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 section. According to Richard Hake, active learning is defined as an interactive engagement of students in 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 percent learning gain, which is the difference in the average post-test score and pre-test score of each course. The data points that are plotted on the graph represent the average of all the students in the course. For example, if a student received an 80% on the pre-test, then the student can have a maximum learning gain of 20%. The maximum possible learning gain is indicated by the diagonal line going through the center of the graph.

Hake found that the students in the traditional lecture courses, which are indicated by the red data points, had a maximum learning gain of 0.23. 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.

Now we're going to talk about specific active learning methods that can be incorporated into your own classroom. These methods have them grouped into three categories based on the amount of time they will take during your lesson. There are activities that will take less than two minutes of class time, those that will take between two and five minutes, and those that will take between five and 20 minutes of classroom time. These groupings are arbitrary, but they are useful when planning the length of time that the activities will take in your class. In all of these methods, it is important to think about how the activity will help your students achieve your desired learning objective and its corresponding level of Bloom's Taxonomy.

First we'll discuss activities that take less than two minutes to complete. The first type of short activity is simply asking your students if they have any questions. When doing this, it's important to do two things. First, think about the phrasing of the question that you use. By asking, do you have any questions, you will create an open environment in which students will feel comfortable asking a question.

The second thing that you as the instructor should do is wait for a sufficient length of time after asking the question. By waiting, you will demonstrate to your students that you would actually like to receive questions. Pause for at least 10 seconds. This will be a sufficient length of time for your students to think of a question, and in some situations, gain the courage to ask the question, and then raise their hand.

Let's see how long 10 seconds feels. OK. Ready, go.

OK, that was 10 seconds. 10 seconds feels like a really long time. As the instructor, I usually count to 10 really slowly in my head to make sure that I wait long enough. Another strategy is to take a sip of water or erase the board while you are waiting. It is very important to wait at least 10 seconds. I can't tell you how many times a student has raised their hand once I have counted to nine in my head.

The second type of short activity is to pose a question to your students and give them time to think of the answer. This type of activity is similar to the first one in that the instructor will need to provide a sufficient length of time for students to think about and answer the question prior to collecting the responses. The amount of time that the instructor waits will depend upon the question's difficulty level.

The last type of short activity is a MUD card. You have already encountered these cards at the end of each session. The MUD card is a method in which instructors can ask students to write down the muddiest or most unclear point from the session. The MUD cards are typically handed out at the end of each class, and students have two minutes to complete the MUD card.

Following the class, the instructor can skim through all of the MUD cards very quickly to identify the most common misconceptions. And then these misconceptions can be addressed at the beginning of the next class. In this manner, the instructor will ensure that any misconceptions are clarified prior to continuing with the course material.