DiscoverLife Research Interns

Introduction – Interest and Performance in Plants, Zoology, and Ecology

GPC Principles of Biology students consistently perform lowest in the categories of Plants, Zoology, and Ecology on standardized assessments (ACAT) given between 2011 and 2013. The areas of Plants and Ecology have been identified as target areas for improvement by the Principles of Biology curriculum committee. While current efforts focus on professional improvement for faculty members, no efforts underway currently target students directly.

Current lab environments created to study these topics are room-restricted and involve little field work. This proposal will involve Science Majors exiting MATH 1113 (a pre-requisite to CHEM 1211) in extended field research experiences. This pre-course immersion in the topics will enhance information retention in later biology courses. Success in this format will be expanded in future work to involve BIOL 2107L and 2108L students in short-term field research experiences.

It has been shown that investigative learning experiences are more effective at creating deep and lasting learning than didactic lecture or “cookbook” laboratory exercises. This project will test the effectiveness of personal field research as a replacement for the current content delivery methods of lecture and scripted lab activities.

(Prior Work) A prior grant for this work was funded in Fall of 2013. Eight student interns were engaged in the work for fall and spring semesters. Three students travelled to GRU in Augusta and presented at the Georgia Academy of Science. This is the first time in over a decade that GPC students have presented at this conference, even though this conference is attended by more than a dozen GPC faculty annually. Additionally, students created a poster and won first place in the GPC STEM Week Poster Fair. Four of the students participating in the project have transferred to four-year colleges, two to GT and two to GSU. One member of the project leveraged this and other experiences to win the Jack-Kent Cooke Scholarship.

Data taken by students has shown a radical difference in the presence of the family of lichen moths in Atlanta compared to Athens (0% of moths in Atlanta vs. 6% in Athens). This observation led to a summer bridge project where two students catalogued lichens at each study site in both cities, finding that Atlanta had many fewer types of lichen and less lichen coverage than Athens. A collaboration has therefore been proposed between PSLSAMP/STEP grants and this STEM II minigrant to continue the lichen research.

Literature Review

Numerous studies show that targeting a learning outcome with additional coverage of the topic results in modest gains at best and even reduced learning in some cases (Russell 1984, Boyer 1998). Significant gains in learning are most often achieved by implementing a variety of strategies collectively known as Active Learning (Freeman 2007, Hake 1998, Knight 2005).

While many might consider a laboratory class to be inherently active in nature, the pre-scripted lab environment has been shown to have little effect on deep learning and enduring concepts (Chin 2000, NRC 2000, Trumble 1993). Additionally, students with significant prior exposure to a topic will often self-direct into a study modes that result in deeper learning (Hazel 2002).

Project-based learning provides a real-world context to the otherwise disconnected facts traditionally presented in science classes (reviewed in Thomas 2000). By providing an objective goal (project
completion) separate from the learning goal (assessment score), project-based learning has shown learning gains as much as 25% higher than traditional lecture control courses (Ross 1999, Rugen 1994).

**Research Plan – Research Internships at Stone Mountain and at Home (Service Learning)**

The main objective this year is to expand our interns’ involvement in data analysis and literature research. Given a sizeable pre-existing Atlanta data set, students can now begin data analysis in the Fall rather than waiting until late spring. This prior delay caused a disconnect between students’ actions in the field and their understanding of the scientific reasoning following the data. Additionally, the project will be expanded to include a focus on lichen diversity.

The student research will focus on the flora in the Stone Mountain song bird habitat and moth populations around student homes. The studies will follow the protocols established as part of DiscoverLife.org. Students will take data during the day on plant bloom cycles and pollinator emergence. Students will take data during the night on moth species abundance and phenology. This data will be provided to DiscoverLife for their ongoing research and completion of the Georgia Natural History Survey (Service Learning Component).

Research interns will make periodic visits to the lab of Dr. John Pickering at the University of Georgia for training and to establish research questions and protocols for an individual project. Interns will be required to create a presentation on their research findings and attempt to present their work at the GA Academy of Science annual meeting or other area undergraduate research symposiums.

Participants will be ten Science Majors having completed MATH 1113. Participants will be chosen from volunteer applications solicited by poster, e-mail, and class visit.

**Personnel – All Tenure Track**

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**Evaluation Plan**

Student attitudes towards ecology and science research will be measure pre/post-internship. Student success in future Principles of Biology courses in plants, zoology, and ecology will be measured via course assessment and compared to matched student control populations.

An additional, non-traditional metric will be student involvement in research presentations. The number of students showing enough proficiency in understanding the project and data analysis to create presentations will be a vital indicator of the true success of the project.

**Dissemination of Results**

Results will be presented to Principles of Biology curriculum committee, at STEM retreats, and at the National Association of Biology Teachers, Georgia Academy of Sciences, and National Science Teachers Association meetings (depending on location and travel funding). Student results will be presented at the Georgia Academy of Sciences or other undergraduate research conferences.

**Bibliography**


