

Increased Comprehension of the Scientific Method Using Inquiry-based Labs

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Knowledge and ability to correctly apply the scientific method is a skill not possessed by most first-year students. We had 2 main goals for the current study. The first goal was to identify which specific elements of the scientific method were poorly understood by students. The second goal was to develop a method or activity that would improve a student's use and understanding of the scientific method. It was believed that inquiry-based labs were the best method to accomplish this second goal. In order to explore these questions, we used two groups of freshman students; the control group spent the semester doing only standard "cookbook" labs, while the experimental group was exposed to inquiry-based labs. Both groups of students were taught by the same instructor in two different sections of the same course. Knowledge and comprehension of the scientific method was measured by a scientific method assessment exam. Both groups of students were assessed prior to the laboratory activities (pre-test) and after the laboratory activities (post-test). We compared pre and post test scores for each student in both groups. Statistical analysis of the results showed that the students in the experimental group demonstrated better understanding of the scientific method after inquiry-based labs (t-value = 3.784, p value = 0.0013), while students in the control group did not after improve in their understanding of the scientific methods completing standard "cookbook" labs (t-value = 0.8148, p value = 0.4258). We also discovered that students had the most difficulty with correctly identifying the independent variable and dependent variables in scientific experiments. This study has helped us identify areas needing more emphasis while teaching students the scientific method. In addition, the study provides support that inquiry-based laboratories increase a student's understanding of the scientific method.

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