**Data Visualization Pilot Project Summary – Draft 2**

Global Warming – Steve Ackerman

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| **Project Description and Specifications** |

**Learning goal:**

Students will demonstrate the ability to “think scientifically” about a problem related to global warming by utilizing and interpreting graphical representations of quantitative scientific information. They will apply this knowledge to formulate evidence based judgments and decisions in response to a specific climate change problem. Students will also be able to apply or transfer the scientific thinking used in the current scenario to other meteorological topics within the course.

**Target Learners:**

Freshman and sophomore students enrolled in introductory meteorology course. Many of these students have opinions and attitudes about climate change and global warming that are not supported by scientific evidence.

**Prototype Learning Object:**

A web-based application will be created for individual students to access on-demand as an assigned learning activity. This learning object will incorporate data visualizations within an interactive problem-based scenario.

**Teaching-Learning Context:**

Students will complete the assignment in preparation for a lecture/discussion that focuses on the causes of global warming. They will apply knowledge gained from this assignment in a classroom-based group discussion activity.

**Instructional Design Strategy** (Preliminary idea)

The visual data provided to students as well as the analysis of that data will be situated within an engaging and interactive problem-based scenario. The student will assume the role of an intern working within a city government agency. He/she has been asked to collect data for a presentation on snow removal costs over a 10 year period – a topic that is indirectly related to global warming. Throughout the scenario the student will interact with 3 characters serving as pedagogical agents. These characters include: 1) a meteorologist, 2) a city planner and (3) a politician. Each character approaches the problem from a slightly different perspective. The characters will prompt the student to “think scientifically” about the problem by demanding scientific evidence as a basis for decision making. They will also prompt the student to ask the right questions and provide corrective feedback. Progression through the scenario is scaffolded such that the student cannot proceed to more advanced levels until he/she has demonstrated understanding of key concepts and data relationships at a particular level. The student will listen to commentary, explanations and respond to probing questions posed by the 3 characters that challenge assumptions regarding climate change and global warming.

**Preliminary Evaluation Plan**

A prototype version of the learning object will be pilot tested with a small group of students selected from a lab section of a Fall 2011 meteorology course. A pretest and survey will be administered at the beginning of the session to capture prior knowledge and skill in scientific reasoning associated with graphical data analysis as well as opinions on climate change. Students will be evaluated using similar measures following the learning activity with the addition of in-depth questions related to climate change and global warming. Participants will also be interviewed and asked to describe their experiences and reactions to the problem-based scenario paying particular attention to the perceived value of the data visualizations in fostering scientific thinking.

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| **Instructional Design Scaffolding** |

The problem scenario for this learning activity focuses on predicting snow removal costs throughout a 10 year period for large Midwestern city. The narrative is structured or scaffolded around 5 levels as the student progresses from one level to the next.

The table below outlines the data visualization tasks the student will perform at each level.

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| **Level** | **Tasks** | **Data Visuals** |
| **1** | **Read graphs** to determine trends and identify types of trends (linear, exponential and cyclic) | Analyze the following data visualizations:   * City population growth * Global city temperatures * ? |
| **2** | **Identify correlations and associations** between 2 data graphs | Analyze the following data visualizations:   * Human consumptions of fossil fuels & atmospheric CO2 * Temperature & CO2 comparisons and relationships * ? |
| **3** | **Explain correlations and causes** represented in data graphs | Analyze the following data visualizations:   * Temperature & CO2 * CO2 and human consumption of fossil fuels * ? |
| **4** | **Make predictions** based on data graphs | Analyze the following data visualizations:   * Artic temperature time series - predict snow cover in northern hemisphere * Snow cover graph map – decide if graph confirms or negates prediction * ? |
| **5** | **Apply data** to making decisions and recommendations | Situational Questions:   * City planner – Snow removal costs * Politician – ? * Meteorologist - ? |