

# The bean beetle microbiome project: The impact of student-autonomy on science identity, project ownership, and abilities to overcome perceived challenges in course-based undergraduate research experiences

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Recent calls for increased inclusion in & access to authentic course-based research have been building on the momentum of support for Course-Based Undergraduate Research Experiences (CUREs). However, these courses can be very challenging to implement at scale or with low resources. To equitably provide these critical science process skills to the largest possible cohort of students, we have developed a new student research project within our first-year biology lab. Our student team research project is integrated throughout the semester, building authentic science process skills from start to finish. Students start from a research idea, develop a multi-site experimental design, do hands-on data collection at home, analyze quantitative data, and present their findings in a conference-style format. We have also embedded structured time for building collaborative skills. This novel change to our lab curriculum runs online, hybrid or face-to-face; it has no lab budget costs; and it has been well-received in multiple offerings of our course of ~200-600 students. It also has allowed us to improve our assessments: we evaluate writing (graphical abstracts) and/or oral presentation skills. Further, our lab exam can now be more cognitively challenging because our new curriculum better prepares students to analyze, evaluate, and synthesize. This article demonstrates that we can reduce barriers to doing authentic research, at scale in introductory courses; and we include here all materials needed to adapt this project to your own context.

**Keywords:** Bean beetles, microbiome, CUREs

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