Engaging Tomorrow's Scientists

Transforming Instruction in Large Lecture Courses

Kelly A. Hogan
Senior Lecturer
Director of Instructional Innovation
Department of Biology

Michael T. Crimmins
Mary Ann Smith Distinguished Professor
Co-Director, AAU Project Site
Department of Chemistry

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How We Fail Our Students

Nationally, what percentage of students who enter college intending to major in a STEM field ***actually*** graduate with a STEM degree?

a. 80 - 90%
b. 70 - 79%
c. 60 - 69%
d. 50 - 59%
e. 40 - 49%
f. 30 - 39%
g. 20 - 29%
h. 10 - 19%

How We Fail Our Students

Nationally, what percentage of students who enter college intending to major in a STEM field ***actually*** graduate with a STEM degree?

e. 40%

How We Fail Our Students

What percentage of students who enter ***Carolina*** intending to major in a STEM field ***actually*** graduate with a STEM degree?

a. 80 - 90%
b. 70 - 79%
c. 60 - 69%
d. 50 - 59%
e. 40 - 49%
f. 30 - 39%
g. 20 - 29%
h. 10 - 19%

How We Fail Our Students

What percentage of students who enter ***Carolina*** intending to major in a STEM field ***actually*** graduate with a STEM degree?

d. 55%

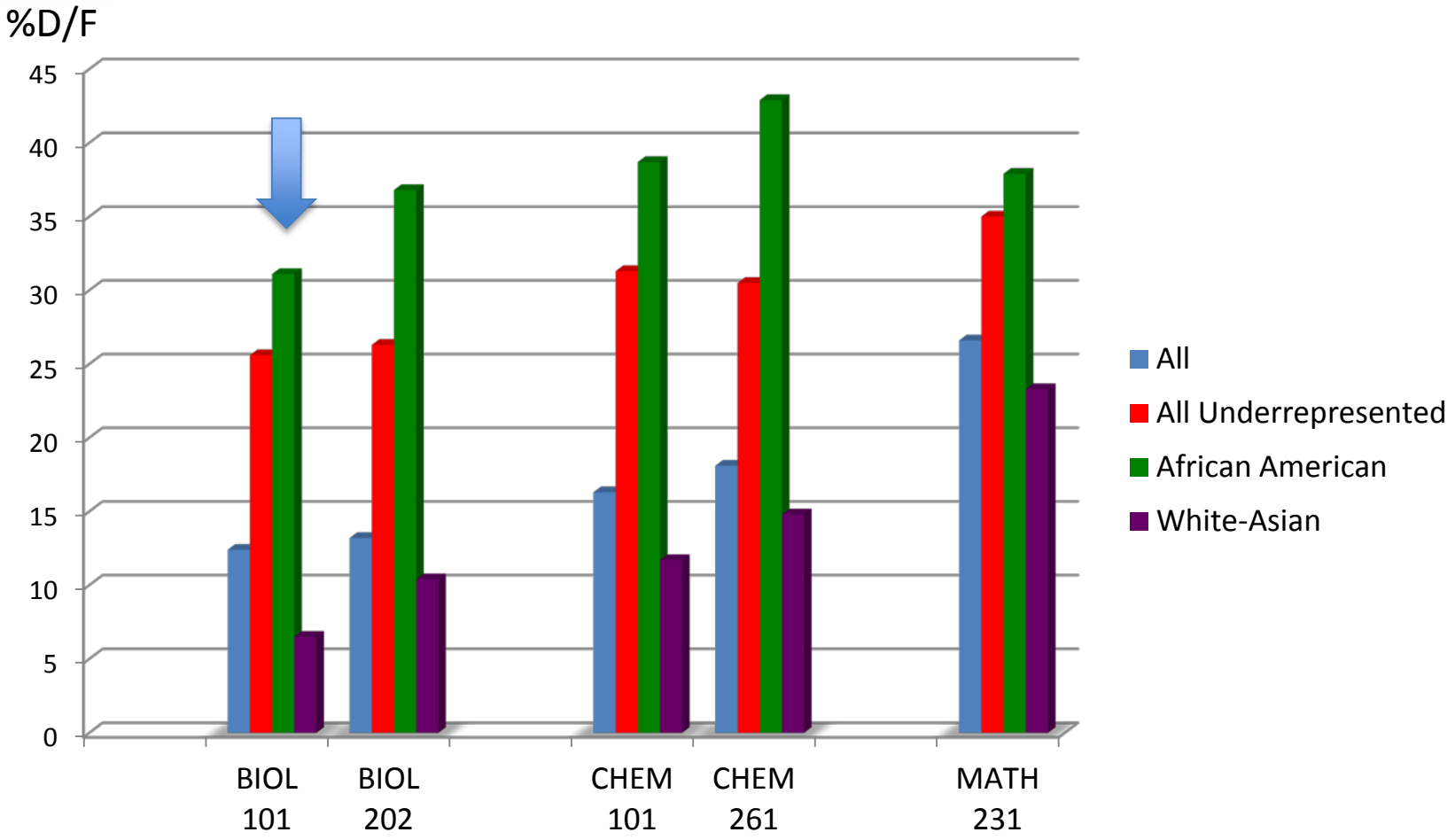
How We Fail Our Students

What do you think should be the success rate of earning degrees for students intending to major in a STEM field ***at Carolina***? Why?

Discuss with your neighbor.

a. 90%
b. 80%
c. 70%
d. 60%
e. I need more information

D/F rates in Introductory STEM courses at UNC: 2007-2008



Biology 101: Principles of Biology

Traditional:

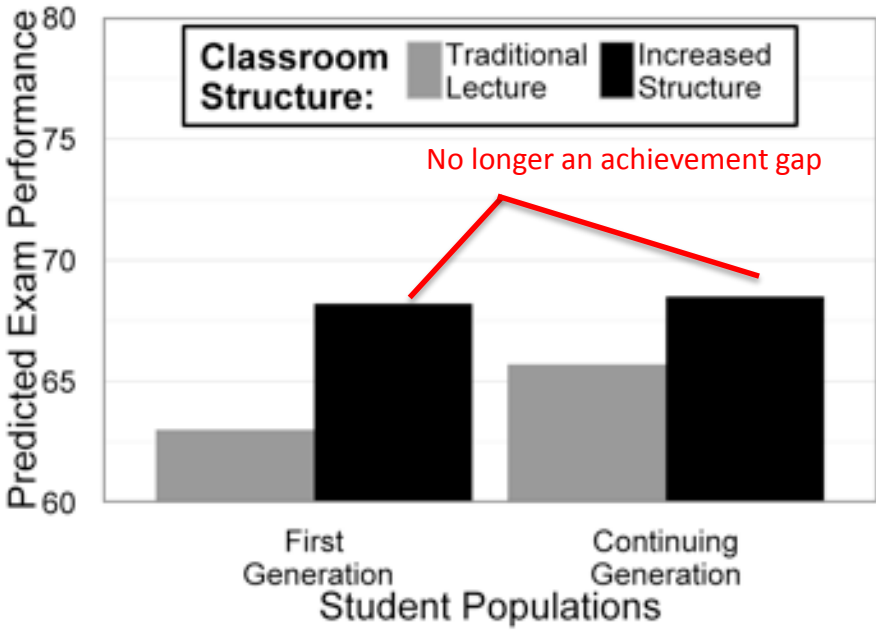
- Lecturing, exams

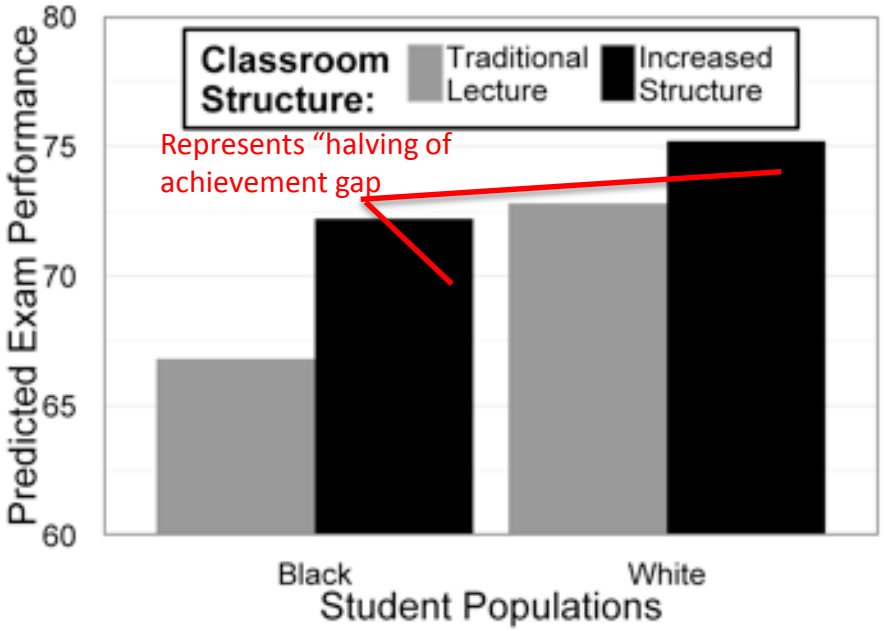
High Structure, Active Learning format:

- Pre class guiding reading assignments
- ***Pre class reading assessments***
- Formative clicker questions during class
- Undergraduate mentors
- Group help sessions 4 times per week
- In class problem solving activities, modeling, drawing, peer discussing

- Summarizing and explaining (not lecturing)

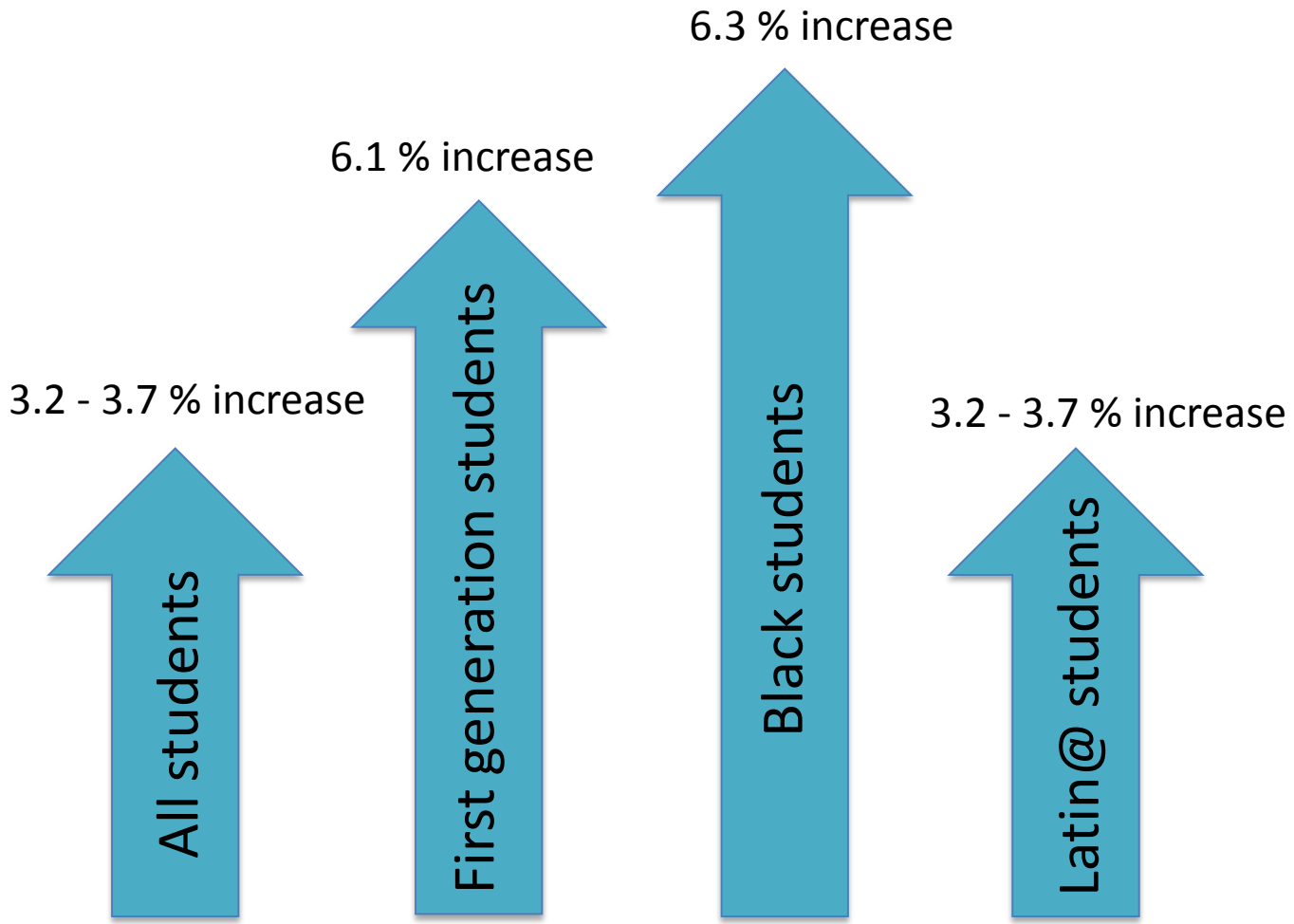
Biology 101





These model predictions use student data for males in same term (Spring), with a combined SAT math and reading score of 1257 (the mean score across the 6 terms).

Performance increased disproportionately for some students



Eddy, S. L.; Hogan, K. A. *CBE Life Sci. Ed.* **2014**, *13*, 453-468

AAU Undergraduate STEM Initiative: UNC-CH Project

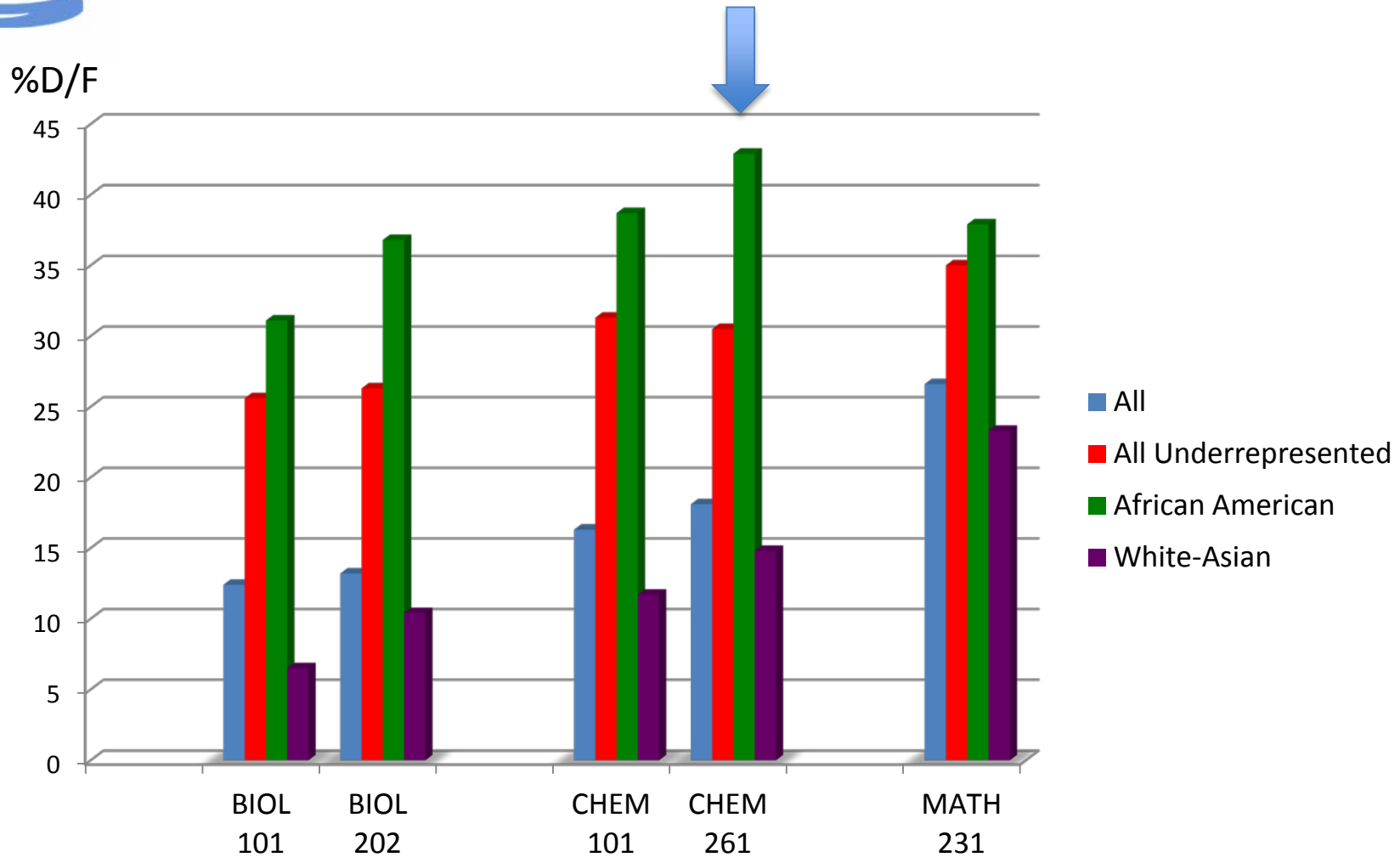
Goal: Transition large lecture format courses in Biology, Chemistry and Physics into high-engagement, student-centered learning environments.

Technique: Create inter- and intradisciplinary "mentor-apprentice" networks to facilitate the transfer of these techniques from experienced instructors to less experienced peers.

Strategies:

1) course release time to learn and implement new methods;
2) *department-level faculty learning communities* to support redesign of gateway courses;
3) *college-level faculty learning communities* for exchange of best practices and support across departments.

D/F rates in Introductory STEM courses at UNC: 2007-2008



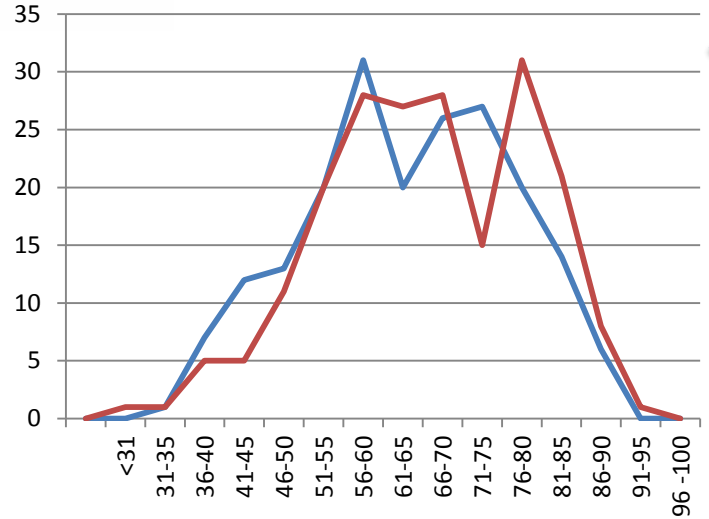
Chemistry 261: Organic Chemistry I

Traditional: *Rock on rock (chalk on blackboard) or powerpoints and lecture*

High Structure, Active Learning format:

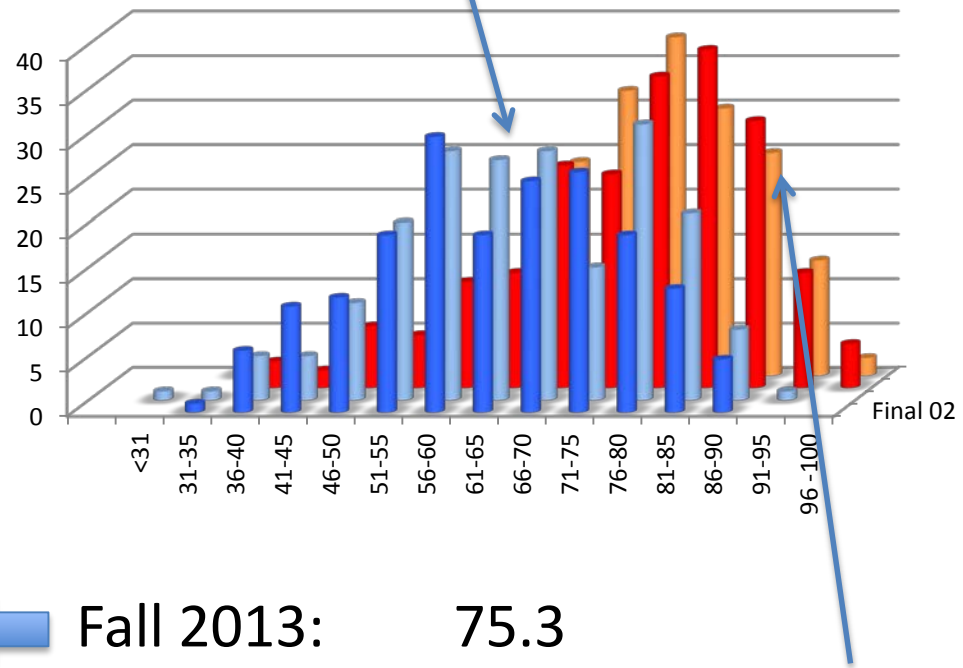
- Weekly online homework assignments
- ***In class quizzes at the beginning of every class***
- Formative clicker questions during class
- Undergraduate mentors
- Coordinated content, schedule, and help sessions for three sections
- In class problem solving activities
- Some lecture (summarizing, explaining)
- Approximately ***80*** Videos available for viewing

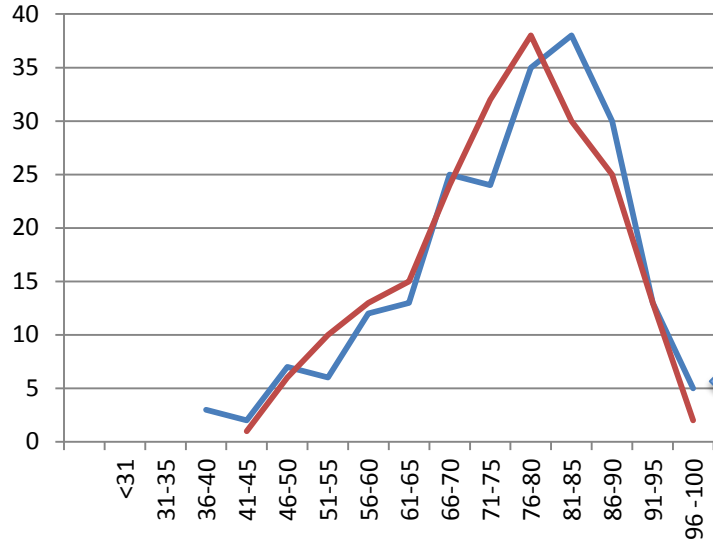
CHEM 261 Final Exam Distribution



Fall 2002: 63.7 *traditional*

Fall 2003: 62.7





Fall 2013: 75.3

Spring 2014: 74.5 *reformed*

Failure Rates Update in High Structure Classes

Biology 101: 40% reduction to date

Chem 261: Early results >50% reduction

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