

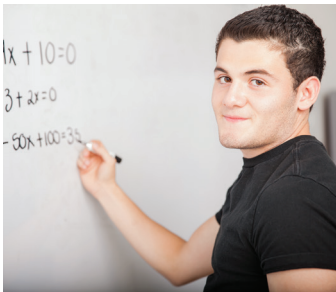
# Executive Summary

OCTOBER 2015

## Pathways of Promise: Statewide Mathematics Analysis



**E3 conducted a statewide research study analyzing the relationship between the highest level of mathematics mastered by high school students and subsequent education outcomes.**



E3 Alliance facilitates **Pathways of Promise** (PoP), a research and implementation initiative in Central Texas designed to *identify and scale strong college and career pathways for high school students that lead to successful transitions to and completion of a postsecondary credential*. To develop the optimal career pathways calibrated to state and regional economies as directed by Texas Legislative House Bill 5, E3 conducted a statewide research study analyzing the relationship between the highest level of mathematics mastered by high school students and subsequent education outcomes, including: high school graduation, college and career readiness, college enrollment, 2-year to 4-year transfer, college completion, and college completion with a Science, Technology, Engineering, and Mathematics (STEM) degree.

This brief includes a short description of the research questions and methodology and the leading findings related to who takes and “masters” different levels of math and their education outcomes beyond high school. In this study, “mastery” refers to students who pass both semesters (as opposed to receive a

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cumulative passing grade over two semesters). The key findings from the study based on longitudinal analyses of both the 2003-04 and 2008-09 first time 9th grade cohorts follow:

### **Distribution of Math Mastery for 2008-09 Texas first time 9th graders enrolled in High School for 4 years:**

1. Vastly more students from the 2009 cohort mastered Pre-Calculus (instead of stopping at Algebra II) under the legislative requirement known as “4x4” compared to before this requirement (2004 cohort). The “4x4” mandated that high school students default to taking four credits (four years) of each of the core subject areas: English Language Arts, Mathematics, Science, and Social Studies.
2. Low income student mastery of Pre-Calculus doubled (to 29%) from the 2004 cohort to the 2009 cohort.
3. Smaller shares of students in rural districts and less populated regions mastered Pre-Calculus or an Advanced Placement (AP)<sup>1</sup> course as their highest math compared to their urban and suburban peers.

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4. 20% of non-low income students mastered an AP math class (Statistics, Calculus AB, or Calculus BC) compared to only 7% of their low income peers.
5. 75% of Asian students mastered Pre-Calculus or higher compared to 36% of Black, 39% of Hispanic, and 52% of White students, respectively.
6. A higher proportion of males (26%) mastered less than Algebra II as their highest level of math compared to females (17%).<sup>1</sup> A smaller share of males mastered Pre-Calculus (29%) than females (35%), but the distribution evens out for AP math courses (12% and 13% respectively).
6. Students who mastered at least Pre-Calculus were more likely to transfer from a 2- to 4- year college. Full time as compared to part time status also had a strong influence on transfer rates.
7. Of the 2004 9th grade cohort who enrolled in higher education, 47% completed within 6 years of initially enrolling.
  - a. 36% with Algebra II as highest math mastered completed a post-secondary credential.
  - b. Large gaps in completion exist by income and by ethnicity even at highest level of math mastery.
  - c. Students with Pre-Calculus as their highest level of math were nearly twice as likely to complete their degree as their peers whose highest level was Algebra II.
  - d. Students with Calculus were more than three times as likely to complete as their Algebra II peers and were 80% more likely to complete than their Pre-Calculus peers.
8. More than 1 in 3 (37%) students who completed an AP math course while in high school earned a STEM postsecondary credential versus 18% of their Pre-Calculus peers and 6% of their Algebra II peers.

### Outcomes Associated with Highest Level Math Mastered in High School:

1. Previous research by E3 Alliance revealed that 43% of non-low income 2012-13 Central Texas 8th graders completed Algebra I by the end of their 8th grade year versus only 17% of their low income peers.<sup>2</sup>
2. 43% of 2009 9th graders with Algebra II as their highest level math were college and career ready compared to 70% for Pre-Calculus, 88% for AP Statistics, 92% and 95% for Calculus AB and BC, respectively.
3. Students who mastered Pre-Calculus while in high school were twice as likely to enroll in higher education as their peers whose highest level of math was Algebra II.
4. 36% of 2009 9th graders (enrolled in high school all 4 years) who mastered Algebra II as their highest math persisted into their second year of higher education, compared to 56% for Pre-Calculus, 68% for AP Statistics, 74% and 71% for Calculus AB and BC, respectively.<sup>3</sup>
5. Income gaps in persistence rates decrease as highest level math mastered increases, though these gaps do not entirely close. In contrast, whether a student enrolled full time ( $\geq 12$  credits) versus part time ( $< 12$  credits) showed an even stronger and more consistent relationship with 2nd year persistence rates, with an average persistence gap of 30 percentage points. Full time college students persisted at higher rates than part time students regardless of the highest level of math mastered in high school and regardless of income status.

### RECOMMENDATIONS:

1. Close the opportunity gap for 8th grade Algebra I completion.
2. Develop increasingly rigorous mathematics courses for all four years of high school for ALL endorsement pathways, not just STEM.
3. Expand opportunities for students to enroll in AP and college credit bearing math, especially in non-urban districts.
4. Provide strong advising in high school about college to reduce the share of students enrolling part time.

<sup>1</sup>Advanced Placement is a program provided by the College Board that offers "college-level" courses in the United States and Canada. Students take a standard exam at the end of the course and colleges may opt to offer placement or credit for the course based on those results.

<sup>2</sup>Wiseman, A. Bailie, C., Gourgey, H. (2015) Pathways of Promise: Student Outcomes in Career and Technical Education Pathways in Central Texas. E3 Alliance: Central Texas.

<sup>3</sup>It should be noted that for AP math courses, lower college persistence rates may be a result of students transferring out of state. The postsecondary education data only includes Texas public and private colleges.