TRACY A. STOOPS

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I have been teaching for eleven years at Shorewood High School. Shorewood has approximately 1800 students and serves grades 9 through 12.

My most recent teaching assignments have included teaching General Biology, grades 10 – 12, Biotechnology grades 11 – 12, and Marine Biology grades 11- 12.

It has been an eventful 10 years. Developing science teams at the ninth and tenth grade level, coming to a teaching consensus on new curriculum for both, beginning a Marine Biology course with numerous field trips and an outreach component accessible to elementary students, and creating a vocational Biotechnology course. Of those experiences, the Biotechnology course has been by far the most challenging. Coordination between scientists, community members and higher education institutions has been a necessary part of that course development as well as maintaining a vocational teaching credential and fulfilling vocational curriculum components. Beginning a new lab, I have discovered, is both invigorating and exhausting but well worth the effort considering what students and staff gain from the connections, experiences and exchanges of creative ideas!

My connection with SEP began about 7 years ago as a participant in the SEP program. My mentor teacher was Janet Miriam at the Quality Control lab for Immunex located in Bothell. It rapidly grew into a lifeline for my teaching as I explored opening up the Biotechnology lab and sought help for curriculum, equipment, reagents and the technical expertise necessary to start a high school biotechnology program. Today I continue to be involved with SEP as a lead teacher and have recently completed work on the Elephant Project, a new piece of curriculum developed for the SEP kit program.

I enjoy snow skiing, swimming, bike riding, hiking and occasionally gardening (not really, only if it's a nice day and there aren't to many weeds!).

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SHORELINE PUBLIC SCHOOLS
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- 3 sections of General Biology, grades 10 - 12
- 100 minute class periods twice a week, 55-minute period once a week
- 30 – 32 students per class
- 8 lab groups of 3 or 4 students

Before beginning the Elephant Project, students have completed their year of study on various Biology topics including units on biomolecules, ecology, DNA structure, protein synthesis, genetics, population genetics, ethics and evolution. In addition they are instructed on the use of micropipets and gel boxes prior to running this lab. The elephant project is used as a culminating project for the year and as an end of the year assessment. It requires students to use previously acquired knowledge to solve a new problem and explore the different ways biotechnology can be used as a tool. In addition, most of my students have just completed a unit on the geography of Africa in their World Geography class and this provides another conduit to connect students learning across the subject areas.

HOW I CUSTOMIZE THE ELEPHANT PROJECT FOR MY CLASSES:

Prerequisites

Day 1 -Micropipet Instructions and Practice Electrophoresis Basics

Engage

Day 2– Scenario/Biographies/Nat. History

Explore

Day 2 – RFLP Paper Activity

Day 3– "Ivory" Digest

Day 3 – Elephant RFLP Lab

Engage

Day 4 – Wild life Warrior Video

Elaborate

Day 4 - Modified ethics writing

Explore

Day 5 – Complete gel electrophoresis on the Elephant RFLP Lab

Explain

Day 6 - Analysis of Comstock and student data

Evaluate

Day 7 – Whale Assessment

Specifics

Day 1 (100 minutes)– The first two pages of the Micropipet lab were completed, stopping just before the centrifuge explanation. Students were proficient enough at selecting, reading

and setting micropipets to work independently or in groups without teacher instruction for the last part (pipetting onto parafilm). This is key to moving on to the scenario and lab. In addition page one of the Electrophoresis Exploration was completed. This allowed students to label the gel boxes, state the parts and review the purpose of the parts in a teacher led discussion. In addition, we simply put distilled water in the boxes and looked at the milliamp and vs. volt readings, then added 1 milliliter 50X TAE and rechecked milliamp vs., volt readings. A discussion followed about electric current and conductivity within the gel box. This saved time, as both labs were shortened to just the essential components and the first day was spent simply getting lab techniques and procedure skills in place.

Day 2 (100 minutes) – The scenario was read, the project introduced. Brainstorming was done on how DNA is used for identification and what information would be required to identify the source of the ivory. The Comstock and Wasser overheads were shown and discussed. Ivory samples and the elephant tooth were examined by students, with a high interest in discussing what part of the tusk is used by poachers and why the elephants are destroyed in order to obtain the ivory. We began the RFLP lab, and completed both paragraphs from option 2 on the RFLP activity. At the very end of the period, the first 8 minutes of the Discovery video was shown to peak interest in elephants – it worked!

Day 3 (100 minutes) - Prepared Samples and the Enzyme Digest. To again save time, the DNA for all samples was previously pipetted into color-coded tubes; (this can be done by the teacher OR by a student(s) proficient in micropipetting such as a TA or advanced class of students. In my case, biotechnology students helped here) A chart was made and put on the overhead to indicate to students how to associate the different color tubes to the DNA that they now contained as well as a tube number. Students in the class copied the information off the board and labeled all their tubes with the proper number and lab team identification. The students then pipetted the restriction buffer and the sterile water into the appropriate tubes containing the DNA and one student from each group came to the teacher to have the enzyme placed in tube 6 for the ivory digest. When all tubes were loaded, students centrifuged their set and placed tube6, the ivory digest tube into the 37 degree water bath. This method of set up met with tremendous success. It saved time, increased accuracy, wasted few reagents and still required each student to read the procedure, following directions, work as a team, and use their knew skills of micropipetting and centrifuging. By having the DNA and the enzyme under teacher control no reagents were wasted or contaminated. The total time for set up was around 40 minutes, when all groups' tubes were in the water bath; we reviewed Concept Questions Part 1. This allowed for classroom discussion, as not all answers are obvious to students in the student lab and some need to be thought through either in lab groups or in a whole class discussion. Also, this saved on making copies, as the lab protocols stayed at the lab tables for the next class. At the end of the period following the 30 minute incubation, lab groups brought there 6 tubes to the front of the room to put in a common rack for that class and to be placed in the freezer until they were ready to run the gel. If time permits, it is a good idea to run another 8 to 10 minute segment of the Discovery video to keep their interest in the bigger picture of the problem they are trying to solve.

Day 4 (time varied – some classes were 55 minutes others were 100) I was absent these days – it is good to keep in mind what else you have on your plate and schedule your movies accordingly! I showed "Wildlife Warrior" in its entirety to all classes. Those students who were in the longer class periods did an extension on this activity, which I borrowed from the ethics, activity in the Elephant Project. These students chose a stakeholder portrayed in the video (poacher, wildlife biologist, politician, ivory trader, ivory consumer, etc) and wrote a paper based on that stakeholders point of view on what they feel should be the consequences for Grandpa and his ivory purchase and why.

Day 5 (100 minutes)– I prepared the gel prior to class and kept it liquid at 60 degrees C. Students poured their own gels, coming to the water bath with a 25-ml beaker to receive the gel and Carolina Blu stain. While they set, instructions were given on preparing the gel box, adding the Sample Loading Buffer to their tubes, and on how to most easily load the wells. Each student was required to load at least one well for his or her lab team. (This took approximately 40 minutes) While the electrophoresis gel was running, students answered Concept 2 Questions and the Vocabulary List definitions were filled in. Again, this took time and was best done in lab team groups or as a whole class discussion. The gel ran for 45 minutes. At the end of the run, gels were put in a staining tray, labeled and left on the back counter for the teacher to stain with Carolina Blu. (I stained the gels immediately following class)

Day 6 (100 minutes) – Results from the gel were obtained and traced onto acetate sheets. These sheets and the Comstock data table were both analyzed by estimating the size of the bands as well as the number of bands observed. Students who ran their gels for less then 45 minutes got poor separation and hence it was more difficult for them to read their results, but the vast majority correctly identified the proper source. It did strengthen the idea that a database is crucial for scientific investigation and the mapping portion of the analysis questions enabled students to combine their world geography information and their scientific information - a great connection! I did not to do the semi log graphing option for analysis of data due to time constraints as well as math skills for the bulk of my students.

Day 7 – (22 minutes – the last day of school!) I was going to have students answer 1 or 2 questions from the whale assessment piece. However, being the last day of school, with some fairly exhausted and excited students and due to time constraints, I chose to discuss the assessment question. The assessment question I focused on was how scientists can provide evidence that a piece of whale meat found on fishing vessel is from a whale that can be legally harvested. This led to how can biotechnology be used to conserve ANY species.