UNIVERSITY OF LOUISIANA AT LAFAYETTE

STEP Committee

Technology Fee Application

Data Loggers for Ecology Labs
Title

Dr. Phyllis Baudoin Griffard and Dr. Scott Duke-Sylvester
Name of Submitter
(Faculty or Staff Only)

UL Lafayette Biology Department, Ray P. Authement College of Science
Organization

Title: Data Loggers for Ecology labs Date: July 6, 2018

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ABSTRACT (250 words or less):

The Biology Department has set a goal of providing authentic research experiences throughout our undergraduate curriculum. The purpose of this grant is to modernize data collection and analysis tools used for ecology labs in BIOL113 and BIOL360 with handheld, portable, wi-fi-enabled data loggers (Vernier LabQuest2 interface) and sensors appropriate to ecology research: weather data, soil conditions and water chemistry. BIOL113 is the second required lab course for biology majors, serving about 400 students per year. The *Campus Habitats* project piloted in Spring 2018 is a longitudinal, ecological research study of the UL Lafayette main campus (Cypress Lake, Hamilton pollinator garden). Field data were limited to those they could collect manually with thermometers, meter sticks and our wildlife camera, or equipment borrowed from research labs. Principles of Ecology (BIOL360) reaches about 40 students per year. Data loggers and probes would allow students to expand on an existing investigation of plant competition. Currently, students can manipulate only nutrient availability, not other important variables such as light and temperature. Also the independent variables are currently prescribed by the instructor, but with more options for data collection, questions can become more student-driven. Progress on this will address objectives of the new Quality Enhancement Program announced in Spring 2018 that will expand UL Lafayette's commitment to Undergraduate Research.

1. Purpose of grant and impact to student body as a whole
    a. Our department has set a goal of providing authentic research experiences throughout our undergraduate curriculum, even in freshman courses. This goal will move us from cookbook labs with known outcomes and a shallow focus on skills and techniques to richer, more rigorous experiences with research that foster critical thinking and an inquiry mindset. This will be further supported with the upcoming launch of the Quality Enhancement Program on Undergraduate Research announced by President Savoie this spring.

       The purpose of this grant is to modernize data collection and analysis tools used for ecology labs in BIOL113 and BIOL360 with handheld, portable data loggers and sensors https://www.vernier.com/products/interfaces/labq2/ appropriate to ecology research:
        - 10 Vernier LabQuest2 interfaces @ $329
        - Probes for field measurements of ecological parameters
            1. 10 PAR (light) sensors @ $199
            2. 10 conductivity (salinity) probes @ $119
            3. 10 soil moisture sensors @ $99
            4. 10 soil pH sensors @ $109
            5. 6 dissolved oxygen (DO) probes @ $219

6. 6 each of anemometer @ $89
7. 6 each of barometer sensors @ $71

- 1 LoggerPro software site license @ $249

Both labs are already equipped with computers that are compatible with the LabQuest2 interfaces and LoggerPro software. STEP has been involved in projection technology in Billeaud 113 (where BIOL113 lab is taught), and is slated for an upgrade this summer.

BIOL113 is the second required lab course for biology majors. This is a multiple section course: 6-8 sections of 26 students per section are taught every semester, for a total of about 400 students per year. In an effort to introduce students to research early, Dr. Griffard and the teaching assistant team have successfully piloted a course-based undergraduate research experience (CURE) in all sections of BIOL113. The *Campus Habitats* project is a longitudinal, ecological study of sites on the UL Lafayette main campus (Cypress Lake, Hamilton pollinator garden). Now, instead of simply observing pond water or soil invertebrates, students in BIOL113 collect ecological data that they enter into a common, longitudinal (ongoing) database. For their course research project, each team queries the database to answer their own research question, analyze the data and complete the research cycle with a public poster presentation. Research questions investigated by student teams in Spring 2018 included *Do different weather variables affect the number of turtles basking in Cypress Lake?* and *What is the phenology of 5 plant species in the pollinator habitat?* To now, these field data have been limited to those we could collect manually with lab thermometers, meter sticks and our wildlife camera, or equipment borrowed from research labs.

BIOL360 is a Principles of Ecology lecture/lab course that fulfills the requirement for a field elective for biology majors. It is taught every regular semester. Approximately 40 students enroll per year. In the lab, students learn about resource-limited growth and intraspecific competition by testing the influence of nutrients on plant growth. Data loggers and probes would allow students to investigate the effects of light (PAR) and provide a quantitative measurement of the effects of plant competition on soil moisture. Salinity sensors would expand the range of possible investigations to examine the effects of salinity stress on plant competition. Currently, students can manipulate only nutrient availability, not other important variables such as light and temperature. Also the independent variables are currently prescribed by the instructor, but with more options for data collection, questions can become more student-driven.

b. Projected lifetime of enhancement: 5-10 years.
c. Person(s) responsible for
   - Implementation: Dr. Griffard and Dr. Duke-Sylvester
   - Installation: Dr. Griffard and Dr. Duke-Sylvester and teaching assistants
   - Maintenance: Dr. Griffard and Dr. Duke-Sylvester and teaching assistants
   - Operation: Dr. Griffard and Dr. Duke-Sylvester and teaching assistants
   - Training (with qualifications) NA

Budget Proposal

1.	**Equipment**	**$10,894**
2.	**Software**	**$249**
3.	**Supplies**	**$0**
4.	**Maintenance**	**$0**
5.	**Personnel**	**$0**
6.	**Other**	**$0**
TOTAL:		**$11,073**