

**Final Report by: Sharyl A. Majorski
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Attendance – Incorporating what you have learned at the Institute, or how you integrated the material you learned at the Institute into an existing lesson plan/SOP/curriculum.

Attendance at the 2010 Tribal Fellows Institute has once again proven to be very beneficial to me as the chemistry instructor at the Saginaw Chippewa Tribal College. Having completed two summer workshops with PETE, I have developed a much deeper respect for the Native American culture and have been successful in incorporating many of the lessons learned at the Institute into my chemistry lecture and laboratory curriculum.

By attending these past two years, I have been able to successfully mold my laboratory curriculum to include the necessary basic skills for a freshman chemistry laboratory as well as incorporate a mini water research project thus reflecting the value Native Americans place on the natural resources, in particular with water. Last year was the first year that I ran the mini water research project and found it to be a huge success. With the class running again this spring, I will now be able to add even more to this mini water research project by allowing even more hands-on science activities. With the added money, I was able to purchase supplies for incorporating a more interdisciplinary approach to teaching the chemistry lab. Students will now be able to seek and identify aquatic invertebrates as part of their research project. Turbidity will also be added with the Secchi disks that were purchased. Both of these areas were new and exciting to me to learn and implement into my teaching. I cannot begin to state how helpful this last summer was for helping to strengthen the project thereby bringing in even more practical aspects into the water research project.

As for the lecture portion, I now have a more environmentally based lecture style for my chemistry class. The units include acid rain, pollution control and sustainability just to name a few. By emphasizing the importance of chemistry in these areas, students seem to have developed a renewed sense of purpose in studying these areas. My Student Opinion Surveys have demonstrated that student interest has been extremely high since I have gone to a more practical approach to teaching my general chemistry class. Not only has their interest increased, but the scores on their exams as well.

The mini science research lab consists of studying four different water sites along the Chippewa River in Mount Pleasant, MI. The research project consists of determining whether the North Branch of the Chippewa River negatively impacts the Main Branch of the Chippewa River. Residents along the main branch of the Chippewa River, downstream from the convergence of the North Branch, have stated that there is a noticeably different appearance in the water clarity after the North Branch converges into the Main Branch. It is with this dilemma that we start our project. Students are instrumental in designing a research plan to investigate the claim. With little input, we set forth to make the determination. The lab experiments consist of going to four

different sites and collecting data. Students learn basic laboratory skills while examining the water samples including use of the balance, the graduated cylinder, the buret and other chemistry glassware items. Last year with the PETE mini grant, a nitrate and a phosphate HACH testing kit were purchased. This past year, the PETE mini grant was used to purchase two Secchi Tubes, a Conductivity and pH testing kit as well as a Water Monitoring Field Kit to enable collecting and identifying macroinvertebrates. Being a chemist, the PETE program enlightened my knowledge into making my project more interdisciplinary and thus more interesting to my students. Students have overwhelmingly loved this project!

Included is a sample of a syllabus incorporating the lesson plan for CHM 105 and 105A (lab):

April 5 Environmental Issues in Chemistry , Review for Exam 3

April 7 Water Analysis of the Chippewa River

Week 11: Read Handouts

April 12 **Exam 3**, Acids & Bases and Salts, Acid Rain

April 14 Water Analysis of the Chippewa River

Week 12: Read Chapter 12

April 19 Kinetic Molecular Theory, Properties of Condensed States, Surface Tension, Viscosity

April 21 Water Analysis of the Chippewa River

Week 13: Read Chapters 9 & 10

April 26 Presenting Scientific Research, Design of a Poster

April 28 Work on Final Project for Assessment Fair and Review for Final Exam ☺

Week 14: Work on Project.

May 3 Assessment Fair – Presentation of Poster

May 5 Final Exam

Week 15: Study for final exam.

An explanation (if applicable) of how the mini grant funds contributed to your Project.

The Tribal Fellows Institute taught me two very important concepts: importance of turbidity including water clarity and the importance of aquatic macroinvertebrates in determining the pollution levels in a fresh water body.

With the \$750 grant money, I was able to purchase two of the Secchi Disks for the determination of water turbidity/clarity. Although various models are out there, the preferred style was one that did not include having to have water drain out of the bottom. Purchasing these disks was yet another aspect in the water analysis that had been left out up until this opportunity. The Secchi Disk creates an easy, yet quick and effective method that allows students to view clarity of water in regards to relative pollution levels.

I was also able to purchase a Forestry Water Monitoring FIELD Kit.

Materials in this kit include:

- * GREEN Program Beginner Kit
- * Transparent Turbidity Tube
- * Water Sampling Bottle
- * LaMotte Bug Kit
- * Hygrometer
- * Student Waders
- * Insect Identification Flash Cards
- * Pocket Case Thermometer

The materials from this kit will help in identification of the aquatic macroinvertebrates that are found in the Chippewa River. Critical to the test in correct identification of the “bugs” to help determine pollution levels. If a diverse population of aquatic organisms is present, the water is deemed to be pollution free. If a large population of pollution tolerant organisms is present, there may be a pollution problem.

To assist in collecting aquatic invertebrates, a Kick net was purchased as well. The white mesh net was designed to meet the requirements of the US EPA Rapid Bio-assessment Protocols for aquatic benthic macroinvertebrates.

Another new aspect to the chemistry class research project will include incorporating the Coliform Presumptive Test Kit to determine if human sewage is a problem with the river. This method is adapted from the Standard Methods for the Examination of Water and Wastewater.

The last item that was purchased included a pH-temperature-salinity-conductivity probe. A strong emphasis will be placed on the chemistry aspect of this project and this will greatly enhance the mini water research project.

A review of how you implemented your project (lesson plan/SOP/curriculum), including:

The number of students who participated and their age group:

Each semester the Saginaw Chippewa Tribal College offers a variety of science classes. Due to lab space limitations, classes are capped at 12 students per science class. Typically around 10 students take chemistry each year while another 10 students take environmental science. The ages of the students vary dramatically but ranges from 18 to 60. It should be noted that most of my students have been non-traditional students, but each semester is very different. Sometimes, my students even bring in their children since they have no baby sitter at home. These projects have been ones where I can have the younger children participate as well. Although they are not able to do everything, they still enjoy working with their parents and learning what their parents are learning.

The number of faculty who benefitted (either through participation or by receiving a description of your project for their own use):

The two-science faculty at SCTC will benefit directly from these purchases. In addition, the Extension Officer at the SCTC will benefit as well. The rest of the faculty will be included in the audience as students present their research findings at the Assessment Fair. It is at the Assessment Fair that students will present a poster from their studies and will stand by it and answer questions as faculty, Tribal members and students peruse the presentations.

A projection as to the number of students per semester who will benefit from this material, if the project is ongoing:

At least twelve students per semester will benefit directly from the project as they complete their science classes (chemistry and environmental science). In addition to the college students, middle school students will also benefit from a summer outreach program that will take place for at least the next four summers. At this point it is unclear exactly how many students will participate. We are aiming for about 25-30 students each summer.

Summary of the overall results

With the initial funding from the Institute two summers ago, an initial water research project was created. Building upon the successes from the grant in my SCTC college class, a USDA Extension grant was sought and received to boost our community outreach efforts (\$400,000). In this Extension grant is a summer program for middle school students to participate in a water research project. The

equipment purchased from this past year's Institute just further expands and strengthens the programs that were started. As mentioned earlier in the report, the students have loved the addition of the new research project. One particular comment stands out. "I always thought research was supposed to be hard, this wasn't hard at all. In fact, I really liked doing it and want to do something like this for my job." Personally, I am very grateful for the opportunity that PETE has provided for my students and know that my students are benefiting tremendously.
