Rob, the science teacher teaches with Paul, the CTE teacher at a 7-12 grade school (pseudonyms)

Our school is coastal so a lot of the things that I do are related to this specific location that we're in. We have a school of 7-12 grades and our population is somewhere between 300 and 325. We're on the coast and most of the students are Caucasian, with minority being Native American. That might be 5% of our population. Pretty evenly distributed between male and female. Our socioeconomic status is relatively low. The community is resource-dependent. It's mostly fishermen and a logging community. There is a mill in town which manufactures recycled cardboard. It is probably the highest paying employer in town. It employs maybe 300 to 500 people.

The other teacher that cooperates with me within this program is Paul. We have been given pretty much carte blanche to do anything we want. It's really been a really huge addition. I've been teaching for over 30 years and I have never had this kind of flexibility. Our collaboration started back about 4 years ago when we were all asked to co-teach a math class. A math and vocational arts class. However, since then everything's grown. Paul's strengths are construction and CTE which stands for a career and technical education, business and management. That really blends nicely with mine which is mostly a math, science, management of business. So when the two of us collaborate we really are a very broad brush in the educational environment. And the administration has accepted that. They have seen over the past couple of years a lot of student success. Attendance is high in our courses and not as high in other classes that the students may take. Most of us are really passionate about what we do and our teaching. It's largely for that reason that we've decided to take the POD training.

Before I participated in POD, my technology teaching was quite limited. We used basic computers with Microsoft Word, PowerPoint, Publisher, and Excel. And I used the Excel primarily in chemistry and physics only. We use T-83plus graphing calculators heavily and obviously we use internet exclusively for research and presentations. We have VHS/DVD and things like that. Hardware and software, we have available. The students had all of them for presentation purposes, whatever they needed it for, this stuff was available. It wasn't available all the time; we had computer labs that we could sign up for. But for the most part the students had all of those things I mentioned available to them.

We have administrators who are very supportive of the program that we are developing, the STEM program that we've developed. It's largely based on POD. Our administrators are willing to take risks. With the knowledge gained from POD, we were able to convince the bean counters and the naysayers that what we were doing is functional. Then they gave us enough support to continue it.

I've implemented several Geospatial Inquiry lessons. Some we have created ourselves, some Mapping Our World GIS lessons and some from an ocean literacy project. The results we've gotten have been fabulous.

One of the hardest things to do is to show data to students and expect them to really understand what the data means. For example, data has to go back to a minimum of thirty years in order to make a statement about climate. And looking at the specifics of that, it doesn't always capture the extension or doesn't have any meaning. So I have students gather their own data. We go around our school on one day and take temperatures and GPS readings of all the rooms, all the bathrooms, the gym, all the offices

and then they use that data to do a statistical analysis including mean, median, and mode, and standard deviation to better understand the concepts. Then when they look at 150 years of temperatures they can get online for climate they start to understand what those numbers mean. And they can put it into perspective.

In the STEM class all the problems that we've addressed are real world. I'm talking about Hurricane Sandy. We have a global warming situation. We have ocean sea level rise and we can talk about inundation and what happens and how to prepare for it. This isn't just a theoretical problem. We have communities that are being inundated with water as a result of sea level rise and the storm surges. This is real life.

Part of what we do in the STEM class is include a language arts component. Our focus is on non-fiction, technical writing. We just did an entire unit defining what the word "claim" means and how do you defend the claim in science or in anything for that matter. I handed out an article that I had which basically stated that the climate changing was going to continue into the future. That was the claim. Then I showed them the video <u>An Inconvenient Truth</u>, and we talked about the claims that were made in the video and whether or not the evidence was adequate to support the claim. Then they had to write an essay.

When we started this STEM course, our district was only giving students a math credit and a fine arts credit in vocational education. They would only give one credit per hour of seat time. Paul and I met with the board and the superintendent. If we could prove the students have proficiency in science as well as vocational education then we could also offer a third credit even though the class only met for two hours. We documented what the students were doing and we documented what we were doing and they agreed that there was no question that science plays a part of it. They changed to a performance-based system as opposed to seat time as a result.

We really use rubrics … and formative assessments and we use something called authentic assessment. They have to actually do something. What we teach is related to the topic of the project that we are looking at. So the math we teach, isn't, we don't teach an algebra 1 class, we teach whatever math is necessary, and if I have to teach calculus, then I'll teach the calculus. In order for them to actually be able to do the work. It's a little different way than a traditional course would be taught. Very effective, very different.

The Sibling Rivalry lesson from Mapping Our World Using ArcGIS talked about the global impact of El Nino and La Nina. We use that lesson and then we tie it to the weather and climate patterns and we tied them to the biology. We talked about the Galapagos Islands and what happened there when El Nino and La Nina hit. Then we can also understand how it might affect Australia and other coastal communities even on the east coast of the United States. It's really a well-designed lesson. The maps were brilliant. Students had to manipulate data, to draw up conclusions, make claims and then support their claims from the data. From the teachers' perspective, it forced the students to work at the highest level. After that lesson we could say, OK what is going to be the effect on our fishing community? So it was perfect.

Using GIS had a dramatic positive impact. It gave them an opportunity to use technical writing skills, which is a real problem for our student population.

There are people who would simply hand the kids the book and pick out the lesson and sit them down in front of the computer and have them go from question #1 to question #25, and then they're done with it. That's just one more unconnected piece of information that they may or may not identify with. That's not the way you teach. You don't teach the lesson to teach the lesson. You teach the lesson to make a point. Think about it. It's not typical in education, unfortunately. So what we're doing is very different. And the impact that we have is very different. I wish that people around the country would do what we have been doing as a result of this process. I really don't have a great deal of hope that it will. Largely because it hasn't been identified as a testing area, and so math and language arts still are getting the primary amount of attention.

Resources are important to our success. Sometimes I spend more time looking for resources outside of our district than I do within the district. We're co-teaching the whole course. We have a science research facility nearby. They have not only professional resources but also graduate research students, and we collaborate with them heavily. We're constantly having professional researchers come over and talk to our students about things that they're working on whether it the sea lions or the use of wetlands to protect coastal environments. It is really a very unique and brilliant opportunity for us. We take advantage of the resources that we have. We also have another research facility that used to be a hatchery. Last year we had four of our students do an independent hatchery project where they used the ArcGIS software to make maps to evaluate capture methods and behavior for a particular type of fish. They did a presentation to somewhere between 18 and 25 Ph.D. researchers. These students are freshmen and sophomore high school students, and the people were there were blown away by this because they did such a nice job.

The other resource is in the community. For example last year, I'm not a real ArcGIS person. My first exposure to it was in POD. But I came back and when I did I realized that I might need some help, especially if I was going to have my students work on that particular project with the hatchery. We had no idea how to start. I found a woman who actually uses ArcGIS for NOAA, and she became a resource. I would bring her in whenever the students thought that they were getting really frustrated. I would let them get frustrated but at some point in time I would say ok, we need to get help. She was brilliant and really provided a lot of assistance when we needed it.

I don't think I'll have something better this year because last year we had about 24 students. In the STEM class this year we have 58 students that signed up. It's a great thing. It's just the size of the class. If you include the teachers, we have the two teachers and one aide in that large two hour block class… if you include Paul and myself, and the aide that's in there for Special Ed., we exceed the occupancy of the classroom.

The only barriers that we experienced, and I'm sure that it's a barrier that other places experience, would be the IT. IT support is a sore spot. We have needs and the only way we get our needs met is to go through IT. They were totally non-responsive. Last year I mentioned that there were 24-25 students

in the course. That number was fine. We had the technology we needed to accomplish the task. This year with 58 students, the technology requirements are significantly higher and we are not prepared for it. We're getting there. I don't see that this would be long term barrier. It would be a short term barrier.

The administration is increasing the number of computers that we have, upgrading the ones that we need to have upgraded, so that we will have computer labs that can handle half of those students. We will have approximately 30 functional computers in one location. And we haven't had that.

As a result of this program and the increased interest, we pushed the content of the STEM program down to the junior high school. Additionally the junior high teachers are working with it in blocks, to try to bring together language arts, science, social studies, and math, that's on the horizon to create projects where they are all integrated. So I think the reason that that has been pursued is because of the success that we've had.

Prior to my involvement with POD I taught traditionally. And I have to admit that the students over time had become less and less willing to learn from the 1950's model of education: give 'em a book and go at it. I think that using technology and using the inquiry-based approach that has the students generating questions, and the material that they learn is relevant to their existence, I think if you package all of those things together, I think you make a much happier and effective learning environment for the student.

A number of the students have been talking about possibly going on and trying to get a certificate or diploma or whatever you need to be able to actually do ArcGIS in the business world. It is actually all over the world and the kids are learning if they get this kind of technical training there's pretty much a job almost anywhere they want to work. And that has opened some eyes and opened some doors.

In the community that we're in however, is somewhat low income and very resource-dependent community and one of the biggest problems that we have is selling education as a means to a better life. Yes have parents that tell their kids, "I'm a bartender, and my life is fine, and you can be a bartender too. You don't need any of this stuff." We have other parents who tell their kids, "I know how to operate a backhoe, you can operate a backhoe, and your life will be just fine." So we have a culture here that doesn't necessarily support education. If you go seven miles west … you have a very different culture. They have an international baccalaureate program …. We don't have that. And kids in our community opt to go to this other school so they tend to skim our better kids. Which creates a different demographic for us. There's barriers, but those barriers are more cultural than academic or educational. The barriers are coming from the community and the community has a lack of education.