Using Learning Assistants as a peer learning model to increase student success in Principles of Biology laboratory sequence

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Author Biographies

Dr. Barbara Musolf is currently an Associate Professor of Biology at Clayton State University. She has worked at developing the course-embedded undergraduate research experiences (CUREs) in the introductory biology sequence and is one of the program coordinators of the learning assistant program at Clayton State University.

Dr. Ann M Showalter is an aquatic ecologist who received her PhD from Miami University in 2016 She has been working on incorporating evidence-based teaching practices, which has led her to focus on developing course-embedded undergraduate research experiences (CUREs). Dr. Showalter is currently one of the program coordinators for the learning assistant program at Clayton State University.

Dr. Paul Melvin is an Associate Professor of Biology at Clayton State University. He earned a PhD in Biology from the University of Alabama at Birmingham, with a focus on environmental toxicology and endocrine disruptors. He teaches courses in molecular biology, general biology, and leads study abroad programs to the Bahamas and Costa Rica.

Goal of the Program

Peer learning models have many benefits, especially within STEM fields (Talbot et al. 2015). One effective peer learning model uses learning assistants, who are students embedded in a course that provide support for student learning in their assigned course, serve as a role model for succeeding in the course, and create an atmosphere of belonging among students. The Department of Biology at Clayton State University developed a Learning Assistant Program with three main goals in mind: 1) support faculty by helping them introduce more active learning in the classroom, 2) mentor learning assistants by helping them develop strong pedagogical skills that strengthen their identity as teachers and scientists, and 3) support student learning in the classroom.

Description of the Program

We built the program initially by incorporating learning assistants into our Principles of Biology laboratory courses, which are course-embedded, undergraduate research, experience-based (CURE) labs, where students work collaboratively to complete a semester-long, authentic research project. The emphasis for CURE labs is to develop students' skills in scientific study design, analysis of data through graphing and statistical analysis, interpretation of findings, and communication of results. Learning assistants play a critical role in developing these skills by working closely with individual students and student groups throughout the semester.

Students who have successfully completed our Principles of Biology labs are eligible to apply to become a learning assistant. The applicants are evaluated on several metrices, including their success in the course in which they will be a learning assistant, their potential and interest in developing pedagogical skills, and their dedication to building a sense of community in the department. Our robust learning assistant program includes the following:

1. Learning assistants receive pedagogical training in a weekly, faculty-led seminar. In this seminar, students learn how to ask probing questions, listen to and elicit student feedback, recognize and

respond to cognitive load, motivate student learning, and encourage students to think about their learning (metacognition). Learning assistants also engage in small pedagogical research projects, which draw from pedagogical theory. The projects are presented at our department and university student academic conferences.

2. Learning assistants are embedded in their assigned course where they guide students in applying the process of science by helping students design research projects and providing feedback as the projects are implemented. They also help facilitate effective collaboration among student groups.
3. Learning assistants hold office hours for students to review faculty-designed formative assignments. Students earn full credit for the assignment if they meet with a learning assistant to review and discuss their answers. Students are not guaranteed full credit if they submit the assignments to faculty to grade. These assignments accomplish two things: reinforce what students are learning in lab and engage them in interactions that provide a greater sense of belonging within the biology community.
4. Learning assistants develop low-stakes, formative assignments for students and gather input on problems that students may be having in the class. The learning assistants use this information, in collaboration with the course instructor, to address student misconceptions.
5. Learning assistants are responsible for guiding students to reflect on what they are learning in the labs, prompting students to develop metacognitive skills and become more intentional, thoughtful learners.
6. Learning assistants are required to meet regularly with the faculty in whose course they are embedded. During this meeting, they review plans for the next class as well as share their observations on student problems in the class.

Reflection on how this program meets the authors' goals

We are pleased with how our learning assistant program is developing, and this past semester we expanded it into two upper division labs and one of the Principles of Biology lecture courses. In addition, the chemistry and mathematics departments joined the program. This supports our first goal, where faculty are now more enthusiastic about including active learning techniques in their courses.

For our second goal, we have observed learning assistants implement pedagogical skills they learn in seminar and develop novel ways to reach students in our lab courses. This past semester they collaborated with faculty in developing virtual formative assignment reviews using Microsoft Teams. By working closely with students and developing their own pedagogical projects (Figures 1 and 2), learning assistants reinforce their understanding of experimental design and improve their identities as scientists.

Finally, we have student-generated data showing that the learning assistants have supported student learning in the classroom, which is our third goal. This is particularly evident in the pedagogical projects the learning assistants have developed as part of their training. For example, data from learning assistant-designed formative assessments show a positive correlation in exam grades (Figure 1), and that student exam scores positively correlate with the number of times they visit a learning assistant (Figure 2). These data, generated by learning assistants, indicate that we are making progress in supporting student learning.

As a result of this project, we have more faculty introducing CUREs into upper-level labs, suggesting that we are introducing more active learning in lab courses. As the program matures, we will begin assessing learning assistant pedagogical skills and hope to encourage more students to consider teaching as a career option.

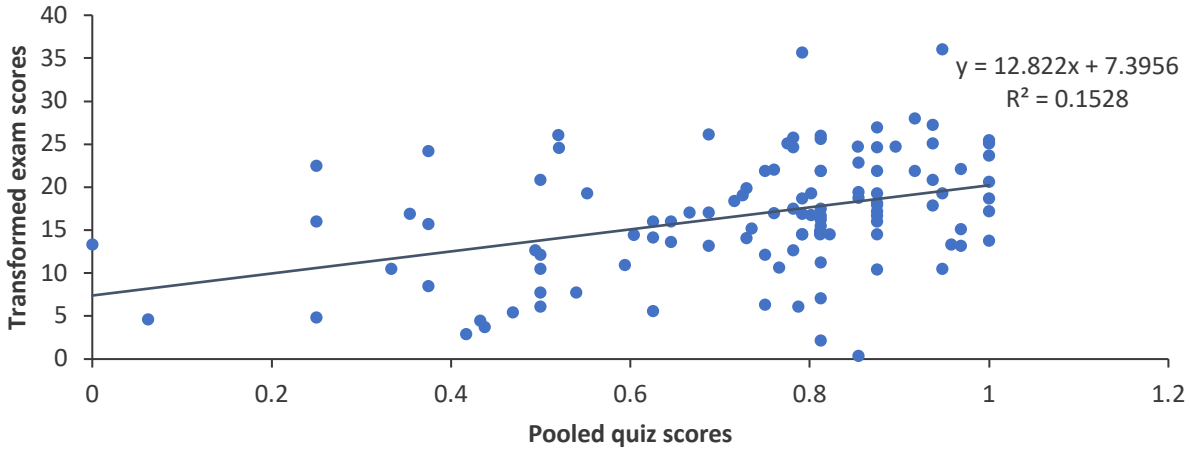

Figure 8: Student scores on weekly quizzes designed by Learning Assistants positively correlates with exam scores (Multiple linear regression, R2 = 0.1528, p = 2.415e-05). Quiz evaluations were not used for course evaluation.

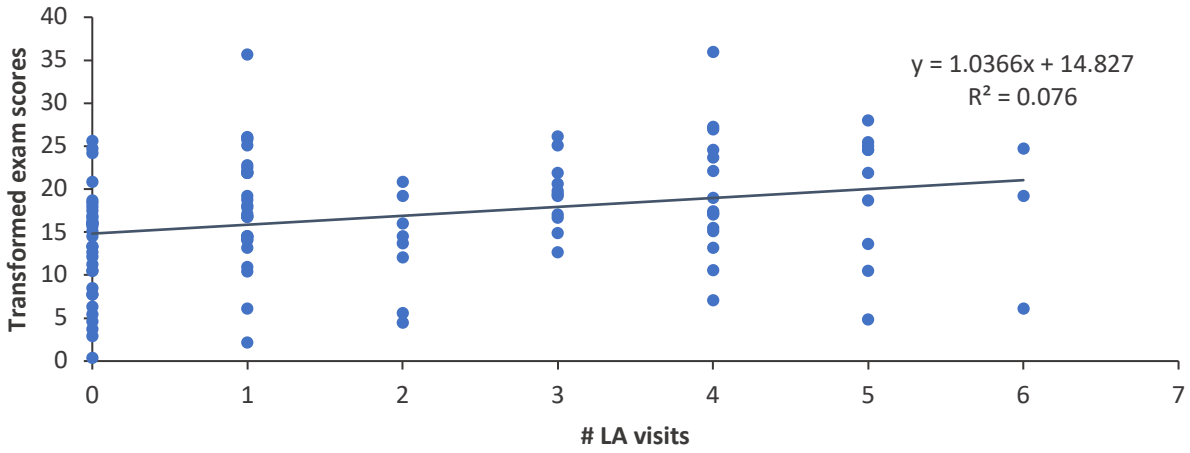

Figure 9: Student exam scores positively correlate with the number of times students visit a learning assistant during office hours (Multiple linear regression, R2 = 0.076, p <0.05).

References

Robert M. Talbot, Laurel M. Hartley, Katrina Marzetta and Bryan S. Wee. 2015. Transforming Undergraduate Science Education with Learning Assistants: Student Satisfaction in Large-Enrollment Courses. *Journal of College Science Teaching.* 44(5), 24-30.