CLASSROOM IMPLEMENTATION STRATEGY

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Big picture ideas....

Students in the middle grades at Nobleboro Central School, beginning in late May 2013 and continuing into all of the 2013-2014 academic year will be exposed to a variety of activities related to the science associated with the ice core climate research project in Denali National Park. Specific aspects of math and science will include but not be limited to the possibilities listed below:

- Weather station data gathering, analysis and presentation from multi-year station operation. Mathematics to include spreadsheet manipulation, mean, mode, median, trends and graphic presentations.
- Ice core chemistry relative to climate studies
- Global climate change
- Glacial studies using predictive "Flubber" modeling and experimentation as it relates to glacier movement, study site selection and flow

The plan is for students to do much of the data analysis and "Flubber" predictive modeling without teacher control. Scientist Campbell and I have worked together over the years on implementing classroom instruction and as the 2013-2014 school year begins Seth will visit Nobleboro multiple times to help deliver classroom based experiential learning covering topics listed above.

Students will encounter first hand the development of mathematical and science understanding as they will perform lab based experiments and data analysis post Denali expedition. The typical student in rural coastal Maine has either direct of near direct contact with people making their living off of the environment. This could either be through lobstering, shellfish harvesting, ground fishing or something in the forest product industry. All of these industries have science and math integrated into day-to-day operations. Science related to climate and glacier studies will have a direct impact on learning in Maine. For example: if the oceans acidify due to global warming, then people making a living in Maine from shellfish have a vested interest in environmental carbon. Glaciers are of interest as Maine was heavily glaciated during the last ice age.

Next Gen Science Standards/STEM activities are being pushed in Maine, so added science and math are simply a reality.

Careers related to the work Scientist Campbell and his team are performing have already been presented to multiple classrooms in my district. STEM careers are a national focus and Nobleboro is no exception. Seth will return multiple times over the next year(s) and along with the science outreach will also do career outreach.

With the push of the Next Gen Science Standards science literacy is getting placed more and more in the forefront. My science classroom has always pushed for literacy in science and the Next Gen Standards create an additional force. Maine has not yet adopted the standards, although they were part of the writing team, and I have not dug deeply into them yet. That will be my summer homework. Drilling into the new standards will also provide for idea development about moving my PolarTREC experience beyond just me. There is lots to do.....

Teaching/Learning Goals:

One overarching goal for me is for students to be presented with an opportunity to predict and then model glacier movement using terrain construction and then "Flubber". My hope is that students will then film, edit and time lapse their experimentation, analysis and conclusions.

A second learning goal would be for Nobleboro students to become real partners with the University of Maine Climate Lab when work is done on the Mount Hunter Divide ice cores. Scientist Campbell has invited students to the Orono based lab they can see the chemistry in action. Some of the content and analytics may be beyond the scope of middle school, by an all day field trip to the climate lab would be valuable in numerous ways.

An out of school trip to the University would present to students information on the career front as they would see all that is associated with a college based research lab. Scientist Campbell would lead the group on a thorough tour with lots of opportunities for students to see real lab work. Climate science is current and relevant as discussed in the previous section. Climate change is pretty much a given in the science community and if middle school students at Nobleboro can be part of a meaningful climate study, then that could be life altering as they move forward into high school and college science content. In essence, the students of Nobleboro are traveling

with me to Alaska and will be part of Researcher Campbell's final PhD field work at the University.

One challenge that comes to mind is the chemistry content associated with the Mount Hunter Ice Cores. It is up to Researcher Campbell and me to bring the science down to a level that middle schoolers will not only understand, but will grab onto and hold with a level of interest that will engage them in even more science. I am not particularly concerned about this for the glacial movement studies that will come out of our work. The "Flubber" has been in my room before and Seth and I are planning that as I write this. We have more work to do with the chemistry and climate piece in order to push the science out at an appropriate level.

Researcher Campbell has spoken about a goal to write a children's book about his work and travels and the Nobleboro School Community is potentially part of the project.

Classroom Activities:

- Students will design a glacial movement study using "Flubbber" and simulated terrain. This will include the making of "Flubber", the creation of a terrain substrate, the grid marking of the Flubber in order to track and observe flow, the predicting of flow, the videotaping of Flubber flow and then an analysis of the model post experiment. Background/front loaded information to include the making of Lab Flubber, glacier flow dynamics, general glacier content

- Students will explore ice cores, and ice core chemistry by analyzing and dissecting teacher made ice cores with "unknown" layers. Preliminary activity will be a possible field trip to the University of Maine cold lab for background knowledge on core/climate chemistry. The challenge here will be to make sure that the science is properly moved to the middle school level.

- Students will interact with real meteorological data from Kahlitna Glacier and use spreadsheet software to record, chart, graph and then establish any trend lines shown by collated data.

I have the luxury of having students for more than one year in multiple classes. I teach reading, writing and science, and for the academic year 2013 - 2014 I may also return to teaching a math section. All of this means that sequencing is not an issue and

that organization can be flexible. In math, I would certainly make sure that students have some background in basic statistics before presenting problems with data work-up and analysis. I would try and build some of the glacier studies into earth science units, but since Scientist Campbell and I are friends and he will be visiting multiple times I will simply make sure that I set students up with necessary preliminary work prior to Seth's visits. I will work around his very busy schedule and so will Nobleboro Students.

Front loading of material is important, but I want to make sure that students are not overly prepped. Exploration is key and the simple act of exploration can bring students to key understandings. Scientist Campbell and I will work together to develop the data, Flubber and ice core lessons. The one part of the classroom implementation that I foresee highly front loading will be the visit to the cold lab at the University of Maine. I am keenly aware of the need for student ambassadors and we will all prepare well, both scientifically and socially, for any visit to a professional lab doing one of a kind research.

Any timeline for activities will need to be fluid at the moment as much of what happens will depend on Researcher Campbell's schedule and PhD defense. We have already had multiple discussions about multiple visits to Nobleboro School and the University of Maine climate lab. Seth has been to Nobleboro and three other schools before the expedition and I can foresee at least four visits by Researcher Campbell to Nobleboro School and then the one big field trip by students to the University of Maine, Orono.

Evaluation:

I am one for authentic types of assessment rather than traditional pen and paper type quizzes, so my goal would be for students to document their own learning through photos, blogging, video taping of lab and associated outcomes and delivering media to local outlets and our school community. The beauty of working in a 130 student K - 8 school is that older students often work with younger students.

Authentic assessments can be easily documented, because there is product beyond the traditional pen and paper type of quiz. I must try, and succeed, in bringing back my PolarTREC experience to students by having them live as much of the science as possible. That is an overarching goal that both Researcher Campbell and I have had for the years that we have been talking about getting me on one of his expeditions.