SCIENTIST IN RESIDENCE PROGRAM

Science Unit: *Living with Oxygen*

Lesson 3: *Researching and Communicating Science*

School Year:	2012/2013
Developed for:	J.W. Sexsmith Elementary School, Vancouver School District
Developed by:	Sheila Thornton (scientist); Duncan Kay and Danielle Conrad (teachers)
Grade level:	Presented to grade 7; appropriate for grades 6 – 7 with age appropriate modifications
Duration of lesson:	1 hour and 20 minutes; follow up session for student presentation (2 hours). Students will require time to prepare posters (duration at the discretion of teacher).

Objectives

1. Understand how to apply a specific scientific concept to various situations.

2. Learn basic research tools using the web.

3. Understand how to identify reputable sources of information.

4. Gain experience in selecting key words for on line search engines.

5. Learn the basic principles of preparing an effective presentation.

Background Information

An important aspect of science is *knowledge transfer*. When scientists undertake experiments, they document and analyze the results and usually report them in a scientific journal. Reputable journals have high standards and require that every paper be *peer reviewed*. The peer review process involves sending the paper out for review by experts in the same field of science, who will critique the paper and make recommendations to the editor of the journal as to whether the paper should be rejected, accepted or accepted with modifications. Once the paper is published, it becomes a source of validated information that may be used by other scientists. This concept of discovery by building on previous discoveries is a fundamental concept in modern day science. The most familiar expression is found in the letters of the famous scientist Isaac Newton: "If I have seen further it is by standing on the shoulders of giants". In today's lesson, we will learn how to select topics of investigation and identify valid sources of information using the world wide web.

Vocabulary

Knowledge transfer:	The process through which one unit (e.g., group, department, or discipline) is affected by the experience of another. It is considered more than just communication, and seeks to organize, create, capture or distribute knowledge and ensure its availability for future users.
Peer review:	The evaluation of work by one or more people of similar competence to the producers of the work (peers). It constitutes a form of self-regulation by qualified members of a profession within the relevant field. Peer review methods are employed to maintain standards of quality, improve performance, and provide credibility. In academia peer review is often used to determine an academic paper's suitability for publication.
Citation:	A quotation from or reference to a book, paper, or author.

Materials

- Information on safe and recommended sites for searching science topics
- Computer access to the world wide web
- Articles on topics related to oxygen metabolism (see reference list below)

In the Classroom

Introductory Discussion

1. In an effort to improve medical practices, traditional physiology was largely focused on humans. When physiologists first began comparing different species, it was sometimes out of simple curiosity to understand how organisms work but also stemmed from a desire to discover basic physiological principles. This shift in philosophy is often referred to as "comparative physiology". Today we will use the principles of comparative physiology to research oxygen metabolism in a variety of organisms.

   - We have talked about diving organisms and how they have developed interesting adaptations that aid in oxygen conservation during submergence. Can you think of other animals that may exhibit adaptations that relate to oxygen metabolism?

   - Are there other conditions or physiological events in humans that would alter or affect oxygen metabolism?

   - How would you research these adaptations or conditions? What key words would you use?

   - How do you assess whether the information that you have found is valid?

2. **General Principles**

   Search: Start with some general key words. If your results aren't what you want, alter the keywords to make a more specific search. You can type in the word "kids" to find child friendly websites and articles. The Google Search Education website provides detailed lesson plans on teaching search skills.

   Delve: Look beyond the first few results – the first websites are not always the best. Many websites use "Search Engine Optimization" to improve the visibility of their pages in search results. That doesn't necessarily mean they're the most useful or relevant sites.

   Source: Look at the actual URL address to see where you're going before you click on a search engine result. Use some intuition to decide whether it seems reliable. Is it from a well-known site? An educational or government institution? Is it a forum or opinion site? Provide students with advice on how to discern where URLs are from (for example, .edu indicates an educational institute; .gov is government websites; .museum is reserved for verified, legitimate museums).

   Validity: Remember - you cannot believe everything you read. Use your own judgment by checking more than one source and validating information that you find on one site with information from another trusted source.

   Purpose: Be wary of websites that are cluttered with advertisements or might be trying to sell you something.

   Background: When reading articles, try to look for the author's name and when the article was written. Is it recent or outdated?

   Teach: Integrate the teaching of these skills into everything you do. Model your searches explicitly and talk out loud as you look things up. Researching skills don't need to be covered in stand-alone lessons.

Justify: When you're researching your topic, go to some weak websites and ask yourself if you can justify whether the site would be useful and reliable.

Path: Start your search with some sites that you know or have used before rather than randomly googling.

Cite: Give students lots of practice of writing information in their own words, and show them how to use quotation marks and cite sources. It's never too early to learn about web literacy.

Science Activity

In groups of four, have students prepare a poster presentation on their topic.

Keep the information simple
- Make full use of the space, but do not cramp a page full of material, as the result can often appear messy.
- Be as clear, concise and succinct as possible.

Use colours sparingly and with taste
- Colours should be used only to <u>emphasize</u>, <u>differentiate</u> and to <u>add interest</u>. Do not use colours just to impress!
- Try to avoid using large swathes of bright garish colours like bright green, pink, orange or lilac. Yuck!!
- Pastel shades convey feelings of serenity and calm, while dark bright colours conjure images of conflict and disharmony.
- Choose background and foreground colour combinations that have high contrast and complement each other - black or dark blue on white or very light grey is good.
- It is better to keep the background light as people are used to it (for example newspapers and books).
- Avoid the use of gradient fills. They may look great on a computer display, but unless you have access to a high resolution printer, the paper version may appear pixilated.

Do not use more than 2 font types
- Too many font types distracts, especially when they appear on the same sentence.
- Fonts that are easy on the eyes are Times-Roman and Arial.

Titles and **headings**
- Should appear larger than other text, but not too large. The text should also be legible from a distance, say from 1.5m to 2m.
- Do not use all UPPER CASE type in your posters.
- **Do not use a different font type to highlight important points,** otherwise the fluency and flow of your sentence can appear disrupted. Use <u>underlined text</u>, the **bold face** or *italics* or ***combinations*** to emphasize words and phrases.
- If you use ***bold italicised print*** for emphasis, then ***underlining*** is not necessary - overkill!

A picture is worth a thousand words … (but only if it is drawn properly and used appropriately)
- Diagrams and drawings should be labeled.
- Drawings and labels should be large and clear enough so that they are still legible from a distance.
- Do not try to cramp labeling to fit into components of a drawing or diagram. Use 'arrows' and 'callouts'.
- Clipart images should only be used if they add interest to the display *and* complement the subject matter. Otherwise, all they do is to distract attention from the focus of the presentation.
- Images can also be 'dangerous', as you may spend more time focusing and choosing appropriate cartoons than concentrating on the content.

Check your spelling - spelling mistakes give the impression that you have not put in the effort.

Maintain a consistent style
- Inconsistent styles give the impression of disharmony and can interrupt the fluency and flow of your messages.
- Headings on the different pages of the poster should appear in the same position on all pages.
- Graphs should be of the same size and scale especially if they are to be compared.
- If bold lettering is used for emphasis on one page, then do not use italics on others.
- Captions for graphs, drawings and tables should either be positioned at the top or at the bottom of the figure.

Arrangement of poster components should appear smooth
- You would probably be preparing sections of the poster on letter sized paper before sticking them onto mounting boards or display stands.
- Remember that you are using posters to tell a story about what you have done and achieved. As in report writing, the way you arrange the sections should follow the 'storyline'.
- Sometimes it is helpful if you provide cutouts of arrows to direct attention to the sequence of the presentation. Use a new page to start off a new section.

Review, review and review!

Suggested Topics for Presentations

• Living at High Altitude

• Asthma

• Climate change and Oxygen

• Diving Physiology

• Marathon Physiology

• The Carbon Cycle

• High Blood Pressure (Hypertension)

• Human Free Diving

References

http://www.google.com/insidesearch/searcheducation/lessons.html

http://lorien.ncl.ac.uk/ming/dept/Tips/present/posters.htm#planning