

Faculty Innovator Grant 2012  
Center for Learning and Teaching

Final Report Form

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Primary Faculty Name:	Pinky A. McCoy
Department:	Chemistry and Biochemistry
Email Address:	pmccoy@odu.edu
Office Phone Number:	683-4103
Project Title: (10 words or less)	Incorporating Technology into Non-majors Chemistry Laboratories

*Other faculty:*

Faculty Name:	Department	Email Address	Office Phone Number
Craig Bayse	Chemistry and Biochemistry	cbayse@odu.edu	683-4097

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1. Describe the specific teaching and learning issues being addressed by the proposal. The health profession is incorporating more and more technology into sample collection and analysis. In particular, nurses increasing use PDA-type devices to measure patient stats, etc. As the nursing profession heads toward more automation through technology, more experience with technology would enhance their success in the workforce.

(a) introduce students to technology based collection of data in real time. In the current health care environment, automated instrumentation is routine and allied health professionals will be expected to have basic knowledge of mobile vital measurement devices and must feel comfortable using the compatible software.

(b) emphasize the importance of instrument calibration. All instrumentation that is used to collect data for differential diagnosis in a health care setting must be calibrated properly so that measurements are reliable. Utilizing the Vernier devices will provide hands on experience in calibrating several types of measurement devices, especially if different types of measurement probes are used (i.e, pH, blood pressure)

(c) to promote complete understanding of the goals and concepts of each experiment before the student leaves the laboratory. In the traditional chemistry lab, the student collects a few data points and interprets results after several hours and/or days have lapsed. For many visual and tactile learners, this approach does foster any comprehension of the purpose of the experiment. They tend to forget what they have done and are lost when asked to recall qualitative and quantitative measurements. Using the Vernier instrumentation with specific sensors will provide instantaneous data collection, graphical representation, tabulation of data so that students can make direct conclusions. 2. Describe the revised specific teaching and learning issues being addressed by the proposal (if applicable):

3. Describe the development activities involved addressing the learning or teaching issue.

(a) enhance their capabilities with using technology for data collection and analysis

(b) increase their awareness of how data is processed by technology

(c) provide early hands-on experience with applications of technology to enhance their preparation for their future careers

(d) improve scientific reasoning skills through immediate analysis of data and interpretation of results

These skills are attained in three major labs of the semester: Analysis of Cooling of Water, Charles' and Boyle's Law, and Solutions and pH

4. Describe the learning outcomes attained by the project.

Students were able to obtain real time, experimental data which simplified traditional data recording and analysis. They also became accustomed to the hand held devices

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they will be using in their health field. In a survey (attached) of 100 students: 85% felt the device increased their awareness of, and how data is collected and processed in real time; 80% felt the devices increased their scientific reasoning skills because they were able to obtain immediate feedback; 65% felt the device was user friendly, and 75% felt the device enhanced their learning of laboratory and lecture content. Some students also commented that they would like to use it in other labs.

5. Describe unexpected outcomes, if any.

Students suggested that a training video be made for the devices rather than to rely on their Teaching Assistants. There was a definite learning curve with the Vernier software, such that more time should be devoted to understanding the device, by teaching assistants and students i.e. troubleshooting.

6. Describe the impact of the completed project on your colleagues, department, college, or community.

There are several different probes available for this instrument, for which we have used only two. Other colleagues have successfully used the instrument with additional probes for upper level laboratories. Since there is widespread use of the instrument in our department, we are considering purchasing the Logger Pro PC software for further data manipulation. At present, the data manipulation can only be performed on the device. Purchasing the software would allow students to transfer data to a flash drive and analyze the data further on departmental/university computers. In addition, there are iPad graphical applications available.

7. Describe how the project can be a model, template, or prototype for use by other instructors.

There are several probes available for the health sciences, such as those for measuring ankle joints and EKGs, which may adaptable for some courses at the introductory level in the College of Health Sciences.

8. Describe the technology used to help address the issues described in the proposal.

Vernier probes are hand-held PDA-like devices designed for real-time collecting and storing data which can be analyzed directly on the probe or interface with PCs for more in-depth data manipulation. These devices have interchangeable probes for measuring a number of physical properties. The versatility of the probe is ideal for incorporation into the CHEM 105-108 sequence

9. Describe products, if any, that are a result of the project.

Our Teaching Assistant, Whitney Fisk, who tested all experiments, enjoyed using the device and has seen the potential of data manipulation available by the instrument. She

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had even attended a free, one day, tutorial, that some colleagues would also benefit. She looks forward to teaching and developing ideas for technology in the classroom when she graduates.

We are looking at the purchase of additional probes for upper level laboratories.

10. Describe the future plans for this project, if any.

We were only able to implement the device in the CHEM 106 laboratory. We are considering labs to add/modify with the probes for the CHEM 108 laboratory sequence. The department will need to decide if we should purchase the Logger Pro software and attend a training conference for the Vernier hand held devices. There are also iPad graphical analysis applications to consider.

11. Attach a financial report with updated Budget Plan Matrix.

**Final Budget Matrix**

Budget Item (equipment, personnel, software, etc.)	Qty	Total Cost	Source of Funds	
			Amount from FIG	Amount from Other Source
M.S. Summer Stipend	1	\$3000	\$3000	

**Note to Student:** At the end of the exam, remove this page from the back of your exam paper. Give it to your Lab Instructor who will put it in a separate envelope. Do not put your name on it. It is an anonymous survey. You gain the 10 points for completing the survey.

**Question 7: 10 points**

**CHEM 106N Vernier LabQuest Instrumentation survey**

Please rate the following questions using the scale below: 5: strongly agree 4: agree 3: neither agree nor disagree 2: disagree 1: strongly disagree	
Question	Rating
1. The Vernier hand held devices increased my awareness of and how data is collected in real time and how the data is processed by technology.	
2. The Vernier hand held devices improved my scientific reasoning skills through immediate analysis and interpretation of results.	
3. The Vernier hand held devices were student user friendly.	
4. Overall, the Vernier hand held devices enhanced my learning of laboratory and lecture content.	

Which labs did you find the instrumentation was most useful?

Which labs did you find the instrumentation was least useful?

If there are any further comments regarding the use of the Vernier Instrumentation, please write them below: