Working Together in Science Education

Science Surrounds Us

A Parent Report on What's New in Science

Dear Parents:

This Parent Report is designed to share important new developments in science education.

In Manitoba, teachers from the French Immersion, English, and Français programs worked together to develop the science curriculum for their students.
No matter which program students take, their science learning will be the same.

The new Manitoba science curriculum sets high expectations for students.
The development of science literacy is the central focus of all learning experiences with an emphasis on the application of science to daily life.

The Manitoba science student learning outcomes found in the new science curricula are based on those found within the Pan-Canadian Science Framework. Student learning outcomes are concise descriptions of the knowledge, skills, and attitudes that students are expected to learn in a course or grade in a subject area.

Educators involved in the Pan-Canadian Science Project believe that having a common curriculum framework will greatly improve the quality of teaching, learning and assessment in our schools. It will also make it easier for students to move from school to school and province to province or territory because of the common base for scientific literacy across Canada provided by a common framework.

Highlighted in this Parent Report are some features of Manitoba's new science curriculum frameworks as well as a description of some ways that parents can help their children learn. By working together, we can help ensure that children will understand the importance of science to their personal lives and to society as a whole, and recognize the career opportunities provided by the study of science.

In this document, the term "parents" refers to both parents and guardians and is used with the recognition that, in some cases, only one parent may be involved in a child's education.

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Visit the Manitoba Education, Training and Youth Web site at:

http://www.edu.gov.mb.ca/metks4

Pan-Canadian Protocol

Signing of an Agreement for Pan-Canadian Collaboration in Education

In February 1995, the Council of Ministers of Education, Canada, adopted the Pan-Canadian Protocol for Collaboration on School Curriculum. Under this agreement, educators from across Canada worked together to develop the Common Framework of Science Learning Outcomes - K to 12 (commonly called the Pan-Canadian Science Framework).

In the Pan-Canadian Science Framework, educators outlined a vision for scientific literacy in Canada and produced general and specific student learning outcomes.

The goal of the Pan-Canadian Science Framework is to provide common ground for the development of science curriculum within each participating jurisdiction. Manitoba Education, Training and Youth is currently utilizing this framework as a basis to develop the province's new science curriculum frameworks.

Predicting the Future

To succeed in the future, citizens will need to:

- appreciate the power and limitations of science
- use science and technology to solve problems
- gather and analyze information
- be open to new and changing ideas
- communicate with others about science
- use technology effectively
- understand basic scientific concepts
- make informed decisions
- create new knowledge
- use technology effectively

Why Change the Science Curriculum?

Scientific knowledge in the 21st century will continue to change and grow. No one can accurately predict what new discoveries, inventions, and technologies will affect our lives in the years to come. Today's student must develop a greater level of scientific literacy than was required in the past. They must also develop skills that will allow them to continue learning and using science and technology in their work and in daily life.

The new Manitoba science curriculum is designed to give today's students the knowledge and skills they need for tomorrow.

Today's Science

Less Emphasis on	More Emphasis On
• learning about science	• doing science
• covering many science topics	• covering a few fundamental science concepts in more depth
• using "the scientific method"	• using a scientific approach to develop and revise an explanation
• learning scientific facts in a lab setting without context	• linking science to the real-world and understanding the impacts science has on daily life
• doing a few investigations in order to leave time to cover large amounts of content	• doing more investigations in order to develop deeper understandings and skills
• teacher demonstrations	• student-designed investigations
• science having all of the answers	• recognizing that science is one way of looking at the world and that science does not have all of the answers
• science for its own sake	• relationship between science, technology, society, and the environment

Doing Science

All teaching and learning of science with the new curriculum involves students in doing science. There is less emphasis on memorizing scientific facts and theories in isolation from the real world. Students will learn how to learn, how to think for themselves, how to critically evaluate information they receive, and how to make informed decisions. This will improve their ability to work and live in the scientific and technological world of the future.

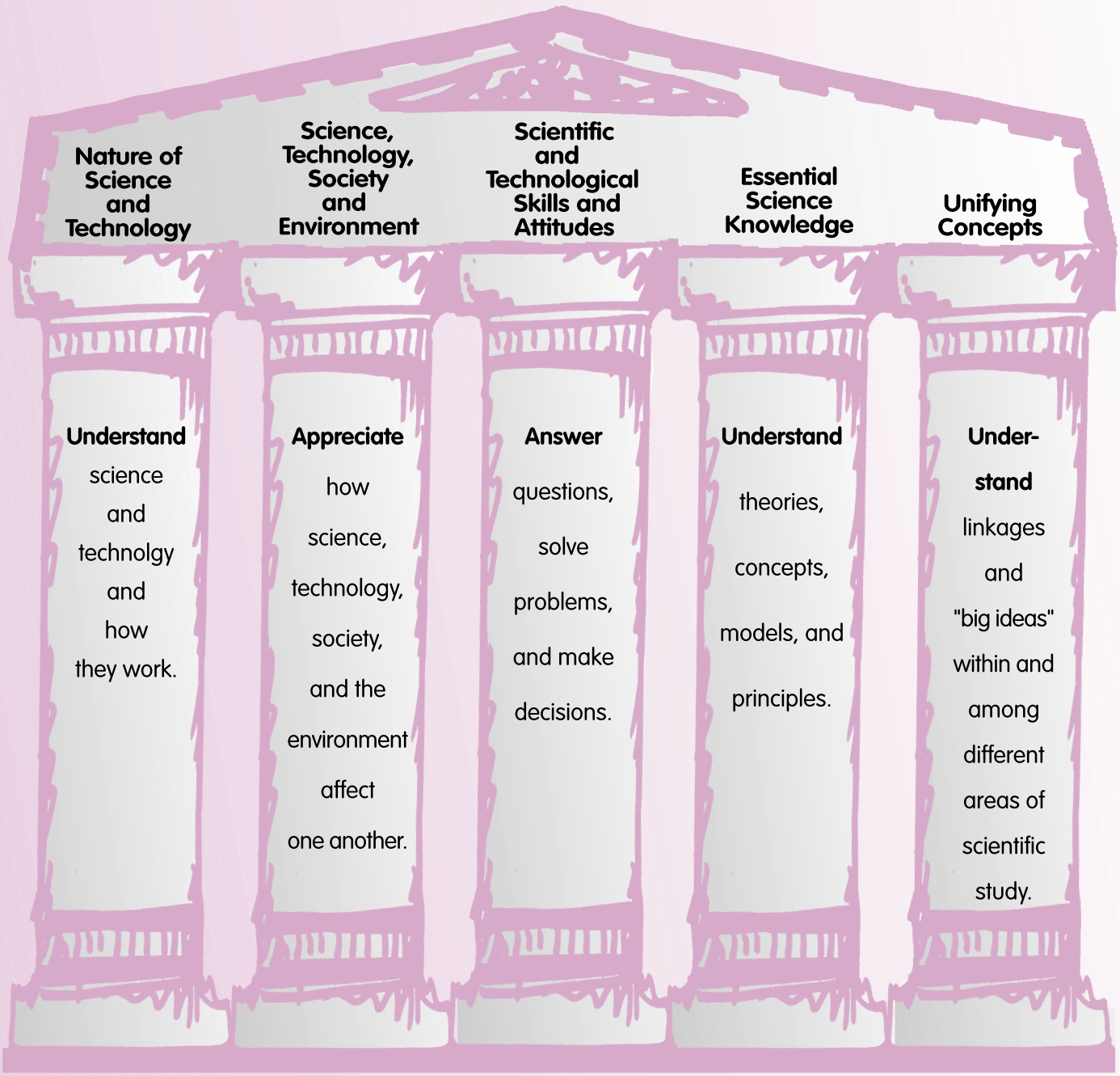
Doing science involves:

Answering Questions Solving Problems Making Decisions

What are Student Learning Outcomes?

Student learning outcomes describe the knowledge, skills, and attitudes that students are expected to demonstrate in a specific subject area in a course or grade. Knowledge and skills in each grade are cumulative, building on previous learning outcomes.

In Manitoba the specific student learning outcomes for science are based on the following five foundations for scientific literacy.



Some Sample Student Learning Outcomes

Early Years (K to 4)
Students will...

Investigate and compare properties of familiar solids.
Include: have mass/weight, take up space, maintain their shape

Conduct experiments to determine how different soils affect the growth of plants.
Examples: compare the same type of plant grown in sand versus potting soil...

Use the design process to construct a game, toy, or useful device that uses gravitational,magnetic, or electrostatic forces.

Middle Years (5 to 8)
Students will...

Describe the types of nutrients in foods and their function in maintaining a healthy body.
Include: carbohydrates, proteins, fats, vitamins, minerals.

Propose a course of action to protect the habitat of a particular organism within an ecosystem.
Examples: protect the nesting habitat of a given bird in a local wetland...

Demonstrate proper use and care of the microscope to observe the general structure of plant and animal cells.

Senior Years (S1 to S4)
Students will...

Discuss current and potential applications and implications of biotechnologies including their effects on personal and public decision making.
Include: genetic engineering, genetic screening, cloning, DNA, Fingerprinting…

Investigate ways in which Canada participates in space research and in international space programs and then use the decision-making process to address a related issue.
Examples: International Space Station, Canadarm...

Investigate and describe qualitatively the relationship between current, voltage, and resistance in a simple electrical circuit.

What Will Students Learn in Science?

Kindergarten	Trees	Colours	Paper	
Grade 1	Characteristics of Needs of Living Things	The Senses	Characteristics of Objects and Materials	Daily and Seasonal Changes
Grade 2	Growth and Changes in Animals	Properties of Solids, Liquids and Gases	Position and Motion	Air and Water in the Environment
Grade 3	Growth and Changes in Plants	Materials and Structures	Forces that Attract or Repel	Soils in the Environment
Grade 4	Habitats and Communities	Light	Sound	Rocks, Minerals, and Erosion
Grade 5	Maintaining a Healthy Body	Properties of and Changes in Substances	Forces and Simple Machines	Weather
Grade 6	Diversity of Living Things	Flight	Electricity	Exploring the Solar System
Grade 7	Interactions Within Ecosystems	Particle Theory of Matter	Forces and Structures	Earth's Crust
Grade 8	Cells and Systems	Optics	Fluids	Water Systems
Senior 1	Reproduction	Atoms and Elements	Nature of Electricity	Exploring the Universe

Note: New Senior 2 to Senior 4 curricula are under development

Science Opens Many Doors

Senior 2 to Senior 4 Science

While Senior 1 and Senior 2 Science are required science credits, it is anticipated that students will take additional science credits in Senior 3 and Senior 4 to fulfill graduation requirements and to prepare them for university or college studies, or for the world of work.

High school science credits help keep options open for the student who hasn't yet decided on plans beyond Senior 4. Continued study of science is important for daily life in the scientific and technological world of the future.

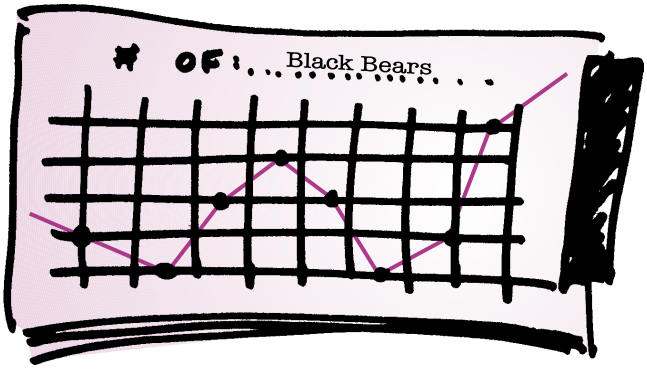
Where Can Science Take You?

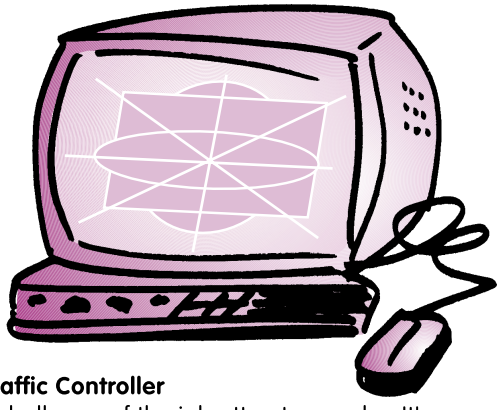
Science is important for everyone. A wide range of career opportunities rely on a background in science.

Agricultural Technician
"I mostly help farmers with concerns they have about weed control. It's challenging to look at different situations and help farmers make the best decision possible." Paul W.
Chemistry, Biology, Computers

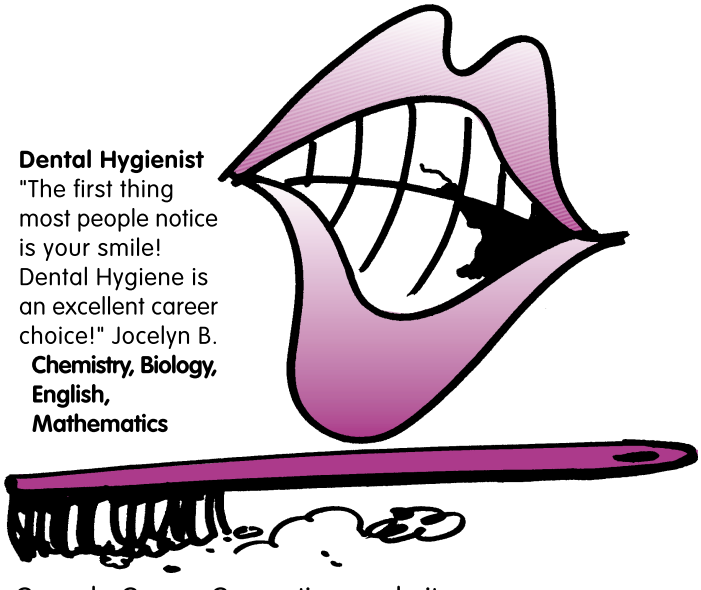
Water Resources Technologist
"I enjoy the field work most, but the office work is interesting too because I work with some very complex computer programs." Gerry W.
Mathematics, Chemistry, Physics, Computers, English

Wildlife Technician
"There is a lot of variety in this job. I do everything from aerial surveys to monitoring disease outbreaks to assessing bird populations." Floyd K.
Mathematics, Biology, English





Air Traffic Controller
"The challenge of the job attracts people. It's an intellectual challenge to learn and keep up with things, the improvements in equipment..." Rick K.
Mathematics, Physics, Computers, English, French, Social Studies

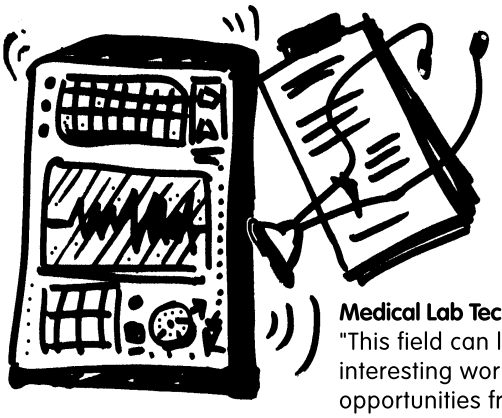


Dental Hygienist
"The first thing most people notice is your smile! Dental Hygiene is an excellent career choice!" Jocelyn B.
Chemistry, Biology, English, Mathematics

For information on other careers, check out the Canada Career Consortium website as:

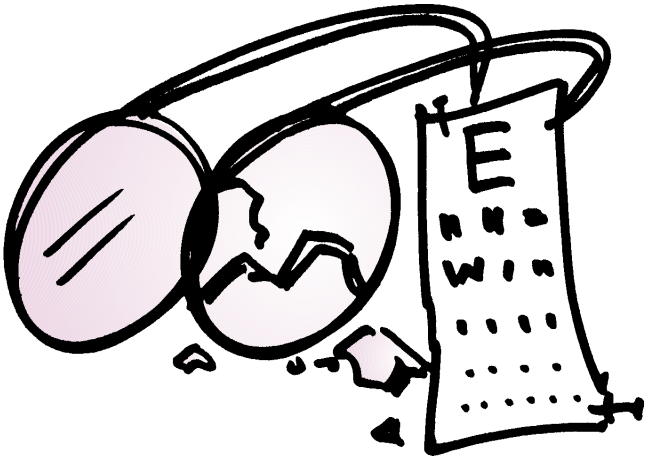
www.careerccc.org

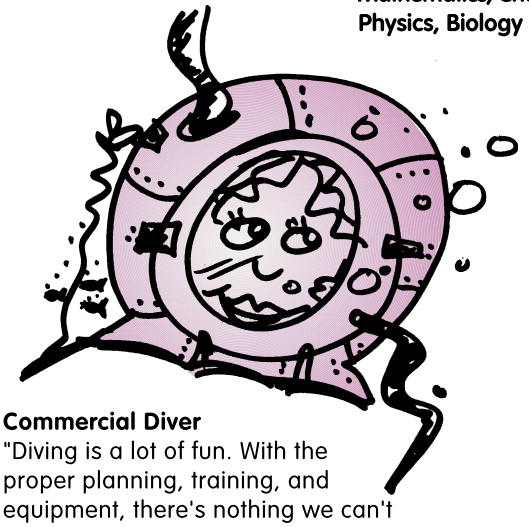
Where Can Science Take You? continued...



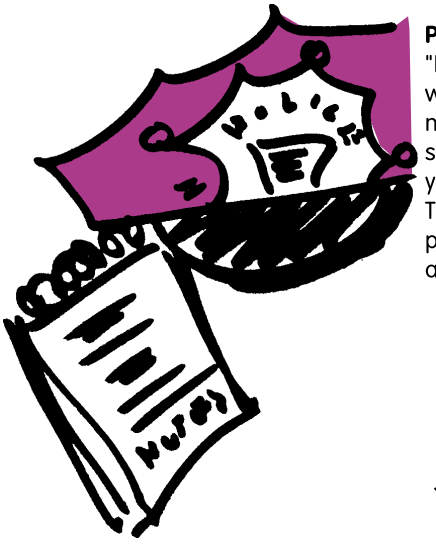
Medical Lab Technologist:
"This field can lead to interesting work opportunities from third world countries to places like Saudi Arabia."
Brennen T.
Mathematics, Chemistry, Physics, Biology

Optician
"It is fulfilling work and I enjoy it very much. Very few people who take the training don't get work." Robert T.
Mathematics, Physics, English





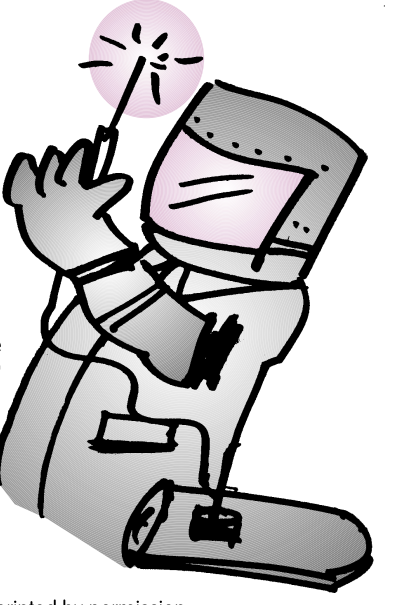
Commercial Diver
"Diving is a lot of fun. With the proper planning, training, and equipment, there's nothing we can't do under the water." Ivy M.
Biology, Chemistry, Mathematics, Physics, Biology, Physical Education, Business



Police Officer
"I love the variety of work plus the number of specialized divisions you can transfer to. The job security and pension... puts you at ease too." Paul H.
English, Computer Literacy, Sciences, Social Sciences

Plumber
"It gives me great satisfaction in completing a project and seeing what I've done. Plumbing offers a quick path to a good paying job..." John L
Mathematics, Industrial Arts, Construction, Business, Science

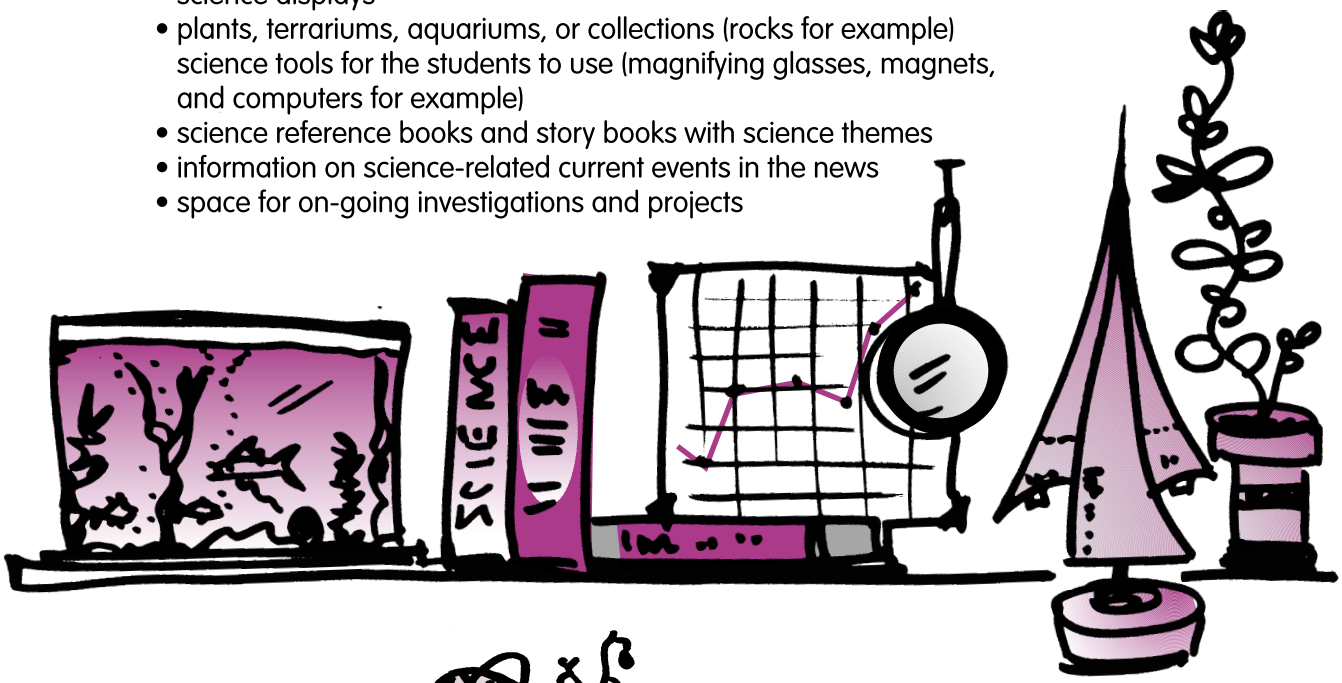
Welder
"I like building things. I like having a finished product." Jennifer B.
Metal working, Drafting, Mathematics, Physics, Computer Literacy

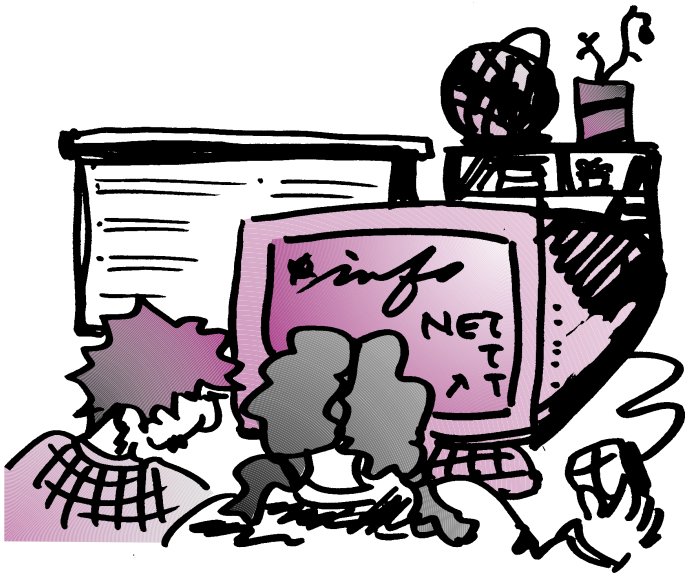


What Might You Expect to See in a Science Class?

What the Classroom Looks Like

- science displays
- plants, terrariums, aquariums, or collections (rocks for example) science tools for the students to use (magnifying glasses, magnets, and computers for example)
- science reference books and story books with science themes
- information on science-related current events in the news
- space for on-going investigations and projects





What Students Are Doing

- using technology to do research or carry out investigations; computers and microscopes for example
- sharing and discussing their ideas and the results of their investigations
- using their math and language arts skills as part of their scientific investigations, using calculators and rulers, writing reports, researching and presenting projects for example
- carrying out investigations related to daily life, recycling and community gardens for example

How Students Are Learning

- working as a class, in small groups, and individually designing and carrying out investigations
- meeting people who use science in their work and daily life
- experiencing science outside the classroom, in the school yard, at a local park, or a nature centre for example

Students Are Active and Curious Participants in the Learning Process

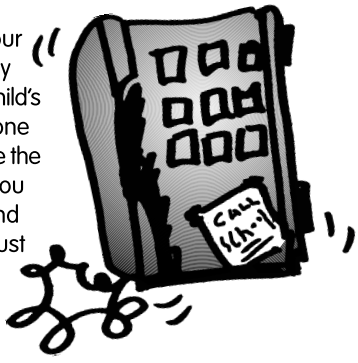
How Can You Support Your Child in School?

1. Work with your child to set up a study area in the home that is comfortable and away from distractions.

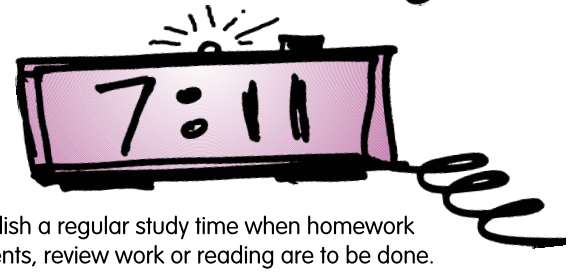
2. Be available to provide help and support, if it is needed. If you are unable to assist your child, find someone who can.

3. Make it a habit to talk with your child about school work. Even if you aren't familiar with the topic, you can still be an interested listener. If you have science expertise, offer to share it with your child's class.

4. Keep in touch with your child's teacher. Stay informed about your child's progress (notes, phone calls, visits). Encourage the teacher to contact you about successes and achievements, not just problems.



5. Make sure your child has access to scraps, odds and ends, and art material for building and making things.

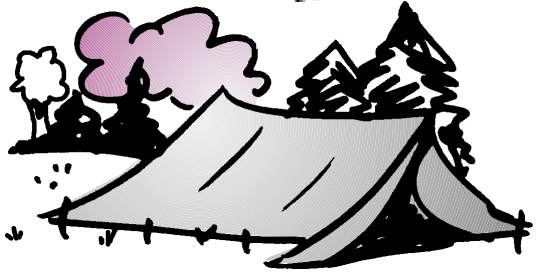


6. Establish a regular study time when homework assignments, review work or reading are to be done. Negotiate a time that is flexible enough to fit your child's extracurricular schedule.

7. Attend parent orientation nights, open houses, special events, and parent-teacher interviews. Read school newsletters. Discuss all of these with your child.

8. Make sure your child has a good night's sleep, eats breakfast and gets to school on time every day.

9. Invite your child to watch or assist you whenever possible. It is an excellent way for a child to gain background experience and to develop self-confidence in trying new things.



10. Encourage your child's natural curiosity. Use your child's experiences, everyday situations, and news headlines to think about and solve science problems.

Science Surrounds Us

Here are some examples of questions children ask.
These and others provide a great starting point to have fun with your child in investigating the answers.

In the Home

- why does bread rise?
- how does a microwave cook my food?
- which diaper absorbs the most?
- how can I clean the grease off pots?
- why do I need to eat my vegetables?
- how does a light switch work?

In the Backyard

- what do plants need to grow?
- how can I build my own composter?
- why is it so hard to get rid of weeds?
- which type of shovel is best to dig a hole?
- which birdfeeder attracts more birds?
- what stars can I see at night?

In the Playground

- how can I balance on the teeter-totter with my dad?
- why do I sweat?
- which bicycle gear will help me get up a hill?
- why can't I roller-blade on the grass?
- why does the metal bench rust?
- why do I have to wear sunscreen?

Your child's question can lead to investigations using:

- observations
- simple experiments
- construction projects
- discussions
- research (print, Internet, asking an "expert")

On-line Support for Parents

Visit the School, Family and Community portion of the Manitoba Education, Training and Youth Website for information on topics such as:

- Graduation requirements
- Manitoba Association of Parent Councils
- Publications for Parents
- School Finder
- Student Records
- Advisory Councils for School Leadership

http://www.edu.gov.mb.ca/metks4/parent

Sharing and supporting your child's curiosity will help him or her appreciate that **Science Surrounds Us!**

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