

Less Teaching, More Learning: A 10-Year Study Supports Greater Inquiry in Labs, Even Alongside Less Coverage, Yields Steady Gains in Student Learning Of Biology

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In this study we compared gains in student content learning over a 10-year period in which the introductory biology classroom laboratory curriculum was changed in two ways: an increase of inquiry and a reduction of content. Three lab formats tested were: traditional weeklong cookbook labs, two 7-week long inquiry labs and one 14-week long inquiry lab curriculum. As the level of inquiry increased, student learning gains on content exams trended upward even while traditional content coverage taught decreased. In a quantitative assessment of content knowledge, students who participated in the 14-week long inquiry lab format outscored their peers in both 7-week and 1-week long lab formats on MCAT-style standardized exams (62.6, 59.3, 48.9% scores respectively; $p < 0.0001$). In a qualitative study of student opinion, surveys conducted at the end of semesters where traditional 1-week labs ($n=154$) were used had low response rates and predominately negative opinions (only 20% of responses were positive), while those who participated in 7-week ($n=453$) or 14-week ($n=218$) inquiry labs had high response rates and 71% and 89% positive reviews, respectively. In an assessment of traditional content coverage in courses, three indices were averaged to calculate traditional forms of coverage had decreased by 40% over the study period. We believe the quantitative and qualitative data support greater student-driven inquiry in the classroom laboratory and deeper learning in fewer topic areas (less teaching), can lead to gains in scientific thinking and fundamental understanding applicable to a broader range of topic areas (more learning) in introductory biology.

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