

# Science Literacy & Self-Confidence in Doing Biology: Inquiry Versus Traditional Labs

*Cara Gormally<sup>1</sup> and Brittan Hallar<sup>2</sup>*

<sup>1</sup> University of Georgia  
Department of Plant Biology  
[cgormally@plantbio.uga.edu](mailto:cgormally@plantbio.uga.edu)

<sup>2</sup> University of Georgia  
Department of Mathematics and Science Education  
[bhallar@uga.edu](mailto:bhallar@uga.edu)

## Introduction

In making the change from traditional cookbook laboratory activities to inquiry-based lab work, our goals have been to increase students' science literacy and science process skills. Through the change to an inquiry-based curriculum, we had the opportunity to study both traditional and inquiry labs of the same course, taught during the same semesters. This allowed us to assess both methods of instruction simultaneously. During Fall 2006 and Spring 2007, pre and post assessments were administered to students in both traditional and inquiry labs to measure differential change in the acquisition of science literacy and science process skills as well as students' self confidence in doing biology. The non-science major introductory biology labs at the University of Georgia serve a diverse group of approximately 700 students each semester. The anticipated outcomes of this study were to gain perspective on the relationship between inquiry-based learning, science literacy and science process skills, student self-confidence in doing science, and provide valuable information for future laboratories.

To assess science literacy and science process skills, we administered a combined one hour assessment on the first and last days of lab. The first 30 questions focused on students' science literacy, while the latter 26 questions measured science process skills. The science literacy assessment is a multiple choice instrument which was previously developed (Norris *et al.* 2003; Wheeler-Toppen *et al.* 2005) and which we have continued to modify in order to increase test reliability. The science process skills questions, modified from a previously validated instrument (Ebert-May *et al.* 1997), measure the following skills: (1) students' ability to identify experimental variables; (2) students' ability to interpret data; and (3) students' quantitative skills. In addition, we developed several new questions to assess: (4) students' ability to design an experiment; and (5) students' ability to construct a graph which accurately describes given data. Across both semesters, inquiry lab students showed significant gains in their science literacy test scores compared to the traditional lab students. Across both semesters, inquiry lab students showed modest gains in science process skills which were statistically significantly higher than traditional lab students' scores.

To assess students' self confidence, we used a previously validated pre and post online survey, a college biology self-efficacy instrument for non-majors (Baldwin *et al.* 1999). The survey addresses confidence in doing three types of skills: (1) writing or critiquing a lab report; (2) summarizing biological information for another person, in either a written or oral format; and (3) doing biology or tutoring biology. Across both semesters, we found a general trend that students in inquiry labs were less confident in their ability to perform these skills than traditional lab students.

In summary, students in inquiry versus traditional labs show gains in science literacy and in science process skills, but have less confidence in their ability to do science.

### **Literature cited**

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