

WCET Member Snippet: Outcome-based Innovation and Engagement in STEM Courses: UNT's Model for Success

The Problem: The State of Post-Secondary STEM (Science, Technology, Education and Math) Education in the United States.

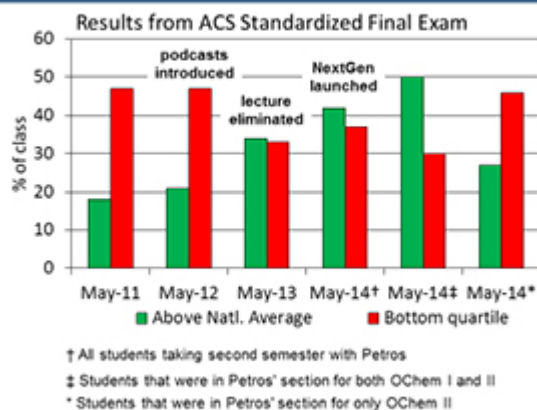
Even though the current presidential administration has set a [national agenda](#) for producing significantly more STEM graduates, the United States continues to [lag behind](#) many other countries as the [gender and racial gaps continue to widen](#). Some estimates indicate that only 40% of entering college students that declare STEM majors complete degrees in STEM disciplines and that as many as one million more STEM professionals will be needed in the U.S than will be produced over the next decade at the current rates. (President's Council of Advisors on Science and Technology, 2012.) According to University of North Texas faculty member, Dr. Rob Petros, we are losing these students for three reasons:

1. Lack of inspiration in low-level science courses,
2. Frustration with the 'weed out' courses,
3. STEM graduate programs are designed to prepare researchers, not educators.

UNT is addressing these challenges by redesigning courses in chemistry and math to make them engaging, outcomes-based classes that use robust assessment tools to give almost real-time learning feedback to students and faculty. By participating in our NextGen Course Redesign program, faculty in Organic Chemistry and Introduction to Probability and Statistics are flipping the courses (content delivery outside of class – interactive project and group work during site-based meetings) to focus on engagement and implement learner-centered instructional strategies. Chemistry has introduced tools like iTunes for podcast delivery, CatMe.org for forming successful student work groups, and ExamSoft to provide robust real-time assessment feedback to students. In Math, we've partnered with Pearson to expand the use of the MyLabs platform to provide timely, formative feedback to students and active learning achievement data to faculty. In both courses, faculty are adjusting the classroom activities weekly in response to the available data from ongoing formative assessments.

Early results in chemistry give us great hope. Key performance indicators like student learning outcome attainment, standardized test scores, and failure rates have all improved dramatically. This chart (see graphic) indicates that students performed above the national average on the standardized chemistry exam after the redesign, which was implemented in stages.

Student Performance During Redesign



Our conclusion from our NextGen Course Redesign experience is that a dedicated faculty member, using an engaged learning strategy with strong outcomes-based assessment, strong institutional support, and innovative technology can make a significant difference in student learning and success rates.

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