Introduction: We developed a series of classroom activities for Geology 1020, a second semester introductory course for majors and non-majors. We used the activities in a small section of about fifty students, who were separated into three sections for class the activities led by undergraduate facilitators. Dr. Budd taught both this test section and a standard lecture section of 160 students in Fall 2010. Both classes were given the same exams and the same lectures on the days without class activities. We compare the exam results between the classes for questions that test learning goals covered by the class activities.

Methods: We identified exam questions that tested learning goals that were taught using the class activities, and compared the scores of the interactive lecture class to the in-class activity students. We found mixed results, where the lecture class performed better on some questions and the class activities on others. Looking at the differences can help us to understand which learning goals were accomplished particularly well using class activities, and which were not. We can then revise the class activities to better explore those learning goals.

Example 1: Question #6
The following questions (6E to #13) refer to the geologic cross section shown below. This cross section represents the observed distribution of rocks across 100s of miles of northwestern Canada. Rock units A and B are granite. All other layers are sedimentary rocks.

Discussion: Students who had done the class activity did not do as well on this question about igneous rocks as those who were in the lecture section. The lecture covered cross sections with a series of clicker questions that led the class through interpreting a section with Dr. Budd explaining each step in between.

Example 2: Question #24
24. Now, how many different biozones can you define from these fossils?
   A. four   B. five
   C. six    D. nine
   E. twenty

Discussion: Here students who had done the activity did better on the exam question, perhaps because they understood the diagram better after working with it in class.

Conclusions: We found that by comparing exam results from classes that used both the lecture and class activities, we could identify strong and weak points in our activities to help us target our efforts at improving the activities. While we had very similar conditions, other courses designing new activities could compare performance to previous years, or use concept surveys given in different course sections to see how well the activities work compared to other teaching methods.