

# Factors that Influence Learning Gains in Inquiry-based Laboratory Courses

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Inquiry-based learning in laboratory courses is often thought to lead to increased learning gains as compared to traditional approaches. However, previous studies that have examined learning gains in inquiry-based laboratory courses have done so in single courses at single institutions. To achieve a broader perspective on the factors that influence learning gains in inquiry-based laboratory courses, we used a standard pre-test/post-test approach with students in laboratory courses from five different colleges and universities in courses ranging from introductory biology to advanced courses for majors. At the end of the course, student confidence and student scientific reasoning skills were strongly influenced by their confidence and scientific reasoning skills at the beginning of the semester, as well as their perception of instructional and assessment practices in the course. Gains in confidence and scientific reasoning were significantly related to positive student's perceptions of authentic laboratory activities. However, other aspects of instructional and assessment practices that influenced post-test scores differed for student confidence and scientific reasoning. As might be expected, STEM majors and those students who had taken more laboratory courses scored higher on the post-test of scientific reasoning skills, although these two factors did not influence student self-efficacy. Interestingly, gender and racial/ethnicity group did not influence post-test scores. Together, our results suggest that instructional practices can greatly influence learning gains in laboratory courses.

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