

# Assessment Grant Proposal Form

Assessing student learning is an essential component of general education and in the major. This grant supports innovative practices in the assessment of student learning. The Assessment Grants are intended for faculty in their efforts to support and assess student learning in public affairs and general education.

Over the course of the Fall 2017 semester, proposal forms will be reviewed and awarded three different times. The three proposal due dates are:

Friday, September 22

Friday, October 20

Friday December 15

Please fill out the form below which will become your grant proposal and click "submit" at the bottom of the page.

**1. First and Last Name:**

La Toya Kissoon-Charles

**2. Email Address:**

kis83@missouristate.edu

**3. Campus Phone:**

417-836-3729

**4. Campus Location/Address:**

King Street Annex 312

**5. College:**

College of Natural & Applied Sciences

**6. Please list the department and program to which you belong.**

Biology Department

**7. Have you received written approval from your department head or dean?**

My department head has approved this proposal.

**8. Will your program, department, or college support this project in any way? This is not a requirement, but "matching" makes dollars stretch farther and the request may help a broader audience understand and support your work.**

Yes

**9. What is the title of your proposal?**

Quantitative tasks in undergraduate biology: assessment of student attitudes and quantitative abilities

**10. Please select from the eligible projects listed below. If "other", please contact an Assessment staff member for approval.**

CoAssess student attitudes and quantitative abilities in biology

**11. What do you plan to purchase or pay for? Please specify what line items will be funded through the assessment grant and what line items will be funded through other sources.**

Funded by assessment grant:

Printing of skills assessment - \$60

Undergraduate student worker to assist with data collection and entry - \$440

Funded by department:

Scantrons - \$100

**12. What contributions will this work have on enhancing student learning?** Briefly describe the learning, writing, or thinking need that you intend to address with this grant.

The proposed project seeks to transform teaching and learning of quantitative skills in undergraduate biology by addressing the critical need for integrating and assessing quantitative reasoning across the biology curriculum. The American Association of Medical Schools and the Howard Hughes Medical Institute articulated a set of goals for the development of quantitative skills in biology students. The proposed project builds from those goals to explore students' development of quantitative skills and their attitudes towards using math in biology.

Specifically, we will:

1. Assess how students perform on quantitative questions,
2. Examine attitudes students have towards using math in biology, and
3. Describe the relationship between student quantitative abilities and attitudes.

Our understanding of quantitative reasoning in biology, in particular, our knowledge of student abilities and attitudes, is really quite limited. We are focusing on the above research objectives:

1. Assessments communicate an implicit message to students of what is important – in this case, what is important about quantitative skills.
2. In addition to student epistemology, student self-efficacy and attitudes can impact their performance on quantitative questions.

**13. What is your time frame for the proposed project?**

This project will begin January 2018 and culminate in August 2018. Instruments will be used to collect data during the first few weeks and last few weeks of classes in the Spring and Fall semesters. A report of the project will be submitted by June 2018.

**14. How will the results of this project be used for program improvement?** Please describe any anticipated outcomes.

Our proposed research will examine student attitudes towards mathematics in biology and determine if these attitudes impact student quantitative abilities. We will also determine if math anxiety plays a role in student performance on quantitative questions in biology. These data on student attitudinal and behavioral outcomes can transform instruction and assessment of quantitative skills in biology. We can use this data to help inform our biology curriculum and teaching of quantitative concepts in biology.

**15. If funded, a short, written report is expected.** The interim report will include the following information: Minutes of meetings (include attendees, date, items discussed, actions), project results, outcomes addressed, changes that will occur in the future due to this project, new learning, new curriculum, recommendations for future projects, and any handouts, student work, survey results, etc.

I agree to write a brief report by the end of this fiscal year (June 30, 2018).

**16. Do you agree to share the funded project at the time of its completion?** This may include sharing the proposal itself, outcome data from the grant's effect, or student work generated from use of the grant.

Yes

**17. How do you plan to show evidence of student learning?**

This research project will address some of the challenges associated with the integration of quantitative concepts in biology by investigating the following research questions:

- 1) How do students perform on quantitative questions in a published scientific literacy test?
- 2) What are biology majors' and non-majors' attitudes toward using math in biology?
- 3) Is there a relationship between student quantitative abilities and student views?

Objective 1: Assess student quantitative skills in biology

Previous surveys of biology instructors found that most instructors expect students to have basic math skills when they come to their classrooms. The Test of Scientific Literacy Skills (TOSLS) developed by Gormally et al. (2012) is a validated assessment, which measures skills related to major features of scientific literacy. Part of this assessment measures students' ability to organize, analyze, and interpret quantitative data. We will administer this quantitative portion of the TOSLS assessment in the targeted courses during the first week of classes to assess student baseline quantitative abilities. We will also administer this survey during the last week of classes to assess student learning of quantitative concepts over the course of the semester.

Objective 2: Assess student attitudes towards math in biology and math anxiety

The Math-Biology Values Instrument (MBVI) was developed using expectancy-value theory, which suggests that student performance on a task is influenced by how students value that particular task. We will administer this survey during the first and last weeks of class to assess student attitudes towards using math in biology. This is a validated instrument, developed for use in research and teaching (Andrews et al. 2017) will up us determine what are students attitudes and if there are changes in attitudes over the course of the semester.

Objective 3: Describe the relationship between student quantitative abilities and student attitudes

Previous research reported that students have difficulties with different aspects of quantitative tasks (Picone et al., 2007; Speth et al., 2010). Student attitudes and math anxiety is reported to impact learning (Ashcraft, 2002; Lovelace and Brickman, 2013) and may explain why students struggle with certain quantitative tasks. We will investigate the relationship between student performance on quantitative questions and student attitudes towards math in biology. We will also collect demographic data (e.g., gender, major, GPA, ACT scores) to support the creation of an empirically driven model to describe influences on student quantitative abilities. Such a model will enable us to predict factors, which influence student performance on quantitative tasks.