Lesson #6: Mental Models and Design Technology

Stage 1 – Desired Results

Established Goals: GLO A, GLO B, GLO C

1. Examine one mental model referred to as "biomimicry"
2. Identify the manner by which it influences decisions about creation of technology (ie how to TAKE resources, MAKE material goods from those resources and deal with the WASTE)
3. Contrast the linear nature of mental models humans have sometimes used in design processes to the cyclic nature of mental models used to produce goods in nature

Understandings:	**Essential Questions:**
Students will understand that… 1. **SLO A2:** Informing ourselves about the TAKE MAKE WASTE of goods helps to clarify the mental model that it is based on (critical consciousness)	**SLO A3:** How do history and culture (mental models) influence creation and use of technology (how we TAKE-MAKE-WASTE goods)?
Students will know… **SLO B2:** Characteristics of the mental model called "biomimicry" **SLO A5: SLO C4:** Examples of technologies that aimed to "mimic" nature **SLO A4:** Influence that biomimicry has on design processes	**Students will be able to…** Communicate an example of technology based on "biomimicry" **Adapt Appendix 9** (p.61) Rubric for Assessment of Research Skills

Stage 2- Assessment Evidence

Knowledge: Assess the presentation/handout of the "Example of Technology Inspired by Nature" using a rubric that has been developed by the teacher and class	**Skills:** Assess the "What I think of biomimicry" in terms of the degree to which the student discusses the influence of the mental model of biomimicry on the design of the product (ie how it would be designed without the mental model). (critical consciousness) (critical thinking) Assess the degree to which the student contributes meaningful generalizations about human and natural mental models to the creation of the display boards

Materials Required

Powerpoint Presentation "Examining Our Mental Models"
Reading from Benyus, J. (1997). *Biomimicry*. New York: William Morrow and Company
Access to website: http://www.cbc.ca/natureofthings/features.html#
Access to website: http://www.biomimicry.net/
HANDOUT: Example of a Technology Inspired by Nature

Stage 3 – Learning Plan

1. **Slide 18** - Describe briefly a mental model as a way of thinking
2. **Slide 19**– Describe "Biomimicry" as a mental model
3. DEMONSTRATE the clips from the CBC website (http://www.cbc.ca/natureofthings/features.html#**)** in which the idea of biomimicry is developed using specific examples (that correspond to what will be read in the book)
   abalone, define abalone, nacre
4. DEMONSTRATE http://www.biomimicry.net/ to provide an idea of what biomimicry holds as a mental model (choose ENTER at the bottom of the page to get deeper into the website)
5. READ (or have students read) as much as you or your students wish (but minimum suggestion is p.95-101 up to "Pearls of Wisdom")
6. DISCUSS the meaning of organic/inorganic as in the reading (living/nonliving)
7. Continue to read from this text as a class opener OR whenever you feel it is appropriate/applicable/desired
8. Handout: Example of a Technology Inspired by Nature

Refer students to the EXAMPLES of biomimicry (link from the website above)

http://www.biomimicry.net/casestudiesB.htm and direct each one to report on one of the examples described there.(there is a copy of this page below). You may want to assign particular examples to students as they vary in reading level required and depth of explanation. 9. In small groups (or one large group) students present their example.
Extension Learning Activities
You may want to spend more time on the "4 of Nature's Tricks of the Trade" given in the book and chart them for future use in the projects This is a GREAT opportunity to link to more creative works (like fictional characters for comic strips or poetry). See your nearest English teacher to discuss this!

Notes to Educator

Two examples (spider dragline and gecko toes) are included for your reference. Exerpted from Staples, H., (2005). The Integration of Biomimicry as a Solution-Oriented Approach to the Environmental Science Curriculum for High School Students, on-line submission.

It is ideal that you read to the end of p.111 for the Oyster example, p.129-139 for the spider example and the rhino example p.139- I have omitted the rhino example as a copy simply due to space and copyright.

Example of a Technology Inspired by Nature

Website: http://www.biomimicry.net/casestudiesB.htm
(or just type in Biomimicry and once you are at the Biomimicry website choose Examples of Biomimicry)

My (our) Name(s): **Date:**

Research

Technology:

Words that are new (include definition):

How it Works in Nature:

What the researchers are trying to mimic:

Possible Uses/Applications:

Where it is being studied/ by whom:

Other Resources Used to Gain More Information:

Personal Opinion

What I think of this technology:

What I think of "biomimicry":