Teaching students how to THINK like a scientist: flipping a classroom without flipping out

Study: A traditional lecture-based 400 level science course was converted into a team-based learning environment. Various activities were used to teach students how to analyze published data from basic science research labs at MSU and thus, learn how to “think” like MSU scientists.

Objectives: For the each of the main concepts covered in the course, the goal was to improve students’ ability to discuss the concept orally and in written format, diagram the concept, use drawings to portray the concept, graph the concept, and identify techniques and measurements used in current research labs at MSU labs that relate to the concept.

Methods: Learning objectives, guided textbook readings, weekly on-line formative assessments with feedback, in-class team based activities, Top Hat in-class response questions, and in-class summative assessments were used to meet the course objectives.

Assessments: 36 on-line formative assessments, daily Top Hat in-class response questions, and 4 in-class summative assessments were provided during the semester. Online student feedback regarding exam questions and course satisfaction were also used.

Results: Student performance on short-answer questions on formative assessments improved throughout the semester. Students identified multiple choice questions as the least likely to assess course objectives. Students with low attendance earned the lowest scores on formative assessments.

Implications: By providing students with examples of how MSU scientists design experiments, display data, and analyze data, students learn how to “think” like a scientist rather than learning a large number of scientific facts. The active learning environment also provides an opportunity for students to improve teamwork skills that are sought by corporations hiring college graduates.