

## **Current Trends In Active Learning In The Sciences**

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Indonesia has made great strides in improving access to education for its people. Indonesia is in the midst of educational reform, and faculty members at UNY, have been an active participant in this reform (Saito, 2007). Increasing interest and skills in the fields of science is imperative in a country like Indonesia that is rapidly industrializing. Therefore, it is a priority to increase the number of students and teachers who are proficient in the fields of science, technology, engineering and mathematics.

A recent study (Freeman, 2014) demonstrates that active learning improves student performance in science. Since student involvement is one of the most important predictors of college success (Astin, 1993), it is vital to include these methods in the university classroom. In a country where teaching is more traditional and teacher-centered, convincing instructors of the value of these new methods can have substantial impact.

The term active learning was popularized in the 1991 report to the Association for the Study of Higher Education (Bonwell & Eison, 1991). In order to learn, students must do more than just listen: they must read, write, discuss, or be engaged in solving problems. In particular, students must engage in higher-order thinking tasks such as analysis, synthesis, and evaluation. Active learning engages students in two aspects: doing things and thinking about the things they are doing.

During my presentation I will discuss current active learning techniques and how to implement them in the classroom.

### ***Use of “ABCD Voting Cards” and Peer Instruction***

Peer instruction methods consist of brief lecture-style presentations on key points of a topic followed by conceptually-challenging, multiple-choice questions. The student thinks about the question on his/her own and selects an answer. The instructor reacts based on the distribution of votes. A common practice is to ask the students to “turn to your neighbor and convince them you’re right.” After a discussion, the students vote again, hopefully with a majority of students choosing the correct answer. The instructor confirms the answer and carries on with the lesson.

This process forces students to think through the arguments being developed so they can explain them to their peers. Students learn better and retain knowledge longer when peer instruction is used (Crouch & Mazur, 2001).

In the United States, student polling is often done with wireless audience response technology referred to as “clickers.” For the past several years, I have been developing the use of a low cost, but effective alternative to the more expensive clicker technology. “ABCD voting cards” are formed by simply printing multiple choice responses in large type on the four quadrants of a piece of paper. The paper can be folded and presented by the student to display their answer. While not providing an automatic record of individual responses, the method does show quite clearly the rough percentage of correct answers, and clearly shows the most common wrong answer. Individual student responses are visible, allowing the instructor to choose students with correct answers to explain their work to the class, or allowing for the identification of groups of students with misunderstandings.

### ***Group Problem Solving***

A similar approach can be followed with problems that require a detailed analysis of a situation (for example, a Clinical case study) or a numerical answer. In a problem solving session, students work in small groups on the solution of a problem. My classes are less than 40 students and I move around the class and help individual groups that are stuck. In larger classes, the instructor can stop the class periodically and give hints to help slower groups. After the session has ended, the instructors, or selected groups, present the correct answer to the class. The cooperation and team work that is practiced in group problem solving improves learning outcomes relative to individual work (Prince, 2004).

### ***References***

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