Active Learning Methods
Interactive Teaching and Active Learning
Best Practices for Teaching and Learning

Let's discuss how we can incorporate active-learning methods as a means to incorporate some of the benefits of one-on-one teaching into a classroom setting. We will be using the term "active learning" in this session. According to Richard Hake, active learning is defined as an "interactive engagement of students and heads-on, always, and, usually, hands-on activities, which yield immediate feedback through discussion with peers and/or instructors."

Heads-on refers to students actively thinking during the lesson. And hands-on means students are doing things to help them learn the material. When we talk about active learning, we are referring to students thinking, writing, predicting, calculating, and classifying information on their own. By just getting students to write or think about the course material, students are actively learning.

When students learn interactively, they may start with active learning, but will go on to discuss, persuade, collaborate, and argue with their peers. These interactive learning methods can be built into a course as a course progresses. And this strategy is recommended for a course in which students may not have previously encountered interactive-learning methods. For the remainder of this session, we're going to call both of these categories "active learning".

Richard Hake demonstrated that courses that incorporate active learning have increased learning gains. He performed a study to analyze learning gains of approximately 6,000 students in high schools, colleges, and universities across the United States that were enrolled in physics courses taught with either a traditional lecture or interactive engagement format. To assess learning gains, students took a physics concept test called the Force Concept Inventory prior to and after learning physics.

The x-axis of this graph shows the average percentage score on the pre-test or the test that is given at the beginning of the course. The y-axis of this graph shows the average normalized learning gain. The normalized learning gain represents the difference between the average post-test score and average pre-test score of each course divided by the total number of points available minus their pre-test score. You could also think of this as the ratio of students’ actual average gain to their maximum possible average gain if they achieved 100% on the test.

The data points that are plotted on the graph represent the average of all of the students in each of the courses that were studied. Hake found that the students in the traditional lecture courses, which are indicated in the graph by the red data points, had an average normalized learning gain of 23%. Students in courses with interactive engagement, which are indicated by green data points, achieved higher learning gains of 0.48, which are almost two standard deviations above the learning gains in traditional classrooms. In fact, all of the courses with interactive engagement had higher learning gains than traditional courses.

In this data, the traditional lecture courses were taught by both excellent and poor teachers. This demonstrates that the instructor ability does not account for the lower learning gains. Instead, the method of instruction accounts for the higher learning gains found in the courses with interactive engagement.