Greg Stott RAMPED – Summer 2016

# Climate Study

Create a data logger, utilizing coding of Raspberry Pi and/or Arduino units. This project would be started early in the year and the analysis would take place later in the spring. These devices off an affordable alternative to large commercial weather stations.

P = Pretest (think essential questions)
O = Objectives (measurable - see Bloom's taxonomy)
C = Catch (hook, anticipatory set, etc... use different senses, not a question)
A = Activity (procedure of what the students should do)
R = Review (how will students go over what they've learned?)
A = Assessment (formative and/or summative)
P = Posttest (same as pretest for comparison purposes)
S = Standards (Wyoming, NGSS, etc...) showcasing crosscutting concepts[1]

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| Pretest Questions | What is weather?<br>What are the components that make up weather?<br>What is the difference between weather and climate?<br>What are possible examples of a changing climate? |
| Objectives | For students to understand what "climate" entails in New England.<br>For students to make observations using local climate data.<br>For students to conclude what changes are occurring from year to year in their climate.<br>To have students work with a large data set and create plots and analyze them.<br>**Bloom's Taxonomy**<br>**Create**: A device to record data.<br>**Evaluate**: Their plans or success.<br>**Analyze**:Data (current and historical)<br>**Applying**: Technology to a goal<br>**Understanding**: How climate change is occurring locally and globally.<br>**Remember**: That climate change shall continue and students will strive to make positive choices to help mitigate the problem. |
| Catch | Ask the students:<br>1."How many of you ski? Do you recall recent years where we have had a lot of snow? No snow? "<br>2. "How may of you collect sap and make your own maple syrup? Do you recall years where you were able to make a lot? Any years in recent memory when you could only make a little?" |
| Activity | (Assuming I can aquire a set of Rasperry Pi's and/or Arduinos)<br>1. With the classroom set, I would have them pre-programmed with coding from the web. (see examples below). I would need to have an array of sensors for the students to include (ex. temp., light, humidity, air pressure, etc.)<br>2. The students would design their own inquiry activity. For example they could decide on what data to record and set them |

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| | up around the school grounds in microclimate zones (ex. near a body of water, a shady forest, open fields) The machines would need to be water proofed, as winters are harsh. They would need to have them set up for a long portion of the school year (we could focus on the fall-spring).<br>3. Students should consider what variables are related (ex. air pressure and snowfall, or air temperature and snow depth).<br>4. The dream would be to organize neighboring or regional districts to monitor their climates over the same duration and correspond with my students. A webpage would be created to log the data in one place.<br>5. Ideally, we would have students set their gear at the same locales at my school from year to year to create a multi year data base. |
| Review | Review what elements they chose to monitor and why.<br>Review the components of a good graph.<br>Review historical data of area. If missing, try www.wunderground.com. |
| Assessments | Pre/Post Tests<br>Production of a short slide show sharing their plots of the climate data, including analyses.<br>Present findings to the class. |
| Posttest Questions<br>(same as pretest questions) | What is weather?<br>What are the components that make up weather?<br>What is the difference between weather and climate?<br>What are possible examples of a changing climate? |
| Standards | http://www.nextgenscience.org/topic-arrangement/msweather-and-climate<br>http://www.nextgenscience.org/topic-arrangement/msearths-systems |
| Crosscutting Concepts from NGSS | ● Patterns in rates of change and other numerical relationships can provide information about natural and human designed systems.<br>● Patterns can be used to identify cause and effect relationships.<br>● Graphs, charts, and images can be used to identify patterns in data.<br>● Relationships can be classified as causal or correlational, and correlation does not necessarily imply causation.<br>● Cause and effect relationships may be used to predict phenomena in natural or designed systems.<br>● Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability. |

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| | • Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.<br>• Proportional relationships (e.g., speed as the ratio of distance traveled to time taken) among different types of quantities provide information about the magnitude of properties and processes. |

*This lesson may be modified to set up a monitoring one particular room at school and let it run for the duration of the experiment.

Links/Resources:

Raspberry Pi Weather Station:
http://www.raspberryweather.com/

https://www.raspberrypi.org/blog/school-weather-station-project/

http://airpi.es/

Arduino Weather Station Examples:

http://makezine.com/2015/11/20/build-your-own-arduino-weather-station/

https://www.toptal.com/c/how-i-made-a-fully-functional-arduino-weather-station-for-300

http://www.instructables.com/id/Wireless-outdoor-Arduino-weather-station-with-PC-l/

Climate Change Model on NetLogo