Reading matters in science

For students in middle and secondary school

Strong reading skills are necessary for every child to succeed in school. This tip sheet will provide you with practical ways to help your child think scientifically by encouraging critical thinking skills.

Through science, your child will be able to apply critical thinking skills in addressing social, economic, ethical and environmental issues related to science and technology.

Foundations of scientific literacy

In order to succeed in science, your child must:

- *know* science - understand concepts and principles
- ***do*** science - labs, problem-solving and other science inquiry skills
- *understand* the impacts and implications of science and technology

To become scientifically literate, students need to be given many opportunities to:

- *read* and *interpret* information
- *analyze* information
- *critique and ask questions* about what was read

Reading scientific texts

Reading science is like reading non-fiction. You can support your child's reading by introducing your child to the following activities:

Before reading activities:

- talk about the topic
- talk about how the topic fits into your child's life and look for examples
- tell your child what you wonder about
- ask your child what he wonders about
- show your child how you look for information in what you're reading

Reading activities:

- do not read sequentially, like you read a story
- look at the text's structure
  - browse the text for key terms and features
  - scan headings, pictures, diagrams and captions
  - read text and pictures that go together to make meaning
  - read diagrams, maps and graphs
- organize information
  - build vocabulary – sort words and use maps
  - use graphic organizers for informational text
- self-monitor for understanding
  - allow your child to explain the text to you or someone else
    provide your child with writing material

After reading activities:

- ask questions about the topic
- talk about what your child has just read
- discuss the material in a positive and supportive manner
- encourage links to other information

Other supporting activities:

- provide access to books and magazines through the internet, library or purchased books
- model scientific literacy in your own reading
- encourage conversations about science
- point out interesting science articles in the news
- view articles online at www.bbc.co.uk, www.thestar.com, oss.mcgill.ca or www.sciam.com

Critical thinking skills

Critical thinking requires students to identify questions or issues, pursue science knowledge to respond to the question or issue, evaluate information that is presented and make a decision based on evaluation.

In science, students are generally asked to investigate:

- the nature of and relationship between science and technology
- the social and environmental impacts of science and technology, in a personal and global context

Try the following strategies to help get your child to think critically:

- wait 10 to 15 seconds after asking a question. Let your child think through his answer.
- model tolerance of conflict or confrontation in structured settings, such as a debate
- encourage "good thinking", which involves identifying and giving good reasons for all opinions
- ask open-ended questions that do not have "one right answer" to encourage students to respond without being afraid of being wrong
- become a more discriminating information consumer. Look at differing accounts and editorials in newspapers, magazines, on television and the radio.

How to think scientifically

Encourage your child to:

- ask whether the data shows a correlation or "cause-and effect", for example, is high income ***linked to*** cancer or does high income ***cause*** cancer?
- question vague claims like "Leading doctors say..." or statements made by celebrities or others outside their area of expertise
- compare consumer products and consider reasonable trade-offs among them on the basis of features, performance, durability and cost
- be skeptical of results based on a few trials, on small samples of data, biased samples, samples without controls, controls which are similar to the experimental group and samples for which the type of control is not specified
- be aware that data and statistics can be interpreted in many ways
- be critical of arguments based on the faulty, incomplete, or misleading use of numbers, for example, a percentage is given without the total

sample size e.g. “9 out of 10 dentists recommend..."

- be aware that when people try to prove a point, they may select only the data that support it and ignore any that goes against it