

Impact of Course Redesign on Student Success at NC State

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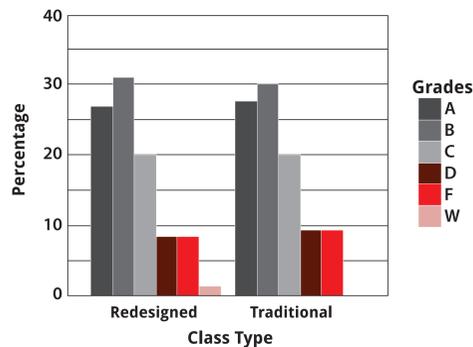
Course Redesign at NC State

The DELTA Course Redesign (CR) Grants provide financial and staff resources to help faculty leverage instructional technology to enhance teaching and learning and increase student access to large, undergraduate courses. CR is helping improve student learning outcomes; increasing access to critical path courses; helping students successfully transition to more advanced study; addressing the need to cope with increasing enrollment demands; and investigating the use of technology to achieve more efficient instructional methods.

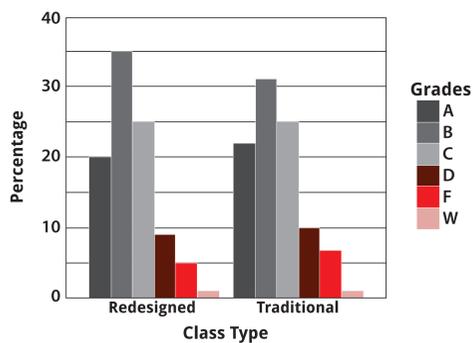
Student Success

Improving the curriculum with CR strategies increases the potential for reducing high student D & F grades and withdrawal (W) rates. Analysis indicates that D & F rates have improved as a result of course redesign.

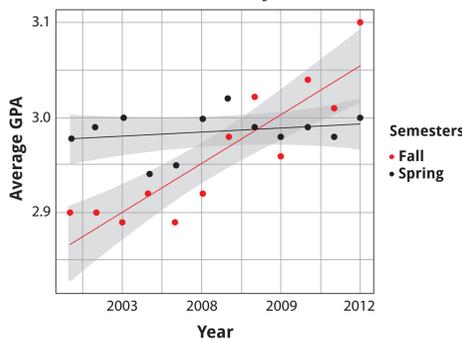
Grade Distributions for MA111 Sections



Grade Distributions for MAE206 Sections



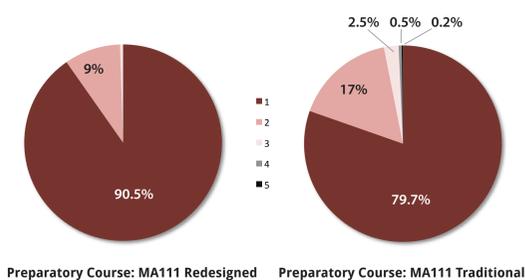
ST311 Overall GPAs by Semester



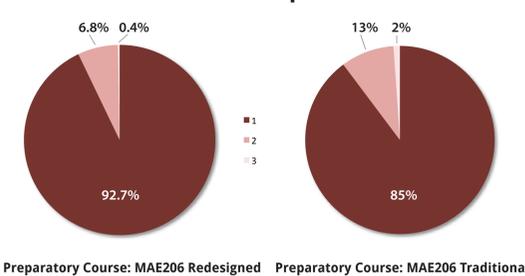
Transfer of Knowledge

Grades from students who completed CR sections of MA111 and MAE206 and moved on to Calculus 1 (MA141) and Mechanics (MAE208), respectively, were tracked to determine the impact their learning in the redesigned course had on their completion of the next level course. Students enrolled in the redesigned preparatory courses required fewer attempts to pass MA141 and MAE208.

Rate of Student Attempts to Pass MA141

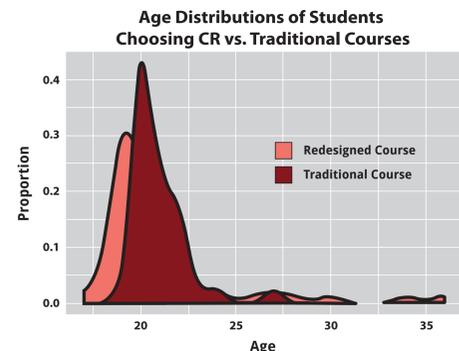


Rate of Student Attempts to Pass MAE208



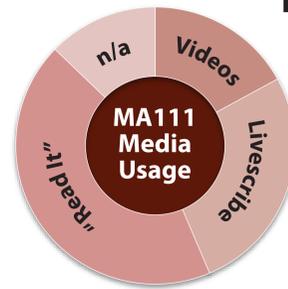
Who Chooses CR?

It has been hypothesized that CR would be resisted by students entering college because they bring a preconceived idea of what the classroom should be like. An experimental semester where students were asked to choose between the redesigned and traditional format shows the opposite effect: younger, freshman-age students are more likely to select the redesigned class, college juniors and seniors habituated to the status quo are less likely to select CR. Students returning to college after age 30 appear to prefer the redesign, possibly due to the improved time management that it affords them.



Educational Efficiency

Online content in CR courses help students manage how they learn by choosing to watch videos or reading PDF documents, approach learning linearly or non-linearly, and benefit from receiving immediate feedback after submitting answers to online assessments. Online examples help students feel they have 24/7 access to their professors.



“[The examples] gave me an idea/ understanding before... class, or helped solidify the material after the lecture.”

Logistical Challenges

Enrollments have exceeded 70% in the past decade in some Physics gateway courses, thus laboratory teaching facilities are at capacity. The CR Kitlab program frees up two teaching labs to accommodate enrollment growth. By replacing 5 of 10 labs with kitlabs, an alternate week schedule was enabled. Bb Collaborate and WebAssign are used to monitor group progress simultaneously with a live report of students' work in the lab assignments. Prior to CR (IL) two rooms were required to administer the 10 labs during the semester. Through the introduction of kitlabs (KL) only one lab room was required as the IL and KL operate on alternating weeks.

Tailoring Courses

While traditional lecture courses fail to provide instructors with quantitative feedback on the amount that they should reinforce each concept, putting a course online in the Moodle environment allows DELTA's statistical team to calibrate the course content with machine learning techniques. CR provides a benefit over and above immediate improvement in student outcomes: using time-on-task and performance data at the topic level, DELTA can optimize the depth in which each concept is explained, streamlining the long-run quality of the information delivered.

Marginal students (2.30 GPA) benefit most from course redesign.

Looking Ahead

Future course redesign focuses on course flipping, scalable and transferable learning objects, and tracking students as they advance in their majors. DELTA will continue to investigate efficient ways to teach in blended courses, keep students on track to graduation, and cope with increasing enrollments.

Takeaways

CR is equal to or better than traditional lectures at Reducing DFW Rates, improving student learning with online materials (video, notes, examples), engaging students in activity-based learning, transferring knowledge and skills to more advanced study, and increasing student satisfaction. In addition, teaching and learning is more efficient.

8943 students impacted by course redesign

Redesigned Courses

2008 - 2009

- Statics (MAE206)
- Precalculus Algebra & Trigonometry (MA111)
- Precalculus Algebra (MA107)
- Foundations of Graphics (GC120)

Precalculus: Algebra and Trigonometry (MA111) (PI: Dr. Brenda Burns-Williams) GER course that prepares Engineering and Mathematical Sciences majors for Calculus I (MA 141). The supplemental model was used to provide course materials online (video, text files and low-stakes quizzes).

2009 - 2010

- Calculus I (MA141)
- Concepts of Financial Reporting (ACC210)

Statics (MAE206) (PI: Dr. Anna Howard) A critical-path course for students in Mechanical Engineering, Aerospace Engineering, and Biomedical Engineering. Annually, 700 students must earn a C- or better to move on to MAE206 or MAE214. Iterations of course redesign include: Phase 1: Supplemental; Phase 2: SCALE-UP; Phase 3: Course Flipping).

2010 - 2011

- Introduction to Statistics (ST311)
- Physics for Engineers & Scientists (PY211/212)

Introduction to Statistics (ST311) (PI: Dr. Roger Woodard) GER for for a broad range of majors from the CALS and CHASS with 1,700 students enrolled annually. Course Flipping redesign model leverages technologies and new instructional strategies to use individual time for concepts that are can easily be mastered by individual learning and in class time for learning that is improved by groups.

2011 - 2012

- College Physics (PY205N)
- Differential Equations (MA341)

Physics for Engineers & Scientists (PY205N) (PI: Dr. Michael Paesler) Enrollments have exceeded 70% in the past decade in some Physics gateway courses. Physics laboratory teaching facilities are at capacity, requiring the department to seek alternative means of managing enrollment growth. Converting half of all PY205N sections to Kitlab sections reduces the need of teaching labs in Fox Hall, impacting 800 students annually.

2012 - 2013

- General Microbiology (MB351)
- Introduction to World Architecture (ARC241)