From conception to submission: Course-based Undergraduate Research Experiences *using* insects

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Typical Undergrad Research Experience

Observations → Question → Hypothesis → Experimental Design and methods → Results → Conclusions → Share findings

Extending Your Research Team: Learning Gains When a Laboratory Partners with a Classroom

Education

Extending Your Research Team: Learning Gains When a Laboratory Partners with a Classroom

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Broadening the voice of science: Promoting scientific communication in the undergraduate classroom

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Abstract
Effective and accurate communication of scientific findings is essential. Unfortunately, scientists are not always well trained in how to best communicate their results with other scientists nor do all appreciate the importance of speaking with the public.
CURE: Course-based Undergraduate Research Experience

Bringing research into the classroom

Benefits undergrads
• Clear learning objectives and supportive cohort
• Motivational authentic research
• Illustrating science as a process of discovery

Benefits Research
• Data collection and synthesis mechanism

Benefits Teaching
• Exciting and motivating learning environment
Support for this Integration

USDA-NIFA-Women and Minorities in STEM (WAMS) program

• Small grants (~$100K) for up to 2 years
• RFA released ~January and due ~April
• Emphasis on women, minorities, rural communities
• Emphasis on multi-disciplinary projects
Making STEM Engaging
Our Course Structure

Project 1. Use existing data to learn analysis and interpretation

Project 2. Use a new study system / organism to develop hypotheses and collect new data that addresses those hypotheses
Project 1: Sperm-storage in a true bug

Research Objective: Determine the ability of an exotic cactus bug to store sperm and successfully reproduce

Questions
↓
Hypotheses
↓
Experimental Design and methods
↓
Results
↓
Conclusions
→ SHARE FINDINGS

DATA previously collected
Project 2: Host-parasite interactions in an invasive insect

Research Objectives: Determine the current status of classical biological control organisms AND if they have changed mole cricket morphology over time

Invasive mole crickets

Questions

Hypotheses

Experimental Design and methods

Preliminary results

DATA collection during the semester
Student “Ambassadors”

• A subset of undergrads carried over into the next semester for independent research credits

• Continued Project 2 data collection, analyses, writing, and community outreach
Funding encourages & facilitates course evaluation

Standardized CURE Survey

• Self-reported gains comparing our students to other CURE students nationwide (Lopatto et al. 2008. *Science*)

• Contracted an external evaluator for more in-depth student evaluation

![Bar chart showing skill gains in science writing, understanding scientific assertions, understanding knowledge construction, and effective oral presentation. The scale is 1 to 5, with 5 being the largest gain. All students and ENY2890 groups are compared.]
Undergrad Outcomes

• 10 students who enrolled in ENY2890 are co-authors on a peer-reviewed publication *in press* in *Annals of the Entomological Society of America*

Student Ambassadors

• Created posters and gave research presentations
• Will be co-authors on a second peer-reviewed paper
• Participated in multiple statewide outreach events
Undergrad Feedback

• “I'm not a great public speaker, so speaking in front of groups really helped me feel more confident.”

• “I feel more confident in research because I learned it is a very collaborative effort, so you don’t have to start knowing everything.”

• “Before the class, I knew that research was finding the answer to a question ...but I never thought of it as having impacts on other parts of our lives.”

• “I felt like being an undergrad was just to learn huge volumes of information that was difficult to put together. Once I got involved in the research process, I could backtrack and everything made sense. You know these discoveries occurred because people were doing research on it. Now I wish I had this opportunity as a freshman.”
Outcomes for my Program

• Hired a Post-doctoral Associate

Research
• At least 3 peer-reviewed publications
• Abundance of data for future research directions

Teaching
• Developed a new course listing (ENY 2890)
• Mentored 5 undergrads
• Scholarship of teaching publication

Extension
• Participation in multiple Extension/outreach events
• Pest management recommendations
• Direction for future applied pest management projects
Thank you!

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