
- food chains play an important role in population changes
- human choices and actions have a big impact on the environment

Skills and Attitudes

- observe animals and plants sharing a habitat (e.g., terrarium, aquarium)
- record observations and investigations using a variety of mediums such as journals, words, charts, and graphs
- infer why particular organisms, animals, and plants are able to share a habitat
- predict the effect of a change in the environment to the habitat and the organisms living there
- demonstrate respect for Aboriginal peoples
- demonstrate respect for living things and environments and a commitment for their care

Grade 4 Life Science: Habitats and Communities

Prescribed Learning Outcomes

It is expected that students will:

- compare the structures and behaviours of local animals and plants in different habitats and communities

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:

- explain in detail why organisms are found in specific local habitats, based on their structures and behaviours
- identify the structural adaptations of two or more organisms
- with teacher support, infer and justify what communities might interact in a particular environment

Planning for Assessment	Suggested Assessment Activities
<ul style="list-style-type: none"> • Ask students to sort a variety of pictures into the various habitats (e.g., ocean, prairie, boreal forest, marsh, alpine, tundra, temperate rain forest, desert). Then, have students respond to the question, “What is a habitat?” (e.g., What do plants and animals need to survive). 	<ul style="list-style-type: none"> • Have students pair/share with a partner and tell all they know about the habitat in a given picture. Assess student understanding of <ul style="list-style-type: none"> - temperature - availability of water - light - food - shelter.
<ul style="list-style-type: none"> • Have students examine pictures of plants and animals found in specific habitats. Challenge them to identify structural adaptations that help the plants and animals to survive in a particular habitat (e.g., pine cones store seeds in drought; great blue heron has long legs for wading and long sharp beak for fishing). 	<ul style="list-style-type: none"> • To assess student understanding, create a four-column chart (task/prediction/find out/reason). Indicate that the task is to have them examine their own structural adaptation by taping a thumb to the palm of the same hand and try to tie their shoes or button their shirts. Look for evidence in the chart that they understand the concept of structural adaptation.
<ul style="list-style-type: none"> • Ask students to examine pictures of plants and animals in a variety of habitats, challenging them to think of behavioural adaptations that help the plants and animals to survive (e.g., bear hibernating in winter; tree losing its leaves in winter). 	<ul style="list-style-type: none"> • Have students complete a “Look it Over” chart, with sections on: “What I see/What this tells me.” For example, “I see a squirrel collecting nuts. This tells me the squirrel is saving food for the winter.” In assessing student charts, look for sensible inferences and justifications. Answers may vary according to experiences.
<ul style="list-style-type: none"> • Take students to visit local ecosystems (e.g., tide pools, forests, wetlands) to discover the interactions of organisms that make up communities within a habitat. 	<ul style="list-style-type: none"> • Assess student learning from field trips using pre- and post-trip activities. For example, have students predict and draw what they expect to find in a tide pool/stream. Then, after the field trip, have students draw new pictures to illustrate new insights.

continued next page

Habitats and Communities (continued)

Planning for Assessment	Suggested Assessment Activities
<ul style="list-style-type: none"> • Set up a colony of mealworms, which can be obtained from a pet store or scientific supply company. Encourage students to predict and test the response of organisms to various environmental stimuli (e.g., light, touch, moisture, surface temperature). 	<ul style="list-style-type: none"> • Have students set up humane experiments to test mealworm behaviour (e.g., light and dark, wet and dry). Look for indications that students <ul style="list-style-type: none"> - ask relevant questions - predict, plan, and carry out procedures - collect and interpret data (e.g., If 20 out of 30 mealworms prefer dark conditions, what does this tell about mealworm behaviour?). Data can be graphed over trials and interpreted.
<p>Recommended Learning Resources</p> <ul style="list-style-type: none"> • Critters • Cycle of Life/Recycle Handbook for Educators • Discovering Insects: Ants, Flies, Crickets • Discovering Insects: Defences • Forests in Focus • Habitats • Hands-on Science (Habitats and Communities) • Healthy Habitats (Pan Canadian Science Place) • Kokanee of British Columbia • The Lives of Ants & Bees for Students Series (Ant Bodies, Ant homes & Communities, Bees & Plants) • Once Upon a Seashore • Project WET • Project WILD • Salish Sea • Salmonids in the Classroom • Science and Technology 4 (Habitats) • Science Detective™ Beginning: Higher-Order Thinking, Reading, Writing in Science • Urban Stewards • The Watershed Works 	

Grade 4 Life Science: Habitats and Communities

Prescribed Learning Outcomes	
<p><i>It is expected that students will:</i></p> <ul style="list-style-type: none"> • analyse simple food chains 	
Suggested Achievement Indicators	
<p><i>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:</i></p> <ul style="list-style-type: none"> <input type="checkbox"/> construct and explain the elements of a simple food chain <input type="checkbox"/> interpret population changes from data in one- or two-factor graphs (e.g., rabbit only; rabbit/coyote) 	
Planning for Assessment	Suggested Assessment Activities
<ul style="list-style-type: none"> • Have students examine food chains (e.g., plants, earthworm, mole, owl) and identify producer and consumer. They should identify consumers as herbivores, carnivores, and omnivores; and carnivores as predators or scavengers. 	<ul style="list-style-type: none"> • Ask students to use picture cards to build as many different food chains as possible, and explain how the food chains work. Look for correct use of vocabulary, logical links in the chain based on knowledge or inference (e.g., “I know coyotes eat mice, so I think foxes do too.”). Challenge students to make more than simple one-to-one links (e.g., fox eats rabbit too).
<ul style="list-style-type: none"> • Conduct an environmental simulation (e.g., Ecosystem Tag). Collect the results for graphing, and discuss population trends that could include endangerment and extinction. • Alternatively, in a tag game, assign students different animals in a given local ecosystem. Different coloured tokens (e.g., multilink cubes) represent different components of surviving in that ecosystem (food, water, shelter, reproduction). Values for tokens (e.g., how many green cubes = a good season of eating) are assigned to indicate if the “animal” survives. Such games can be modified to be simple or more complex. 	<ul style="list-style-type: none"> • Look for evidence that students can interpret the class graph. Can students <ul style="list-style-type: none"> - infer what the graph shows? - make predictions about future population trends, based on the graph?

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*Habitats and Communities (continued)***Recommended Learning Resources**

- Critters
- Cycle of Life/Recycle Handbook for Educators
- Discovering Insects: Ants, Flies, Crickets
- Discovering Insects: Defences
- Forests in Focus
- Hands-on Science (Habitats and Communities)
- Healthy Habitats (Pan Canadian Science Place)
- Kokanee of British Columbia
- Once Upon a Seashore
- Project WET
- Project WILD
- Salish Sea
- Salmonids in the Classroom
- Science and Technology 4 (Habitats)
- Science Detective™ Beginning: Higher-Order Thinking, Reading, Writing in Science
- Thinking Connections: Concept Maps for Life Science
- Urban Stewards
- The Watershed Works

Grade 4 Life Science: Habitats and Communities

Prescribed Learning Outcomes

It is expected that students will:

- demonstrate awareness of the Aboriginal concept of respect for the 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:

- describe in detail how to show respect for the environment (e.g., clean up school yard, recycle, weed garden)
- create accurate, detailed drawings to illustrate stories that demonstrate the relationship Aboriginal peoples have with the land, water, animals, plants, and sky (e.g., respect for water, earth)

Planning for Assessment

Suggested Assessment Activities

- Invite a local First Nations person to share an experience on how his or her culture shows respect for the environment. Students can compare this experience to their own, or suggest examples of how they are showing respect in other ways, in the community or in school. Contact the district Aboriginal Education coordinator or resource teacher for assistance in drawing on the local Aboriginal community.

- Review skills and attitudes related to invited guests, such as SWIM:
 - Sit up
 - Watch the speaker
 - Inquire (ask yourself what the speaker is saying)
 - Make connections with what you know already.
- Observe the extent to which students use LAPS strategy while listening to the speaker:
 - Listen
 - Ask yourself questions
 - Picture (draw) what you hear
 - Summarize (retell) what you heard.

- Read stories that demonstrate the relationship First Nations people have with the land, water, animals, plants, and the sky.

- Ask students to respond to the stories in their journals and reflect on ways they show respect for their own environment. Establish assessment criteria with students, such as students
 - select a relationship they have with any three of land, water, animal, plant, sky
 - tell how they personally show respect for each of their choices
 - indicate how their behaviour is similar to or different from the First Nations stories they read and wrote about.

Recommended Learning Resources

- Cycle of Life/Recycle Handbook for Educators
- Healthy Habitats (Pan Canadian Science Place)
- Once Upon a Seashore
- Project WET
- Salish Sea
- The Watershed Works

Grade 4 Life Science: Habitats and Communities

Prescribed Learning Outcomes

It is expected that students will:

- determine how personal choices and actions have environmental consequences

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:

- document the steps involved in supporting actions that positively affect the school environment (such as those involved in a garbage-less lunch campaign), using detailed checklists and various group projects
- prepare and illustrate a simple, local habitat improvement plan that shows which plants and animals benefit from the plan

Planning for Assessment

- Ask students to suggest possible actions that would improve their environment. They should identify any benefits and challenges associated with each action. For example, if the proposal was to add more plants to the schoolyard, student plans could look like the following:

Action	Benefits	Challenges
Schoolyard garden		
Classroom composting	Reduce classroom waste	Get <ul style="list-style-type: none"> • composter • worms • permission
Recycling		

Suggested Assessment Activities

- Look for evidence that student habitat action plans
 - are manageable
 - include the information needed to complete and sustain the project
 - present solutions to challenges
 - show indicators of success
 - indicate how each group will work together.
 -

Recommended Learning Resources

- Backyard Biodiversity and Beyond
- Cycle of Life/Recycle Handbook for Educators
- Hands-on Science (Habitats and Communities)
- Healthy Habitats (Pan Canadian Science Place)
- Kokanee of British Columbia
- Once Upon a Seashore
- Project WET
- Project WILD
- Salish Sea
- Science Detective™ Beginning: Higher-Order Thinking, Reading, Writing in Science
- Urban Stewards
- The Watershed Works

GRADE 4 PHYSICAL SCIENCE: LIGHT AND SOUND

Key Elements: Physical Science

Estimated Time: 25 – 30 hours

By the end of the grade, students will have described sources and investigated the properties of sound and light.

Light and Sound

Students become familiar with the properties of natural and artificial light by observing how light interacts with various objects in the environment. Through investigations, they gain understanding of light sources. Students discover that light travels in a straight path, and the type of material it strikes determines whether it is absorbed, reflected, or refracted. They also learn that forms of light are either visible or non-visible.

Students explore the properties of sound by discovering how sounds are made, how they change, and how sound travels. Through experimentation with a variety of objects, they discover how different materials transmit, reflect and absorb sound. They produce sounds and control frequency and pitch in the sound made.

Vocabulary

Light - reflect, refract, absorb, transmit, natural, artificial, light beam, transparent, translucent, opaque, spectrum

Sound - vibration, vocal cords, pitch, frequency, loudness, sound waves, reflect, absorb, transmit, echo

Knowledge

- light carries energy
- brighter light carries more energy
- forms of light can be either visible or invisible
- natural and artificial light have measurable properties (e.g., colour, wavelength, brightness)
- light can travel in a straight path (rays)
- light rays change direction (bend, refract) as they pass from one medium to another
- materials may transmit, absorb, or reflect light sound carries energy
- loud sounds carry more energy
- forms of sound can be either audible and inaudible
- sound is caused by vibrations in a medium
- sound can travel through many substances (e.g., air, water, metal)
- the shaking (oscillation) of objects is called vibrating
- vibrations are measured in the number of oscillations per time (called the frequency)
- higher (faster) the frequency corresponds to higher pitch sounds
- lower (slower) the frequency corresponds to lower pitch sounds
- materials may transmit, reflect, or absorb sound (an echo is reflected sound)
- sound travels through gas, liquid, and solids

Skills and Attitudes

- use appropriate vocabulary to describe observations, explorations, and experiments
- predict the results of light and sound experiments
- compile and interpret data to record and present results using tally charts, tables, and graphs
- communicate the procedures and results of investigations by using oral presentations, written notes and descriptions, drawings, and diagrams
- handle a variety of materials safely

Grade 4 Physical Science: Light and Sound

Prescribed Learning Outcomes

It is expected that students will:

- identify sources of light and sound

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 sort various sources of light within their environment as natural or artificial
- relate vibrations to the production of sound (e.g., the human voice relies on the vibrations of vocal cords)

Planning for Assessment

- Take a short indoor/outdoor field trip to identify sources of light (e.g., overhead/hall lighting; Sun, traffic lights, exit signs, fire). Ask student to sort and classify into artificial or natural light sources.

- Ask students to close their eyes for one minute, and listen to identify all sources of sound, both indoors and outdoors. They should record observations in their journals.
- Place a 30cm ruler over the edge of the desk, and “twang” the ruler to demonstrate that vibration produces sound. Then have students suggest other examples of vibration (e.g., vocal cords, elastic bands, guitar).

Suggested Assessment Activities

- Have students keep an ongoing science journal where they reflect on what they have learned about light and sound, and make suggestions about how they could apply and extend their knowledge. Provide criteria such as the following:
 - Three things I learned
 - How I could use this information
 - Questions I have/things I wonder about
 - Experiments or activities that might help me learn more.

- Have students start a three-part approach “dictionary” to keep track of new vocabulary, such as the following:

word	means	diagram
vibration	back and forth movement that produces sounds	
frequency	how many vibrations per second	

Encourage students to maintain their dictionaries throughout the unit. Assess regularly, looking for

- clear diagrams
- good choice of synonym
- clear explanations.

Recommended Learning Resources

- Colour in Science
- Hands-on Science (Light)
- Hands-on Science (Sound)
- Primarily Physics – Investigations in Sound, Light and Heat Energy (AIMS Activities)
- Science & Technology 4 (Light)
- Science & Technology 4 (Sound)
- Science, Please! (Parts 1 & 2)
- Sound and Light (Pan Canadian Science Place)

Grade 4 Physical Science: Light and Sound

Prescribed Learning Outcomes

It is expected that students will:

- explain properties of light (e.g., travels in a straight path, can be reflected)

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:

- predict, demonstrate, and report on how light travels in a straight path and through different materials (e.g., reflects, refracts; is transparent, translucent, opaque)
- with teacher support, conduct an experiment to demonstrate how white light can be separated into colours

Planning for Assessment

Suggested Assessment Activities

- Hole punch the centre of two index cards. On a third card, mark a bulls eye in the centre. Line up the cards 30cm apart, and anchor them upright in modelling clay so that the two holes are lined up with the centre of the bull's eye. Ask students to predict the path light will travel. Darken the room. Have a student shine a flashlight through the punched holes. Record the path light travels. (e.g., Does the light hit the bulls eye?)
- Ask students to place a pencil in the centre of a clear glass of water, and observe what happens. Students should infer how light behaves when it passes through two media (light bends, refracts).
- Introduce the concepts of transparent, translucent, and opaque by having students sort a collection of materials (e.g., different types of paper; clear plastic bags, water bottles).

- Have students complete an entry in their science journals that includes
 - their predictions
 - labelled diagrams
 - what they observed
 - how this compared to their predictions
 - what this means about how light travels.
- Remind students to update their three-part-approach dictionaries.
- Challenge students to group the objects according to how or whether light passes through them. Ask students to record observations in a chart of their own making. After completing the chart, have students define each of: transparent, translucent, opaque in their own words/diagrams.

- Using a prism to separate white light, have students identify the colours of the spectrum and record their observations. (If no prisms are available, the shiny face of a CD can catch and separate the spectrum for viewing.)

- Ask students to create an ordered spectrum diagram and label observations. Encourage students to make connections to real-world observations of natural light (e.g., rainbows). Check diagrams for accuracy of their actual colour observations.

Recommended Learning Resources

- Colour in Science
- Hands-on Science (Light)
- Primarily Physics – Investigations in Sound, Light and Heat Energy (AIMS Activities)
- Science Answers
- Science & Technology 4 (Light)
- Science, Please! (Parts 1 & 2)
- Sound and Light (Pan Canadian Science Place)

Grade 4 Physical Science: Light and Sound**Prescribed Learning Outcomes**

It is expected that students will:

- explain properties of sound (e.g., travels in waves, travels in all directions)

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:

- demonstrate and report on how various materials will absorb, reflect, or transmit sound
- predict and record changes in vibration and pitch (e.g., by using a ruler) and describe the relationship between pitch and vibration

Planning for Assessment	Suggested Assessment Activities
<ul style="list-style-type: none"> • Have student pairs explore how sound travels through solids, liquids, and gases by strumming the teeth of a comb in air, against a table and in a container of H₂O. Students should listen and record observations. • In groups, have students pick an object that makes a sound (e.g., alarm clock, small bell). Challenge students to amplify and then absorb the sound (e.g., alarm clock in a coffee can or insulated by newspaper). 	<ul style="list-style-type: none"> • Ask students to collect and interpret data in their science journals. Ensure that student journals <ul style="list-style-type: none"> - accurately use appropriate vocabulary (e.g., amplify, absorb) - demonstrate understanding of techniques of amplification and absorption - tell what was learned - extend knowledge to identify other examples of amplification and absorption.
<ul style="list-style-type: none"> • Make part of a musical scale by striking glass bottles containing varying amounts of water. Ask students to note changes in pitch and tone. • Challenge students to design and build musical instruments (e.g., pencil box guitar with rubber bands, pan-pipe straws, plastic tub drums with balloon skins). • Construct a glass water harmonica (singing wine glasses), which produces a range of sounds. 	<ul style="list-style-type: none"> • Ensure that students can predict and identify which ones will produce the highest and lowest pitch. • Work with students to develop criteria to assess musical instruments, such as <ul style="list-style-type: none"> - chose appropriate materials - demonstrated change of pitch and loudness - explained where the sound vibrations came from - indicated ways to improve the design - demonstrated how to maintain consistent note playing with pitch accuracy.
Recommended Learning Resources <ul style="list-style-type: none"> • Hands-on Science (Sound) • Primarily Physics – Investigations in Sound, Light and Heat Energy (AIMS Activities) • Science Answers • Science & Technology 4 (Sound) • Science, Please! (Parts 1 & 2) • Sound and Light (Pan Canadian Science Place) 	

GRADE 4 EARTH AND SPACE SCIENCE: WEATHER**Key Elements: Earth and Space Science**

Estimated Time: 25 – 30 hours

By the end of the grade, students will have observed and measured weather conditions and analysed their impact on living and non-living things.

Weather

An important part of the study of weather is gaining understanding of the properties of air, its movement, and its ability to hold water. Students study various aspects of weather such as temperature, wind speed, precipitation, air pressure, and clouds, and begin to recognize the role these aspects play in weather systems. Students use appropriate tools and instruments to complete investigations. They investigate basic components of weather through observations, predictions, hypotheses, measurements, and recording data. Students examine the impact of weather on living and non-living things.

Vocabulary

temperature, wind speed, wind direction, water cycle, cloud, evaporation, condensation, precipitation, erosion, barometer, anemometer, thermometer, rain gauge, weather vane

Knowledge

- the surface of the planet Earth is surrounded by a blanket of air called the atmosphere
- most of the Earth's surface is covered by water and circulates through the water cycle
- the Earth's surface is heated by energy from the Sun
- weather conditions that can be observed and/or measured include temperature, wind speed, wind direction, precipitation, air pressure, and cloud formations
- weather conditions affect living things (e.g., growth, behaviour, food, shelter)
- weather conditions (e.g., erosion) affect non-living things

Skills and Attitudes

- observe weather conditions and record using graphs, tables, and charts
- interpret data from recorded observations
- predict weather conditions
- construct simple instruments

Grade 4 Earth and Space Science: Weather

Prescribed Learning Outcomes	
<p><i>It is expected that students will:</i></p> <ul style="list-style-type: none"> • measure weather in terms of temperature, precipitation, cloud cover, wind speed and direction 	
Suggested Achievement Indicators	
<p><i>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:</i></p> <ul style="list-style-type: none"> <input type="checkbox"/> systematically chart daily temperatures using a thermometer <input type="checkbox"/> design, build and test a simple rain gauge, weather vane, and anemometer <input type="checkbox"/> identify, chart, and illustrate daily cloud cover <input type="checkbox"/> make a detailed local weather report based on collected data 	
Planning for Assessment	Suggested Assessment Activities
<ul style="list-style-type: none"> • Brainstorm the basic elements of weather, and review the water cycle. Then start a word wall. 	<ul style="list-style-type: none"> • Pre-test knowledge of the water cycle by having students (individually or in small groups) label a simple drawing with relevant vocabulary (e.g., precipitation, condensation, evaporation). Students could begin a 3-point approach (drawing/word/definition) dictionary to keep track of weather words. Assess student drawings and dictionaries for completeness, accuracy, and relevance.
<ul style="list-style-type: none"> • Introduce students to safe use of thermometers, and have them practise reading thermometers placed in different water temperatures. 	<ul style="list-style-type: none"> • Over a week, ask students to individually demonstrate <ul style="list-style-type: none"> - safe handling of a thermometer they move between containers of warm and cold water - ability to read resulting temperatures. See the sample assessment tool (Thermometer Use) provided at the end of this grade.
<ul style="list-style-type: none"> • Develop a class chart for keeping track of daily weather, including <ul style="list-style-type: none"> - temperature - precipitation - wind direction - cloud cover - prediction of tomorrow’s weather. • Have students construct and test weather instruments and record findings, which could be used in a class weather station. Include <ul style="list-style-type: none"> - rain gauge - wind vane (wind direction) - anemometer (wind speed) - cloud identification. 	<ul style="list-style-type: none"> • Establish with students expectations for filling in the weather chart and use of weather instruments <ul style="list-style-type: none"> - clarity and accuracy of observations and measurements - daily entries for all categories - reasonable predictions - organization of observations.

continued next page

Planning for Assessment	Suggested Assessment Activities
<ul style="list-style-type: none"> • In pairs, have students make a cloud model, answer questions, and record observations <ol style="list-style-type: none"> 1. Pour a cup of hot water into a clear glass jar. 2. Put ice in an aluminium pie pan. Cover the top of the bottle with the pan. 3. What is happening inside the bottle? What is happening on the bottom of the pie pan? Record observations. 4. Repeat the experiment. This time, instead of ice put warm water in the pan. • Have student pairs discuss <ul style="list-style-type: none"> - What caused the change on the bottom of the pie pan? - When did “liquid” water change to water vapour? <p>Then have them predict and test the change in one variable. (Alternatively, demonstrate this activity for the class.)</p> 	<ul style="list-style-type: none"> • Have each student pair label and present to the class a diagram (poster, overhead) of what they learned about cloud formation. Assess student diagrams to ensure that they are clear and easy to follow, and that they include the main steps in the process.
<ul style="list-style-type: none"> • Have students examine weather reports from various media (e.g., TV, newspaper, Internet, radio). Then ask students to prepare their own weather reports with themselves as meteorologist. 	<ul style="list-style-type: none"> • Student weather reports should <ul style="list-style-type: none"> - include current data - use all the categories of the class weather chart - provide a forecast for upcoming weather. <p>Encourage students to report daily weather conditions to a broadcast program such as Skywatchers.</p>
<p>Recommended Learning Resources</p> <ul style="list-style-type: none"> • Discovery Works for Grade 4: Unit E – Weather and Climate • Exploring the Atmosphere: Meteorology in Canada • Hands-on Science (Weather) • Introduction to the Water Cycle • Science Detective™ Beginning: Higher-Order Thinking, Reading, Writing in Science • Science & Technology 5 (Weather) • Science, Please! (Part 2) • Weather & Climate • Weather and Climate 	

Grade 4 Earth and Space Science: Weather

Prescribed Learning Outcomes

It is expected that students will:

- analyse impacts of weather on living and non-living things

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:

- predict and report on how freezing and thawing affect a variety of materials (e.g., water and soil)
- accurately predict and test various materials for water resistance and insulation from cold (e.g., slow down the rate of a melting ice cube)
- research and create a comprehensive report on the effects of erosion, drought, or other local weather impacts (e.g., sand table rivers, effects of run-off)

Planning for Assessment

- Pick unusual weather conditions and have students role play their effects on living things (e.g., hurricane, tornado, flood, blizzard).
- Have students test the effects of freezing and thawing by completely filling a small plastic water bottle with water and placing in a freezer. Ask them to predict, observe, and record what happens.
- Test for the effects of drought by having students select and plant and observe the effects of little or no water. Record observations, and predict what the long-term effects might be.
- Test for the effects of erosion by having students compare areas of the schoolyard (or a nearby field) that are only dirt-covered and those that are grass-covered, after a rainfall.

- Have students collect samples of fabric, and predict on a scale of 1-3 which ones might be water resistant. Then ask students to test predictions. Discuss the qualities of cloth that seem to be water resistant (e.g., plastic backing on a piece of table cloth).

Suggested Assessment Activities

- Assess student inferences connecting the investigations in this unit with weather-related events (e.g., bursting pipes, potholes, browned-out lawns, crop failures, rockslides) by completing a T-chart: “What I see, What this tells me.” Encourage students to use personal experiences and/or picture collections.

Look for explanations that

- show accurate observations
- show reasonable inferences
- use appropriate vocabulary.

- Challenge students to design an outfit for a snowperson so that there is no melting. Look for evidence that students
 - justify choice of materials
 - develop appropriate designs
 - are open to suggestions for improvement.

Recommended Learning Resources

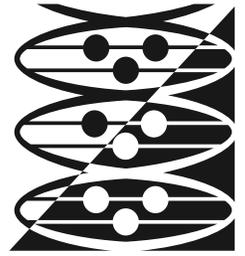
- Exploring the Atmosphere: Meteorology in Canada
- Hands-on Science (Weather)
- Introduction to the Water Cycle
- Project WET
- Science Detective™ Beginning: Higher-Order Thinking, Reading, Writing in Science
- Science, Please! (Part 2)
- Weather & Climate
- Weather and Climate

THERMOMETER USE

Name of student: _____ Date: _____

Use a rating scale such as the following to record individual student achievement/understanding.

Criteria — student is able to:	not yet within expectations	meets expectations	fully meets expectations	exceeds expectations
verbally describe parts of a thermometer				
verbally identify the thermometer as a tool for taking temperature readings				
verbally explain what temperature is				
show correct way to place thermometer in containers of hot/warm and cold water				
handle thermometer and hot water with care and attention, keeping self and others safe				
read numbers corresponding to temperature with a good degree of accuracy				
verbally explain the idea of minus (negative) numbers in relation to temperature				



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.

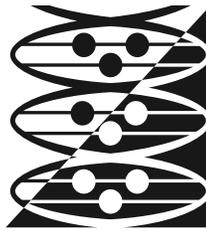
Web Sites

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.

	<i>Audio Cassette</i>
	<i>CD-ROM</i>
	<i>DVD</i>
	<i>Film</i>
	<i>Games/Manipulatives</i>
	<i>Kit</i>
	<i>Multimedia</i>
	<i>Music CD</i>
	<i>Print Materials</i>
	<i>Print Series</i>
	<i>Record</i>
	<i>Slides</i>
	<i>Software</i>
	<i>Video</i>
	<i>Video Series</i>
	<i>Web Site</i>



LEARNING RESOURCES

Grade 4

**SCIENCE – GRADE 4
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
	<i>Habitats and Communities</i>	<i>Light and Sound</i>	<i>Weather</i>
Comprehensive Resources			
There are no comprehensive resources for Grade 4 Science			
Additional Resources – Print			
Backyard Biodiversity and Beyond, 1999 Edition	✓		
Critters (AIMS Activities)	✓		
Cycle of Life/Recycle Handbook for Educators			
Discovering Insects: Ants, Flies, Crickets	✓		
Discovery Works for Grade 4: Unit E – Weather and Climate			✓
Forests in Focus	✓		
Hands-On Science: Habitats and Communities	✓		
Hands-On Science: Light		✓	
Hands-On Science: Sound		✓	
Hands-On Science: Weather			
Healthy Habitats (Pan Canadian Science Place)			
Kokanee of British Columbia	✓		
Once Upon a Seashore			
Primarily Physics – Investigations in Sound, Light and Heat Energy (AIMS Activities)			
Project WET			✓
Project WILD	✓		
Salish Sea			
Salmonids in the Classroom	✓		
Science Detective™ Beginning: Higher-Order, Thinking, Reading, Writing in Science	✓		
Sound and Light (Pan Canadian Science Place)			
Thinking Connections: Concepts Maps for Life	✓		

 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.

LEARNING RESOURCES • *Grade Collection — Grade 4*

	Life Science	Physical Science	Earth and Space Science
	<i>Habitats and Communities</i>	<i>Light and Sound</i>	<i>Weather</i>
Additional Resources – Print (con't.)			
Urban Stewards	✓		
The Watershed Works			
Additional Resources – Print Series			
Science Answers Series		✓	
Science & Technology 4	✓	✓	
Science & Technology 5 (Weather)			✓
Additional Resources – Video/DVD			
Discovering Insects: Defences	✓		
Exploring the Atmosphere: Meteorology in Canada			✓
Habitats	✓		
Introduction to the Water Cycle			✓
Science, Please!		✓	✓
Weather and Climate			✓
Weather & Climate			✓
Additional Resources – Video Series			
The Lives of Ants & Bees for Students Series	✓		
Additional Resources – Kit			
British Columbia's Mountain Pine Beetle	✓		✓



Backyard Biodiversity and Beyond, 1999 Edition

Author(s): *Dulc, S. et al.*

General Description:

BC produced teacher resource has been revised and is now coil bound. Contains background information and student activities around the topic of biodiversity. It features native flora and fauna, as well as biodiversity issues and success stories. The booklet contains six modules and 150+ pages of instructional activities.

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: 0-7726-3954-X

Copyright: 1999

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



Critters (AIMS Activities)

General Description:

Book investigates a variety of 'critters,' including insects, spiders, mealworms, earthworms, snails, silkworms, and isopods, 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: 1-881431-23-1/20137

Copyright: 1992

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 Insects: Ants, Flies, Crickets

Author(s): *Brillon, G.*

General Description:

Book introduces ants, flies, and crickets, and addresses how to catch, house, and care for them. Includes various related activities.

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: 2-89435-010-4

Copyright: 1994

Year Recommended in Grade Collection: 2005



Discovering Insects: Defences

General Description:

This video investigates defense mechanisms in insects and shows examples of active and passive defense strategies.

Audience: *General*

ESL - intermediate to advanced language proficiency; appropriate pacing; visual and oral cues correspond; descriptive; specialized vocabulary may require explanation

Category: *Student, Teacher Resource*

Grade Level:

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

Supplier: *Encyclopedia Britannica Educ. Corp.*

310 South Michigan
Chicago, IL 60604

Telephone: (312) 347-7900 ext. 6464

Fax: (312) 347-7903

Toll Free: (800) 554-9862 (orders)

Price: Check with supplier

ISBN/Order No: Not available

Copyright: 1988

Year Recommended in Grade Collection: 2005



Discovery Works for Grade 4: Unit E - Weather and Climate

General Description:

This 41-page student booklet moderately investigates weather and climate. It fully meets the Grade 4 curriculum, but only slightly addresses impacts of weather conditions. Each chapter contains relevant knowledge and hands-on activities. Throughout this booklet scientific processes are stressed.

Caution: *Some pages are dense with text and the amount of technical vocabulary may overwhelm some students. Glossary is difficult to use, i.e., reference to 'DSI' means looking in another book.*

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: 0-618-00256-1

Copyright: 2003

Year Recommended in Grade Collection: 2005



Exploring the Atmosphere: Meteorology in Canada

General Description:

This 23-minute video traces the historical development of meteorology in Canada, focussing on the study of the ozone layer. It explains the reasons for weather observations and the advances made in technology.

Audience: *General*

Category: *Student, Teacher Resource*

Grade Level:

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

Supplier: *McNabb and Connolly*

60 Briarwood Avenue
Mississauga, ON L5G 3N6

Telephone: (905) 278-0566

Fax: (905) 278-2801

Web Address: www.mcnabbconnolly.ca

Price: Check with supplier

ISBN/Order No: Not available

Copyright: 1989

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



Habitats

General Description:

This well-paced 15-minute video and support package presents an overview of the world's habitats: polar, tundra, temperate, coniferous and deciduous forest, desert, fresh and salt water. Each habitat presented shows the dominant plants and different animals which are adapted to varied conditions. Age appropriate references and maps are incorporated. A support package with comprehension and assessment is included.

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: 1-2283 F-1#60

Copyright: 1999

Year Recommended in Grade Collection: 2005



Hands-On Science: Habitats and Communities

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

General Description:

This 75-page teacher resource is well organized and creates a balance between knowledge, investigation, and applications of science processes of predicting and interpreting data. Background information is provided, activities are age/grade appropriate and engaging. It provides scope for different learning styles, and as well, provides black and white diagrams, assessment strategies, and rubrics.

Caution: *Does not address Aboriginal content/roles/context.*

Audience: *General*

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: 1-894110-61-7

Copyright: 2001

Year Recommended in Grade Collection: 2005



Hands-On Science: Light

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

General Description:

This 52-page teacher resource contains eight units/modules which address the properties of light. Each unit contains activities, investigations, and applications of science which are age/grade/topic appropriate. Assessment strategies and indicators are present. Science background information, annotated web site, and extensions are included in this resource.

Caution: *This resource is 'light' only. Visuals, diagrams and master are black and white only.*

Audience: *General*

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: 1-894110-63-3

Copyright: 2001

Year Recommended in Grade Collection: 2005



Hands-On Science: Sound

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

General Description:

This 59-page teacher resource is divided into 11 modules designed for classroom implementation. Modules include knowledge and applications. Investigations emphasize the science process for this grade level. Blackline masters and diagrams support learning activities. Assessment activities and strategies follow investigations. Teacher background references and annotated web sites are included.

Caution: *Does not cover Light part of Prescribed Learning Outcomes.*

Audience: *General*

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: 1-894110-65-X

Copyright: 2001

Year Recommended in Grade Collection: 2005



Hands-On Science: Weather

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

General Description:

This 80-page teacher resource is arranged into a 12 unit format which allows teachers to plan and implement investigations, activities, and test which match the Grade 5 curriculum for weather. Many activities are adaptable to different learning styles, independent, or cooperative learning. Assessment strategies and rubrics are provided for each unit. Background information, teacher reference, and annotated web sites are provided.

Audience: *General*

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: 1-894110-79-X

Copyright: 2001

Year Recommended in Grade Collection: 2005



Healthy Habitats (Pan Canadian Science Place)

General Description:

The 48-page student text and 108-page teacher's guide investigate topics prescribed in the Grade 4 learning outcomes for Habitats and Communities. Processes of sciences, predicting, and interpreting, are addressed in hands-on activities. Aboriginal content is embedded in the teacher's guide.

Caution: *The text is most useful and effective when used with teacher's guide.*

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: 0-7791-0045-X

Teacher's Guide: 0-7791-3502-4

Program and Assessment Guide:
0-7791-0093-X

Copyright: 2005

Year Recommended in Grade Collection: 2005



Introduction to the Water Cycle

General Description:

Thirty-minute video illustrates the many different ways that water is recycled. It defines condensation, evaporation, and precipitation, demonstrating how sun and wind are major factors affecting the water cycle.

Audience: *General*

ESL - intermediate to advanced language proficiency; requires pre-teaching of vocabulary and concepts

Category: *Student, Teacher Resource*

Grade Level:

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

Supplier: *Encyclopedia Britannica Educ. Corp.*

310 South Michigan
Chicago, IL 60604

Telephone: (312) 347-7900 ext. 6464

Fax: (312) 347-7903

Toll Free: (800) 554-9862 (orders)

Price: Check with supplier

ISBN/Order No: Not available

Copyright: 1988

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



The Lives of Ants & Bees for Students Series

General Description:

Three 10- to 11-minute videos which explore the body structures of ants and bees and shows their social behaviour and life cycles. The segment on the ant uses computerized 3D images. The symbiotic relationship between the bees and the plants is outlined. On-line resources are available for use once this series is purchased.

Caution: *One interview with the scientists may be a little hard to understand due to regional accents. The quality of the on-line component is unknown as access was not available to the review team.*

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: Videos: \$89.00 each
or \$249.00 for all three

ISBN/Order No: Ant Bodies: 73418-HAVTX
Ant Homes & Communities:
73419-HAVTX
Bees & Plants: 73420-HAVTX

Copyright: 2004

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



Primarily Physics - Investigations in Sound, Light and Heat Energy (AIMS Activities)

General Description:

Book investigates sound, light, and heat energy through 26 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: 1-881431-46-0/20125

Copyright: 1994

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 Answers Series

Author(s): *Cooper, C.*

General Description:

These are 32-page student booklets which focus on light and sound, and forces and motion. They are age/grade appropriate, include current science content, as well as hands-on investigations which emphasize the scientific processes at this grade level.

Caution: *Measurements are given in both Metric and Imperial standards.*

Audience: *General*

Gifted - could easily be used independently, thoughtful and clever activities

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: Not available

ISBN/Order No: Forces and Motion: From Push to Shove: 1-4034-3548-0

Light: From Sun to Bulbs:
1-4034-3550-2

Sound: From Whisper to Rock Band:
1-4034-3553-7

Copyright: 2004

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



Science & Technology 4

Author(s): *Campbell, S. et al.*

General Description:

Science & Technology 4 is comprised of three student booklets and accompanying teacher guides: *Habitats, Sound* and *Light*. The visuals are bright, the applications are innovative, and are within the capabilities of this age/grade level. The Science is accurate and well presented. This resource is well-adapted to multi-learning styles.

Audience: *General*

Category: *Student, Teacher Resource*

Grade Level:

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

Supplier: *Pearson Education Canada*

26 Prince Andrew Place
Don Mills, ON M3C 2T8

Telephone: (416) 447-5101

Fax: 1-800-563-9196

Toll Free: 1-800-387-8028/7851

Web Address: www.pearsoned.ca

Price: Not available

ISBN/Order No: Student Text: Various
Teacher's Guide: Various

Copyright: 2000

Year Recommended in Grade Collection: 2005



Science & Technology 5

Author(s): *Campbell, S. et al.*

General Description:

The student booklet and teacher resource are well organized, with appropriate visuals that promote a good balance between knowledge and applications. Titles include: *Forces on Structures, The Human Body* (for Grade 5), and *Weather* (for Grade 4). This resource is flexible, could be used as a whole or in part, depending on classroom needs. Many hands-on and stimulating activities in a well organized format.

Audience: *General*

Category: *Student, Teacher Resource*

Grade Level:

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

Supplier: *Pearson Education Canada*

26 Prince Andrew Place
Don Mills, ON M3C 2T8

Telephone: (416) 447-5101

Fax: 1-800-563-9196

Toll Free: 1-800-387-8028/7851

Web Address: www.pearsoned.ca

Price: Not available

ISBN/Order No: Student Text: Various
Teacher's Guide: Various

Copyright: 2000

Year Recommended in Grade Collection: 2005



Sound and Light (Pan Canadian Science Place)

General Description:

This 48-page student book and accompanying teacher's guide cover the learning outcomes for Grade 4 Physical Science.

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: 0-7791-3503-2
Teacher's Guide: 0-7791-3504-0
Program and Assessment Guide: 0-7791-0093-X

Copyright: 2005

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



Urban Stewards

Author(s): *Keetch, T.*

General Description:

Engages students in stimulating hands-on science and environmental education activities 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



Weather and Climate

General Description:

This 15-minute video and support package visually addresses age and grade learning outcomes for weather. Key terms and concepts are clearly presented in an engaging manner. Science vocabulary and diagrams are accurate and clearly explained. Extreme weather conditions are highlighted with easily understood explanations.

Caution: *Imperial and Metric measurements appear. American locations sometimes used.*

Audience: *General*

Category: *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: 1-2284F-1#49

Copyright: 1999

Year Recommended in Grade Collection: 2005



Weather & Climate

General Description:

This 12-minute video covers the knowledge content of weather in an engaging age/grade appropriate manner. Visuals are accurate, diagrams extend knowledge, and are easily understood. Narration is lively and promotes scientific interest in this topic. Support material is reproducible print.

Caution: *Imperial measure is coupled with Metric.*

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

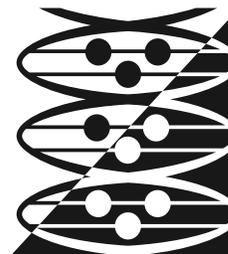
Web Address: www.bclc.bc.ca

Price: \$26.00

ISBN/Order No: SC0337

Copyright: 2000

Year Recommended in Grade Collection: 2005



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

- McGraw-Hill Ryerson
- Scholastic Canada Ltd.
- Thomson Nelson.

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 detritivores.

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.

N

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.

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.

S

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.

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 through 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 electromagnetic 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 dissolve 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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