Dropping Lecture and Summative Exams to Accelerate Deep Learning

Innovation Description
Picture a section of 60 engineering students working in 12 groups, each with its own whiteboard. Prior to class, everyone has carefully read the assigned text and marked it up with social annotation software developed at MIT. After individuals bring homework solutions to class, each group strives for up to 90 minutes to create a superior, collective response. Almost as much time is then spent analyzing differences between the best solution and one's initial effort: distinguishing conceptual from procedural errors, rating overall understanding, listing areas that need review, and assessing other group members. Grades reflect working really hard and being honest about effort, rather than punishing mistakes.

No one is checking Facebook, and the room is buzzing with energy. When groups hit a roadblock, they appreciate quick and direct access to an instructional aide (an undergraduate who recently took the course), a graduate student instructor, or the professor. This course, MSE 220, Introduction to Materials and Manufacturing, is open for any U-M faculty to visit, just as Yalisove was able to learn about these pedagogies through multiple visits to the Harvard physics classroom of Eric Mazur, the founder of Peer Instruction.

In 2015, this course will be scaled up for 200+ students by holding it in the newly renovated Pierpont Commons cafeteria.

Student Comments
"Despite the work required to complete challenging homework assignments and excel on our detailed group projects, the course was immensely enjoyable and fulfilling."

"Prior to this course, I focused only on the final grade, rather than the process of learning."

"Removing the exam-centric approach to learning was conducive to a more unprejudiced and eager pursuit of knowledge."

"The structure of MSE 220 gave me the opportunity to work with the teaching staff and the students at a far deeper level than any course I had taken before."

"Completing these homework problems, you always learned the applications of the concepts from the reading, and you learned the value of working collectively to solve complex problems."

"Group projects facilitated critical applications and extensions of course concepts to contemporary engineering problems. For example, our final group project was to design a solar farm on Mars that accounted for the harsh conditions of the Martian environment."

"I have implemented the practice of proactive learning in my other courses."

Examples of Teaching Innovation

MSE220 syllabus from fall 2013.

Without the tiered seating typical of lectures, a flat room with tables and whiteboards allows instructors to circulate easily among small groups.

Students annotate readings and answer each other’s questions using nb.