

## Graduate Research Assistant - Biology Education - Montana State University

**Start Date:** Negotiable - preferably by July 1, 2015

**Overview:** We are searching for a PhD student to join our interdisciplinary research team that seeks to identify attributes of college students that affect learning in science. Specifically, we want to determine how motivation, epistemic beliefs, study strategies, formal operational reasoning, biology content knowledge, and personal demographics interact with instruction to influence whether students learn key concepts in introductory biology courses.

The PhD student will collect data from 60 universities from across the United States and analyze this data using item response theory, factor analysis, and structural equation modeling. This project offers an excellent opportunity for students seeking to develop statistical skills, and the research team includes an experienced statistician to mentor this student. Our team is developing a multi-perspective framework on conceptual change in science that merges cognitive, individual, and social learning perspectives, so the PhD student will develop expertise in multiple learning theories. Students with a strong foundation in statistics and an undergraduate or Master's degree in a related field (especially education, biology, or psychology) are encouraged to apply.

This 3-year project focuses on undergraduate biology, and offers opportunities for motivated students to develop their own questions. This could include extending the work into physics, chemistry, and other college science disciplines or studying how these attributes affect learning in middle or high school science.

The research is funded by a NSF EHR-Core Research award, DUE-1432577.

### **Project Description:**

#### *Background*

Students bring their own ideas, beliefs, and values to science classrooms, including diverse and surprisingly intractable misconceptions regarding natural phenomena. A central question for several decades in science education research has been how to change students' misconceptions to more scientifically-supported understandings. The primary approach used to do this has been to focus instruction directly on the misconceptions themselves. However, it is becoming clear that a more holistic approach is needed. There is growing recognition that conceptual change is influenced by many additional attributes of the students. Important variables include: motivation, epistemic beliefs, cognitive and metacognitive strategies, formal operational reasoning ability, and content knowledge. We do not know how all of these variables interact to affect conceptual change, and which variables are most important. This makes it impossible for instructors to know the most efficient way to improve instruction. The goal of the research we propose here is to explore how five categories of 23 variables work together to influence conceptual change and to determine which variables play the strongest role. No research to date has investigated as many variables related to conceptual change in as many courses or institutions.

This research has both theoretical and practical implications. It will describe the interaction and contributions of multiple types of variables affecting conceptual change in science, and identify which variables have more influence on conceptual change in introductory biology courses. It will provide an exemplar approach for studying conceptual change in other areas of science and at other levels, specifically in high school. Ultimately, the insights it generates may help instructors become more successful in moving students to scientifically-accurate understandings.

### *Research Approach*

We will study student misconceptions relating to natural selection in 60 university biology classrooms randomly sampled from across the United States. This data will allow us create structural equation models of conceptual change that bring together some of the most important discoveries in this field in the past three decades.

### *Project Team*

The interdisciplinary research team includes a science education professor/ educational psychologist, an ecology professor/population geneticist, and a statistician/quantitative ecologist. The Ph.D. student will be an integral member of our team and assist in carrying out this ground-breaking research.

**Duties and Responsibilities:** The doctoral graduate research assistant will assist in all (or lead in) aspects of the research. Responsibilities include recruiting 60 introductory biology instructors from multiple institutions across the country to participate in the study, collecting and analyzing data, and writing articles for publication. The research assistant will be mentored in structural equation modeling by an expert statistician. Ideally, the doctoral research assistant will identify an aspect of the research to develop and pursue as her/his own line of research as a dissertation study. The position will require the graduate research assistant to work in Bozeman, Montana.

### **Required Qualifications:**

- Successful application to Montana State University's Education Ph.D. program (or Master's enroute to Ph.D.) <http://www.montana.edu/education/>
- Bachelor's degree in science education, educational psychology, psychology, biology, or a related field
- Strong interest in science education
- Strong foundation in statistics
- Demonstrated ability to work independently
- Demonstrated ability to take initiative
- Strong written and oral communication skills
- Strong organizational skills

### **Preferred Qualifications:**

- Master's degree or research experience

**Stipend:** \$2400/month for 12 months<sup>1</sup>

**Benefits:** Tuition for 6 graduate credits in each of spring and fall semesters, mandatory university fees, and student health insurance will be covered during the term of the graduate research appointment.

**Application Deadline:** Applications will be accepted until the position is filled.

**Application Procedure:** Submit letter of interest addressing the required and preferred qualifications, resumé or curriculum vita, and list of three professional references to: Dr. Mary Leonard, Department of Education, Montana State University, PO Box 172880, Bozeman, MT, 59717-2880; [mleonard@montana.edu](mailto:mleonard@montana.edu); (406) 994-2336. Applications may either be emailed or sent in hard copy.

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<sup>1</sup>This includes an additional payment of \$120/month as described in Article 8 of the Graduate Employee Organization collective bargaining agreement and is intended "to defray costs including, but not limited to, living and healthcare costs."