BSC 307 Contextual Teaching Lesson Plan- **Heather Bartos**

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| **Title:**  The North Atlantic Current Investigation: Global Warming Exposed | **Grade Level:**  9-12 |
| **Objectives:**   * Students will observe and explain that cool water is more dense that warm water * Students will observe and explain that salt water is more dense than freshwater * Students will describe the relationship between density, temperature, and salinity * Students will trace the flow of water throughout the North Atlantic Current in terms of temperature, salinity, and density * Students will visualize differences in water density and relate this to potential consequences of increased glacial melting * Students will predict the consequence of melting glaciers and North Atlantic Current * Students will compare their predictions to current scientific data | |
| **12.E.5** Analyze the processes involved in naturally occurring short-term and long-term Earth events (e.g., floods, ice ages, temperature, sea-level fluctuations).  **12.E.4a** Explain how external and internal energy sources drive Earth processes (e.g., solar energy drives weather patterns; internal heat drives plate tectonics). | |
| **Academic Language Demands:**  **Global warming:** the alteration of average global temperature, rainfall, and wind patterns as a result of increased atmospheric greenhouse gases  **Greenhouse gases:** gases in Earth’s atmosphere that absorb and reradiate heat near the surface of the planet  **Density:** a measurement of compactness. For solids, this is usually measured as mass per unit volume. For substances dissolved in water, this is usually measured as parts per thousand or million.  **Salinity**: the amount of salt dissolved in a solution  **North Atlantic current:** A global ocean current based on this concept drives a process known as thermohaline circulation.  **Thermohaline circulation**: “great ocean conveyor belt.” Here, surface water moving north from lower latitudes becomes saltier (due to evaporation) and colder as it moves northward. This causes the density of the water to increase, and the water eventually sinks as it enters the North Atlantic. When the water sinks, it drives a current that plays a significant role in global ocean circulation. The sunken water (it’s colder and more dense) slowly flows along the bottom of the ocean back toward the lower latitudes where it eventually rises, like a conveyor belt, to the surface and starts the journey north again. | |
| **Engagement:**  The instructor will begin the lesson with a detailed prediction of earth in the year 2112 based upon scientific research on global warming. The instructor will prompt students with a series of questions relating to their prior knowledge and person experience with global warming. The instructor will transition the conversation into understanding the effects of global warming by showing a 2 minute video clip from the movie *The Day After Tomorrow.* While watching this short clip, students will jot down all of the scientific terminology associated with global warming; terms will be written on the board (undefined). After watching the scientific clip, students will be given their objective. | |
| **Exploration**:  Students will be exploring the function and significance of the North Atlantic current. The North Atlantic current is not only the main topic being discussed in the video clip, but is actually a significant factor of the biosphere that may be severely impacted by global warming.  Students will work in pairs to complete a water exploration activity. Students will be given 2 worksheets: one containing the instructions of the activity and the other containing observation entry and critically thinking questions. In the activity, students will determine the relationship between temperature, salinity, and density. Students will apply these basic concepts to a global scale relating to the Earth’s ocean, North Atlantic Current, and global warming. The instructor will walk around to assess students and answer any questions. | |
| **Explanation:**  The class goes over their findings, with the instructor facilitating the discussion and correcting misconceptions as necessary. Students will share the observations and conclusions. | |
| **Extension:**  Students will read the online article “Oceans Current Flip Out”. This article relates directly to global warming and the North Atlantic Coast. It covers the findings and predictions of real-life oceanographers currently researching this topic today. Students will be asked to write a summary of the article. | |
| **Evaluation(Assessment Strategies):**  The evaluation will be based upon the student’s participation in the activity and discussion. The evaluation will also cover the student’s answers on the worksheet as well as their summaries of the article. | |
| **Rationale:**  When developing curriculum, educators have the tendency to cover a large amount of surface-level material. My challenge was to take something extremely broad (biosphere, global warming) and pinpoint an interesting, non-traditional aspect of it. Alternative to surface-level learning, I wanted my students to deeply engage and critically think on this one specific topic.  The beginning of the lesson is designed in a way to engage students by using a captivating scenario and discussing previously known material, personal experiences, and movies. The movie also acts as a transition into the student’s objective and activity. The activity is presented in a way that allows students to explore; no outcomes or expectations are pre-determined; students are simply given the directions and handout. By using this technique, students can independently create their own predictions and conclusions. More importantly, they can build the fundamental concept of how the North Atlantic functions, without cluttering it with scientific language. The handout is used as an organization tool and guide; the questions are purposely designed in a manner to build upon the conceptual foundation by adding scientific terms. The classroom discussion is a way for the instructor to assess and the students to reflect. Student’s ideas and discoveries are then further extended when reading the online article. The article not only supports the student’s findings, but paints “the big picture” by relating real scientific findings to global warming and the biosphere. | |
| **Resources:**  Illinois State Board of Education. (1997). Illinois State Learning Standards. [On-  line]. Retrieved on August 14, 2008. Available:  <http://www.isbe.net/ils/Default.htm>.  BioEdOnline. (2004). The Water Cycle and Global Warming.  [Online]. Retrieved February 27, 2012. Available: <http://www.bioedonline.org/lessons/water-cycle.cfm>  Peplow, M. (2006). Ocean Currents Flipping Out. [On-line]. Retrieved on February 27, 2012. Available: <http://www.bioedonline.org/news/news.cfm?art=2257>  Teacher L.G. (2011). The Day After Tomorrow UN Conference. Retrieved from: <http://www.youtube.com/watch?v=ul69GX39z9U>  The Exploratorium. (1998). The Amazing Water Trick. [Online]. Retrieved February 27, 2012. Available: <http://www.exploratorium.edu/science_explorer/watertrick.html> | |