



COLLEGE OF ENGINEERING
THE UNIVERSITY OF TOLEDO

University of Toledo

Engineering Applications of Math

Scott C. Molitor, Ph.D.

Associate Professor of Bioengineering

Associate Dean for Undergraduate Studies

Brian W. Randolph, Ph.D., P.E.

Professor of Civil Engineering

Executive Associate Dean for Academic Affairs



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Undergraduate Engineering at UT

- ABET accredited Engineering Science programs
 - BioE, ChE, CivE, CSE, EE, ME + new ENVE
 - Target population for WSU Engineering Mathematics
- ABET accredited Engineering Technology programs
 - Construction, Computer, Electrical, Information Technology and Mechanical
- Mandatory co-op program for all Engineering Science students
 - Three semesters of co-op are required
 - Requires students to stay on schedule in their curriculum



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Undergraduate Engineering at UT

- Credentials, retention and subsequent data pooled across 2007 - 2015 entering classes
 - Offered EN math course over this same time frame
- Engineering Science credentials
 - ACT composite 26.0 / math 27.2
 - HS GPA 3.66
- First to second year retention (2007 – 2014 only)
 - 78.6% remain in EN and 86.2% remain at UT
- Six year graduation rate (2007 – 2010 only)
 - 55.4% graduate from EN and 65.8% graduate from UT

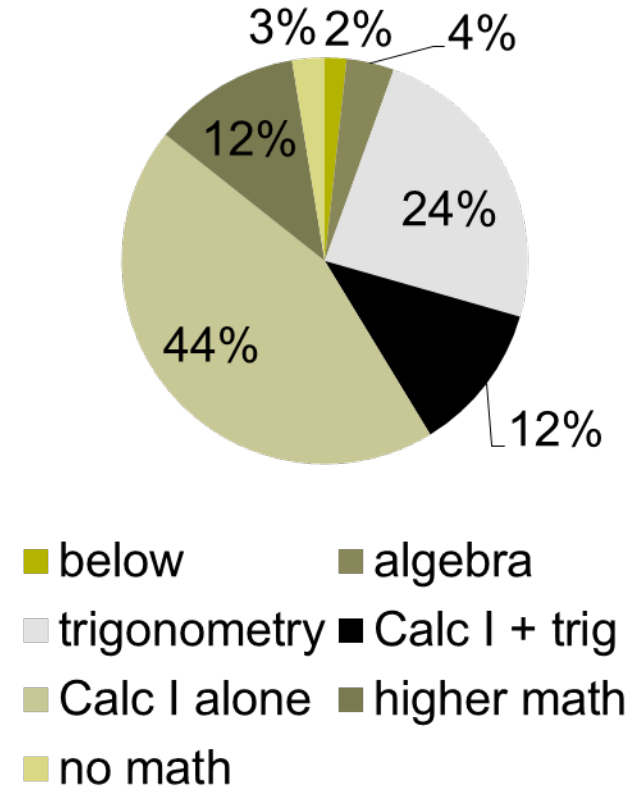


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Mathematics Placement

- Placement in math courses based on various factors
 - ACT or SAT Math score
 - Algebra placement test
 - Trigonometry placement test
- Goal is to have students take Physics I as soon as possible
 - Required for subsequent Engineering coursework
 - Many students go out on their first co-op after 3rd semester
 - 2/3 of first year students are on target or better (was 75%)

Math Placement (07-15) Engineering Science





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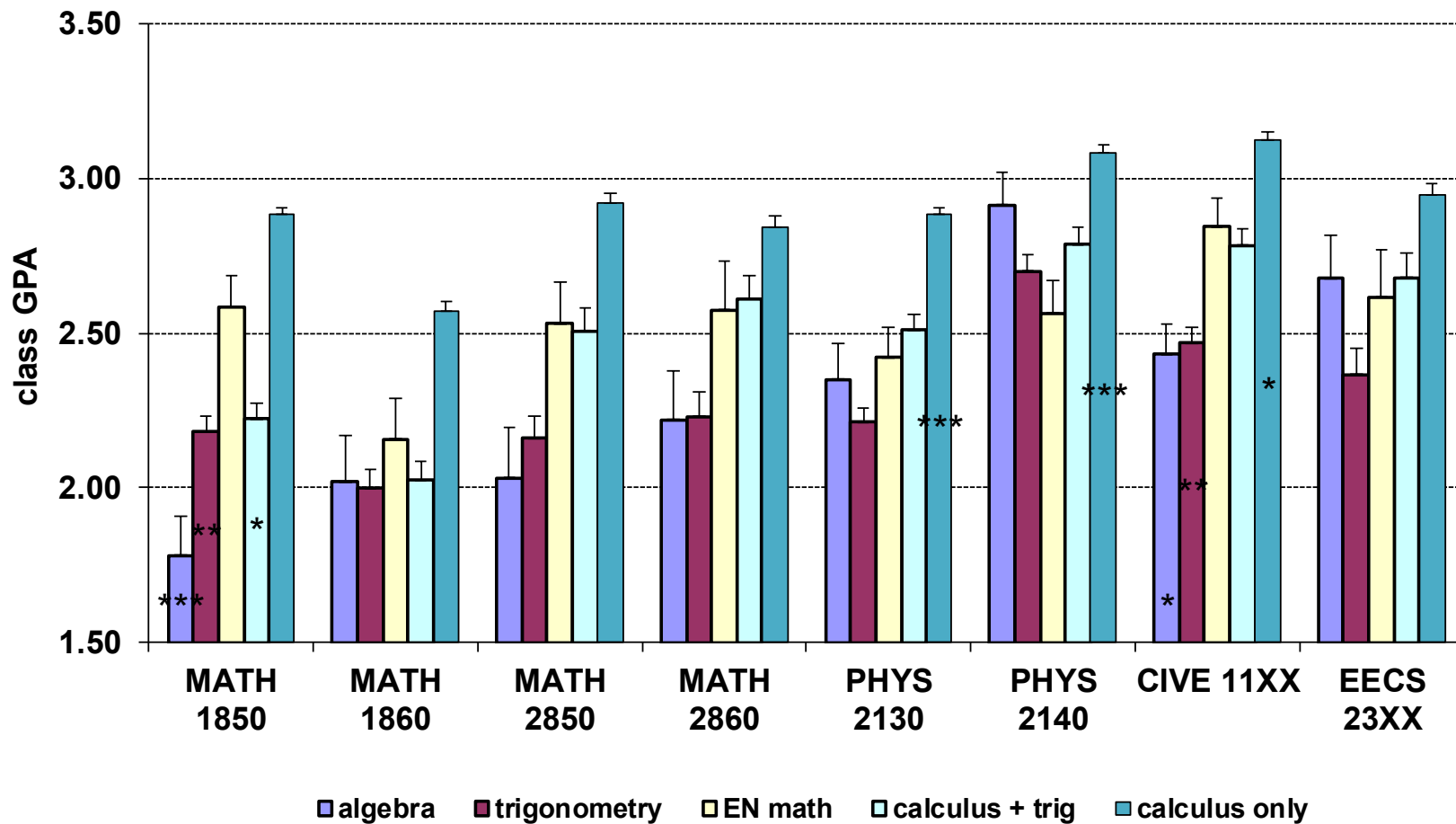
UT Engineering Applications Course

- Optional supplement for students that place into College Algebra and Trigonometry courses
 - Goal is to improve student performance when they take Calculus I
- Adapted Wright State Mathematics for Engineering Applications Course materials
 - Topics range from vectors to differential equations
 - Present applications for each topic then introduce theory
 - Combined hands-on laboratory & recitation reinforces lecture topics
- Provide tangible benefits to encourage students to enroll
 - Physics department allows students that complete this course to enroll in Physics I and Calculus I simultaneously
- Completion rate is 83.5%, rate for C or better is 75.3%



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GPA in core courses



* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$



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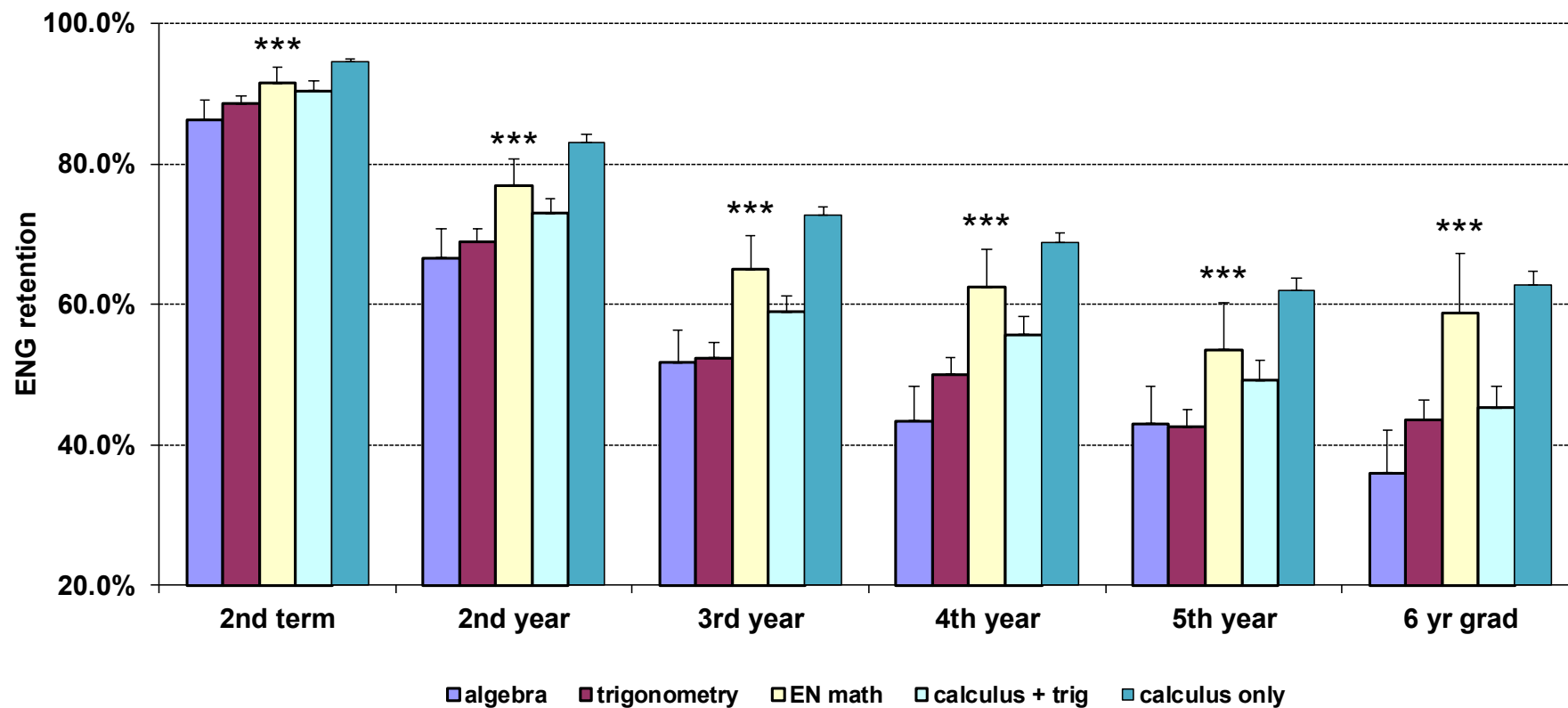
GPA in core courses

- ❑ Mixed results with a few consistent trends
- ❑ EN Math cohort does nearly as well in MATH 1850 Calculus I as cohort that directly enters MATH 1850
- ❑ EN Math cohort out performs algebra, trigonometry and calculus w/ trig supplement in MATH 1850
- ❑ EN Math performs same as calculus in all MATH courses, worse in PHYS and CIVE courses
- ❑ EN Math performs the same or better than calculus w/ trig supplement in all other courses

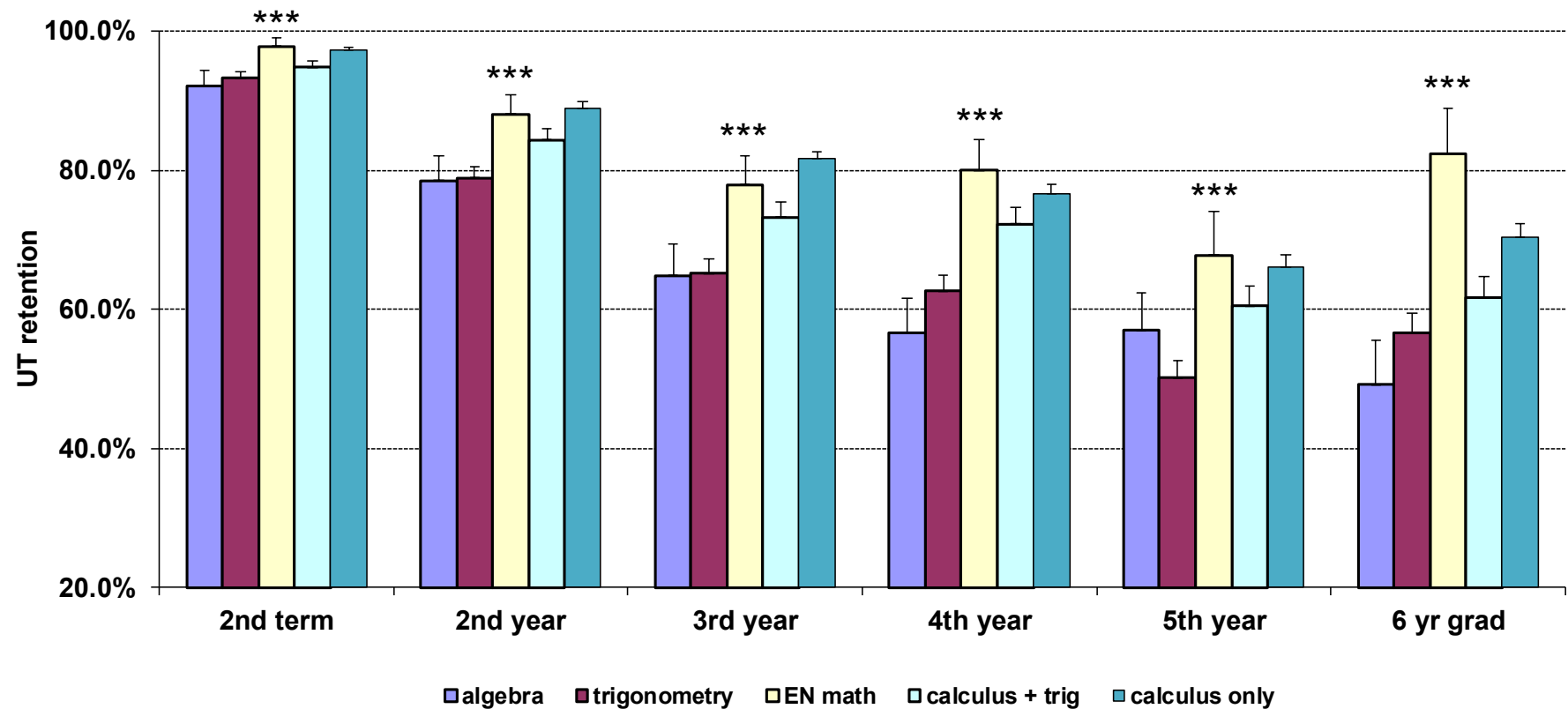


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Retention and persistence



Retention and persistence



*** $p < 0.001$



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Retention and persistence

- Clear and encouraging results
- EN math retention and persistence in EN and at UT comparable to cohort directly entering Calculus
- EN loses 15-20% more students from Alg / Trig and Calc / Trig cohorts compared to EN math
- UT loses 20-25% more students from Alg / Trig and Calc / Trig cohorts compared to EN math
- May explain core course GPA results
 - More EN math students stay and take core courses
 - Lower performing students in algebra, trigonometry and calculus / trigonometry cohorts are leaving



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Plans for the future

- Continue efforts to increase completion rate
 - Replaced some lab exercises with recitation sessions
- Expand population to capture trigonometry cohort
 - BioE, CivE place all trigonometry students in GNEN 1800
 - CSE, EE and ME place a few, ChE does not place any
- MATH department now uses ALEKS for placement
 - May affect performance of various populations change
 - Factor in reduced percentage of calculus ready students
 - New admissions and math placement standards will eliminate algebra cohort