Science Unit: ***Living with Oxygen***

Lesson 5: ***Beaty Biodiversity Museum Field Trip***

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:	All day
Notes:	VSB teachers have complimentary admission to the Beaty Biodiversity Museum, for themselves and one guest. Check with the Scientist in Residence Program Managing Director to see if a discount for students is available. This lesson plan relates to Scientist in Residence Program Lesson 3, Field Trip to Beaty Biodiversity Museum: What is Biodiversity and Why does it Matter?, in the science unit Biodiversity of Local Habitats. http://scientistinresidence.ca/science-lesson-plans/biodiversity-of-local-habitats/

Objectives

1. Bring the concepts of oxygen production and oxygen consumption together.
2. Compare and contrast the oxygen needs of an oxygen consumer *versus* the rate of production from producers.
3. Explore the concepts of biodiversity.
4. Explore the concept of adaptation and convergent evolution.

Background Information

One Life to Live tour: Students will explore biodiversity and the interconnectedness of life by comparing structures and behaviours of local animals and plants in different habitats and communities. Students will participate in hands-on activities and use museum specimens to learn about adaptations and taxonomy.

Please see the following Scientist in Residence Program lesson plan for background information about biodiversity and why it's important: Lesson 3, Field Trip to Beaty Biodiversity Museum: What is Biodiversity and Why does it Matter?, in the science unit Biodiversity of Local Habitats. http://scientistinresidence.ca/science-lesson-plans/biodiversity-of-local-habitats/

Vocabulary

adaptation	**An adaptation** is a trait with a current functional role in the life history of an organism that is maintained and evolved by means of natural selection.
natural selection	**Natural selection** is the process by which only the organisms best adapted to their environment tend to survive and transmit their genetic characteristics in increasing numbers to succeeding generations, while those less adapted tend to be eliminated.
convergent evolution	**Convergent evolution** is the process whereby organisms not closely related will independently evolve similar traits as a result of having to adapt to similar environments or ecological niches.

Materials

- Scavenger hunt sheets
- Blue whale facts and figures

Beaty Biodiversity Museum Field Trip

Group 1:

10:15 am	Lecture and assignment
10:30 am	Blue Whale film
11:15 am	Hunt for adaptations -galleries
12:00 pm	Lunch
1:00 pm	One Life To Live tour
2:30 pm	Departure

Group 2:

10:15 am	One Life To Live tour
11:45 am	Lecture and assignment
12:00 pm	Lunch
12:45 pm	Hunt for adaptations -galleries
1:30 pm	Blue Whale film
2:30 pm	Departure

FACTS, ESTIMATES, AND FUN WITH NUMBERS

A blue whale requires ~ 220,000 L of oxygen per day to support its metabolic demands.

Rainforests are responsible for ~25-30% of the world's oxygen production.

Estimates of the ocean's contribution range from 50-85% of the world's oxygen production.

Algae have been estimated to produce 330 billion tons of oxygen per year.

There are 875 L of oxygen gas per ton of oxygen.

1. Calculate the litres of oxygen produced per day by algae.

   330,000,000,000 tons of oxygen x 875 L of gas per ton = 288,750,000,000,000 or 288 trillion L of gas per year.

   288,750,000,000,000 L of gas per year/ 365 days in a year = 791,095,890,410 L per day.

2. Calculate what % of the daily oxygen production is required to support a blue whale.

   (220,000 L oxygen per whale per day / 791,095,890,410 L oxygen produced per day) x 100 = 0.0000278 or 0.000028% of the world's oxygen.

3. Calculate what % of the daily oxygen production is required to support the world's population of blue whales.

   A worldwide population of 10,000 blue whales would consume 0.28% of the world's oxygen.

References:

Species at Risk regional website – Blue Whale (Pacific population)
http://www.dfo-mpo.gc.ca/species-especes/species-especes/blueWhale_pac-rorqualbleu-eng.htm

Species at Risk Registry – Blue Whale (Pacific population)
http://www.sararegistry.gc.ca/species/speciesDetails_e.cfm?sid=718

Estes, James A. et al. *Whales, Whaling, and Ocean Ecosystems* Berkeley: University of California Press, 2006.

Goldbogen, J.A. et al. “Mechanics, hydrodynamics and energetic of blue whale lunge feeding: efficiency dependence on krill density” *The Journal of Experimental Biology* 214 (2011): 131-146.

Lockyear, C. "Growth and Energy Budgets of Large Baleen Whales from the Southern Hemisphere" in *Mammals in the Seas: General papers and large cetaceans* Food and Agriculture Organization of the United Nations. Working Party on Marine Mammals. Rome, 1981.