Let Icarus Fly: Multiple Measures in Assessment and the Re-imagination of Student Capacity

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bit.ly/MMCCA2017

@jjhetts #LetIcarusFly

#CCADream17

EDUCATIONAL RESULTS PARTNERSHIP

COMPLETE COLLEGE AMERICA

Recognize contributions of thousands

Long Beach City College

- Andrew Fuenmayor
- Karen Rothstein
- Eva Bagg
- Mark Taylor
- English Department
- Math Department
- Counseling Department
- Assessment and Matriculation
- Promise Pathways Committee
- Student Success Committee
- Executive Leadership
- And many more

Multiple Measures Assessment Project

- Mallory Newell
- Craig Hayward
- Terrence Willett
- Loris Fagioli
- Peter Bahr
- Ken Sorey
- Rachel Baker
- Nathan Pellegrin
- Alyssa Nguyen
- Danielle Duran
- RP Group
- Common Assessment Initiative
- Multiple Measures Work Group
- California Community Colleges Chancellor's Office
- Faculty, staff, and leadership at more than 60 pilot colleges
- And many more

Daedalus and Icarus

(Indebted to Seth Godin's The Icarus Deception for inspiring this analogy)

- Daedalus crafted labyrinth for King Minos
- Imprisoned in tower with his son, Icarus
- To escape, Daedalus built wings of feather and wax for his son Icarus and himself
- Don't fly too high, lest sun melt the wax and you plummet to your doom
  - Dangers of innovation/invention, hubris,
  - Importance of knowing your limits, listening to your wiser elders
- But most of us forget the rest of that story…

Why are multiple measures important in assessment?

- Basic assessment/measurement theory:
  - When you measure something you get:
    - True score (thing you care about)
    - Systematic error (regular error or bias in measurement)
      - Single method increases vulnerability
    - Random error (temporary errors)
      - Single instance increases vulnerability

Why are multiple measures important in assessment?

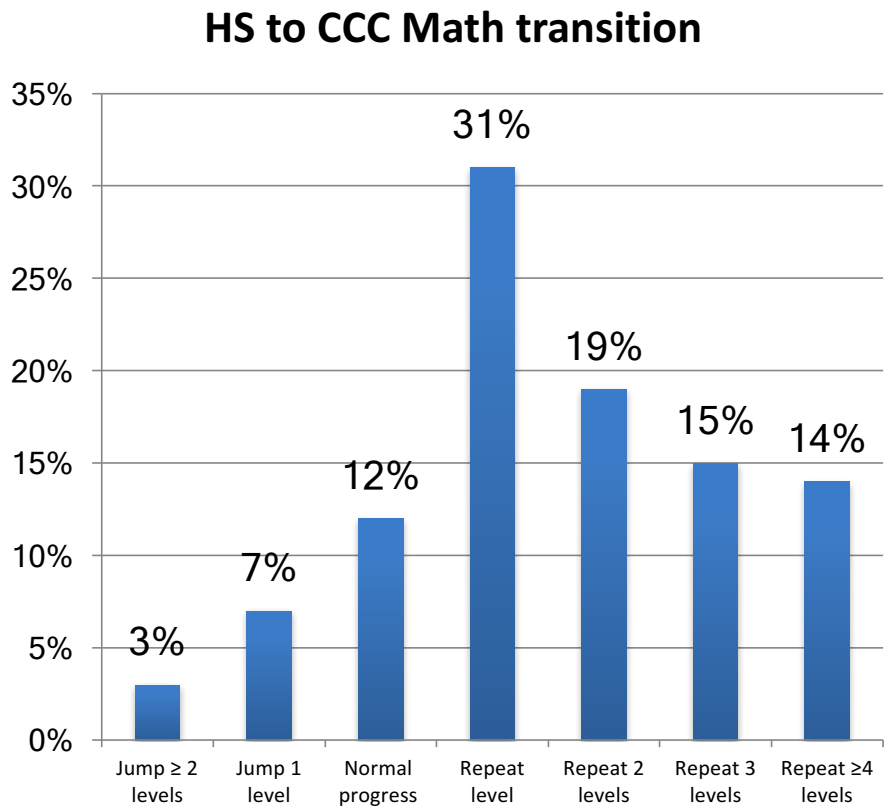
- Methodological gold standard of assessment
  - To minimize systematic and random error, triangulate to true score through assessment across different:
    - methods of assessment (how)
    - context of assessment (who/where)
    - content domains (what)
    - time (when)

Reality of current practice

- Community colleges rely nearly entirely on standardized assessment
  - >92% (Hughes & Scott-Clayton, 2011): bit.ly/Hughes2011
  - 100% (Fields & Parsad, 2012) bit.ly/NAGB2012
    - Only 27% of public 2 year & 4-year colleges use anything other than test in math, 19%/15% in reading
- Majority of students **placed*** below college-level
  - 68% take ≥ 1 deved course (Scott-Clayton & Belfield, 2015) bit.ly/CCRCPlacementAccuracy
- Cohort completion rates of gateway college-level course drop by a third to half for every additional level placed below college level (e.g., CCCCO Basic Skills Cohort Tracker: bit.ly/BSCohort)
- **50-60% of equity gap** in outcomes may occur during assessment and matriculation (Stoup, 2015: bit.ly/STOUP2015)

Transitions and intersegmental trust

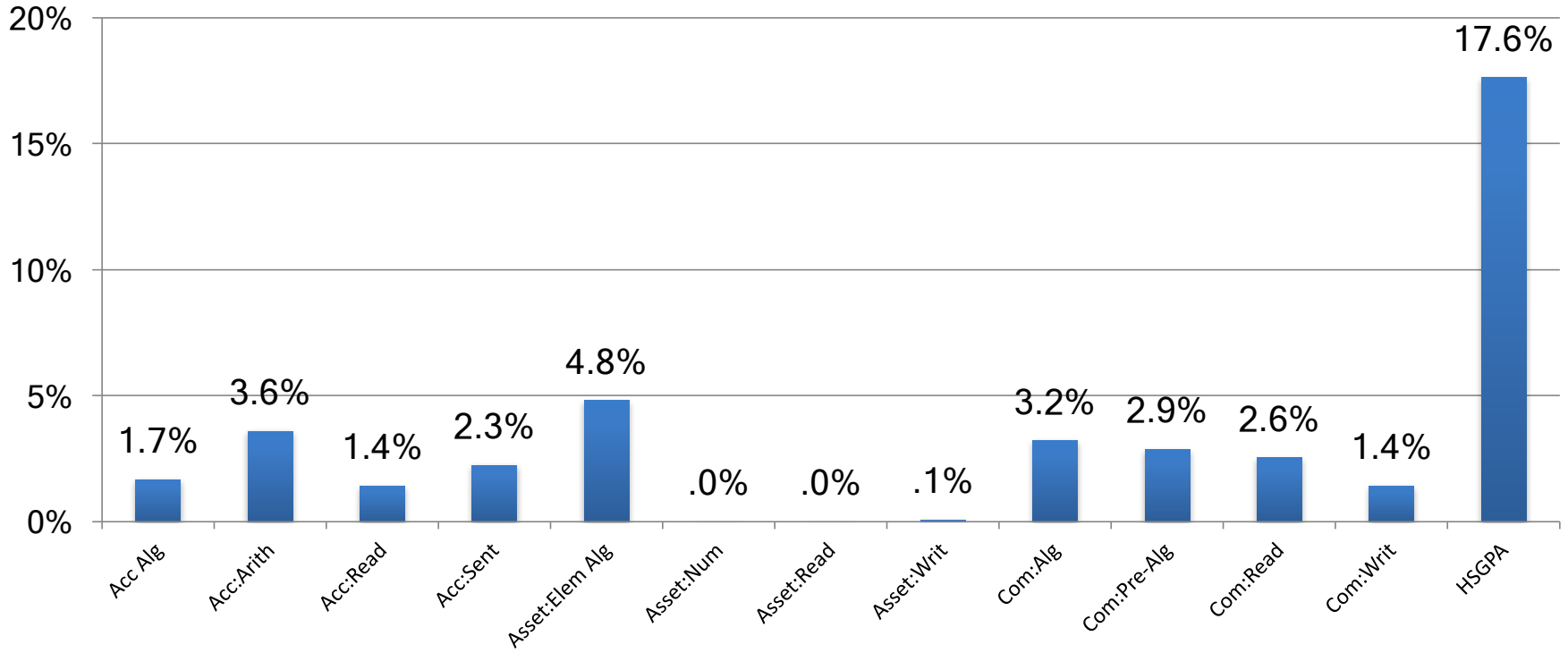
- Within systems: highly reliable progression after successful completion
- HS to CSU: bit.ly/CSUProficiency
  - ~40% repeat previously completed coursework, African Americans & Hispanics ~50% more likely
- HS to CCC transition: : bit.ly/BSI2012
  - ~3/4 repeat ≥ 1 level, ~1/2 repeat ≥ 2 levels of math
  - African Americans & Hispanics ~60% more likely, Female students ~20% more likely
- Noyce Foundation report: bit.ly/Noyce2010
  - Algebra in 8th grade, ~2/3 repeat including 50% of students with B or better
  - Algebra in 7th grade advance to Geometry in 8th grade



Why are multiple measures important?

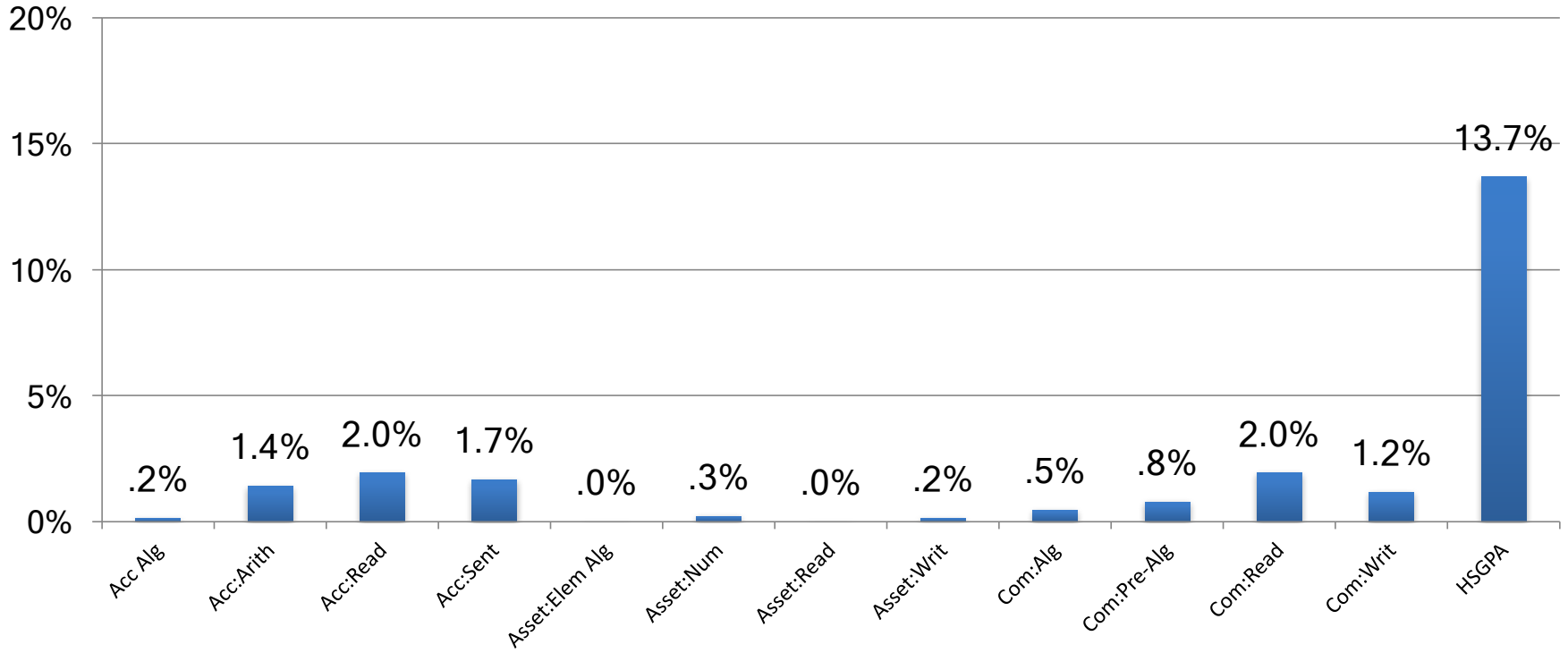
- Research increasingly questions effectiveness of single instance, single method assessment for understanding student capacity
  - Weak relationship to college course and completion outcomes, especially compared to measures of high school achievement
    - (e.g., Belfield & Crosta, 2012; Edgescombe, 2011; Scott-Clayton, 2012; Scott-Clayton & Rodriguez, 2012): bit.ly/CCRCAssess see also bit.ly/COMPASSValidation
  - 20-30% of students are **severely** underplaced into one or more developmental education sequences bit.ly/CCRCPlacementAccuracy

Variance in college level Math grades explained by various assessments - NC



Adapted from Bostian (2016), North Carolina Waves GPA Wand, Students Magically College Ready adapted from research of Belfield & Crosta, 2012 – see also Table 1: http://bit.ly/Belfield2012 (cf also Scott-Clayton, 2012)

Variance in college level English grades explained by various assessments - NC



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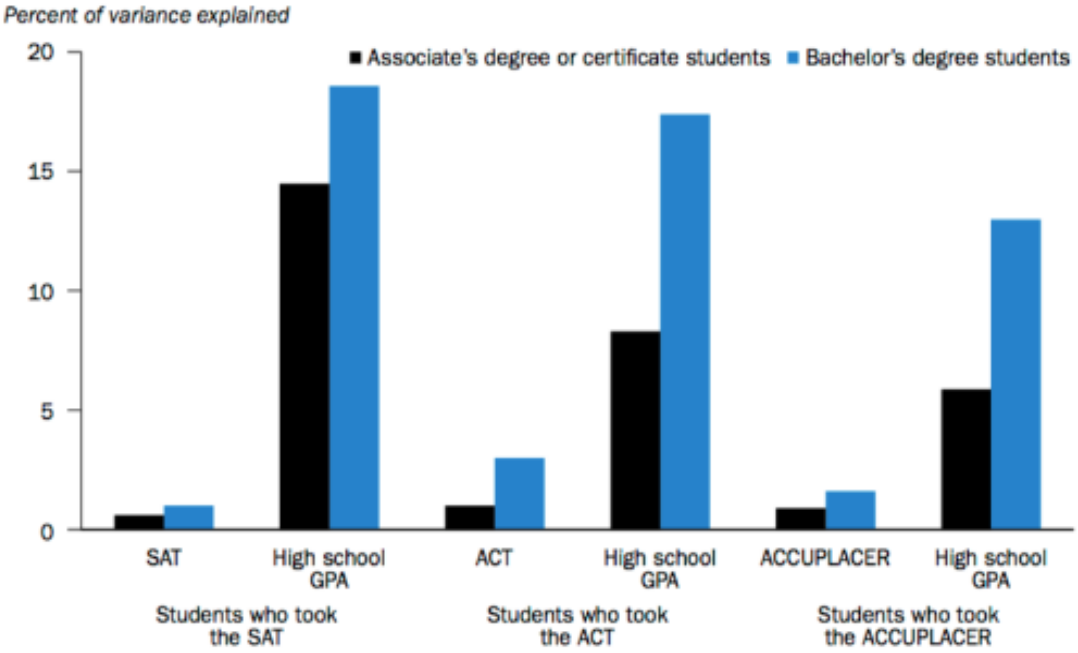
Accuplacer, SAT, ACT - AK

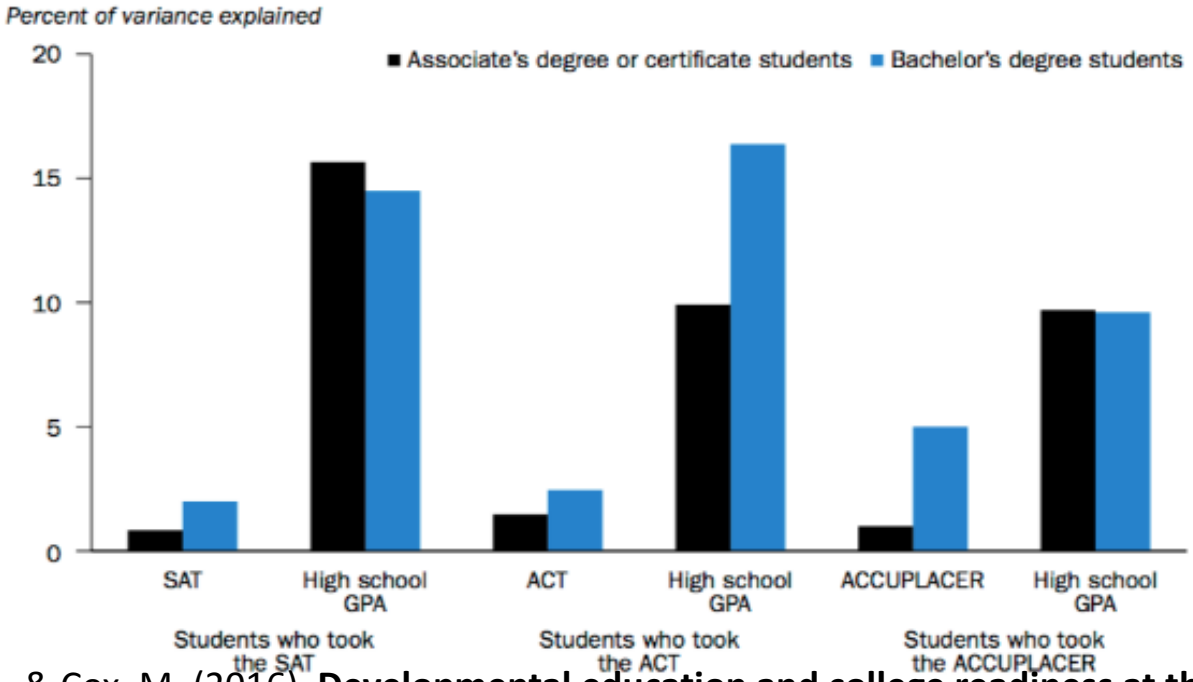
Figure 6. Among University of Alaska students who enrolled directly in college English courses, high school grade point average explained more of the variation in college English grades than did exam scores, 2008/09–2011/12



From Hodara, M., & Cox, M. (2016), **Developmental education and college readiness at the University of Alaska**: http://bit.ly/HSGPAAK

Accuplacer, SAT, ACT - AK

Figure 7. Among University of Alaska students who enrolled directly in college math courses, high school grade point average explained more of the variation in college math grades than did exam scores, 2008/09–2011/12



From Hodara, M., & Cox, M. (2016), **Developmental education and college readiness at the University of Alaska**: http://bit.ly/HSGPAAK

Why else are multiple measures important?

- Can improve accuracy (reduce error in placement), success rates, & sequence completion
  - bit.ly/CCRCPlacementAccuracy
- Represent best practices in assessment, placement, and developmental education
  - REL Southeast and IES Guide to assessing college readiness
    - bit.ly/CRGuide
  - WWC Educator's Practice Guide: Strategies for Postsecondary Students in Developmental Education
    - bit.ly/WWCGuide

Two approaches to improving assessment through evidence-based multiple measures

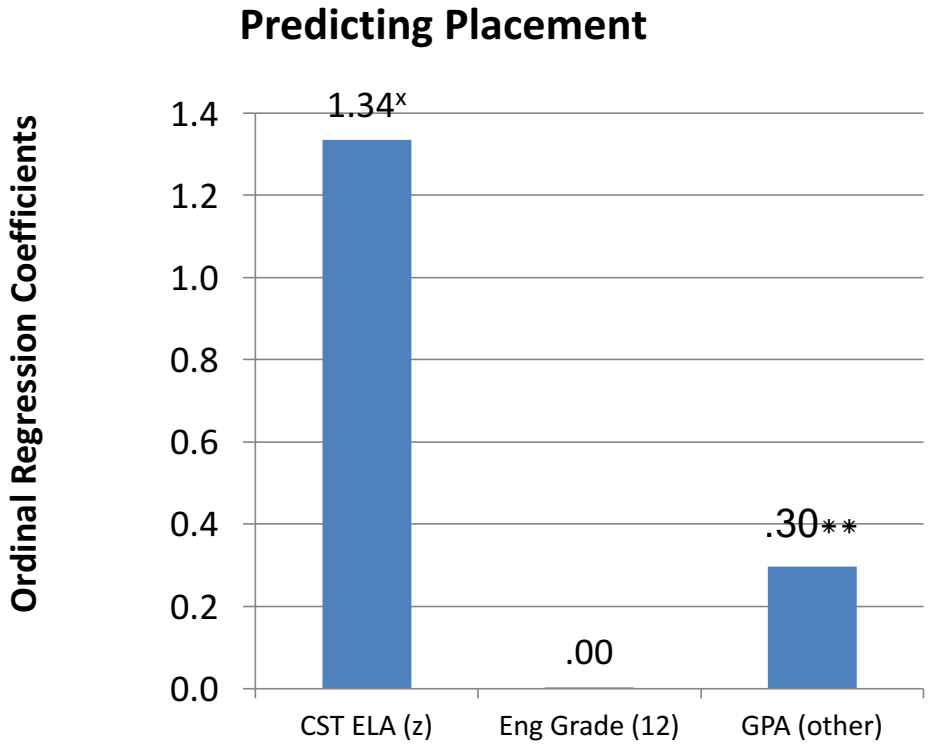
Resources/references:

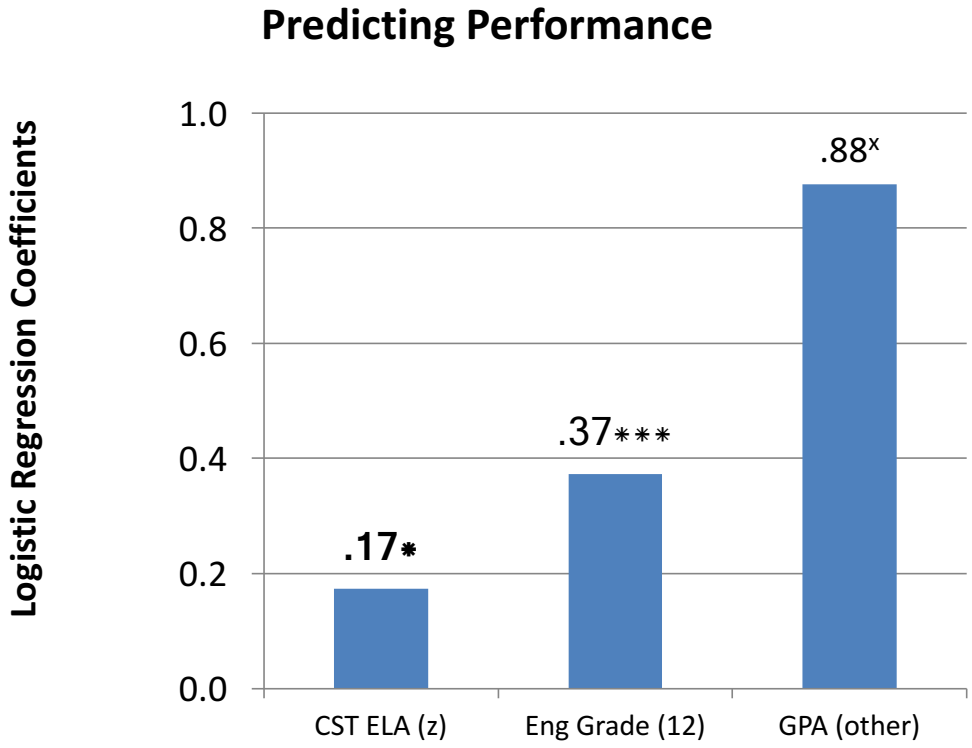
- http://www.lbcc.edu/PromisePathways
- http://bit.ly/MMAP2017
- http://bit.ly/STEPSRP
- http://bit.ly/MultipleMeasuresRP

LBCC Multiple Measures Research

- Initial research: five cohorts tracking more than 7,000 HS grads who matriculated to LBCC directly
- Examined predictive utility of wide range of high school achievement data for predicting:
  - How students are assessed and placed
  - How students perform in those classes
  - (and alignment between them)

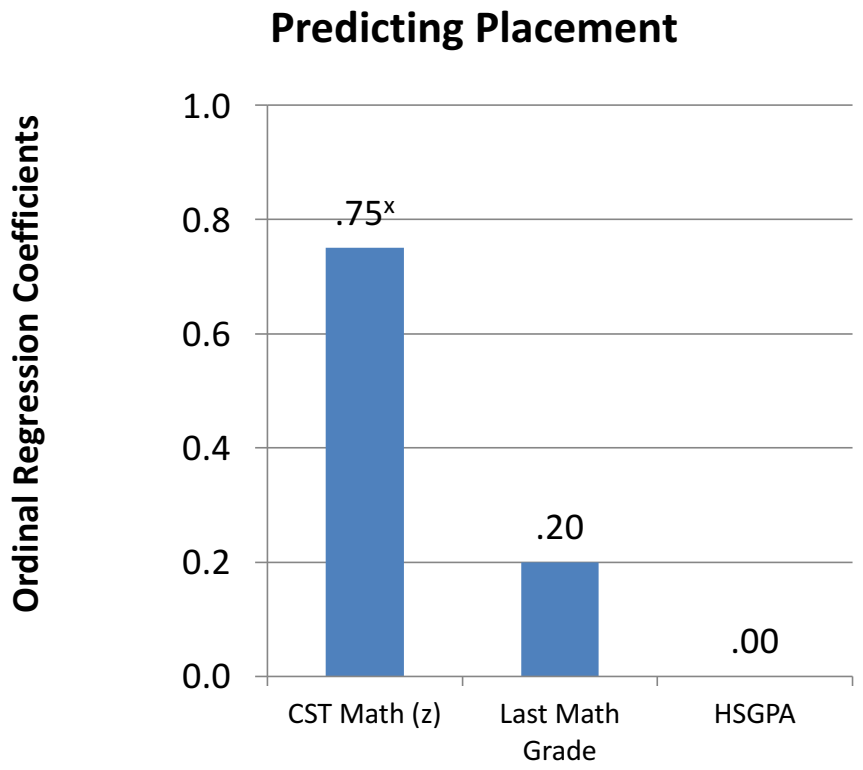
Predicting placement & performance in English at LBCC

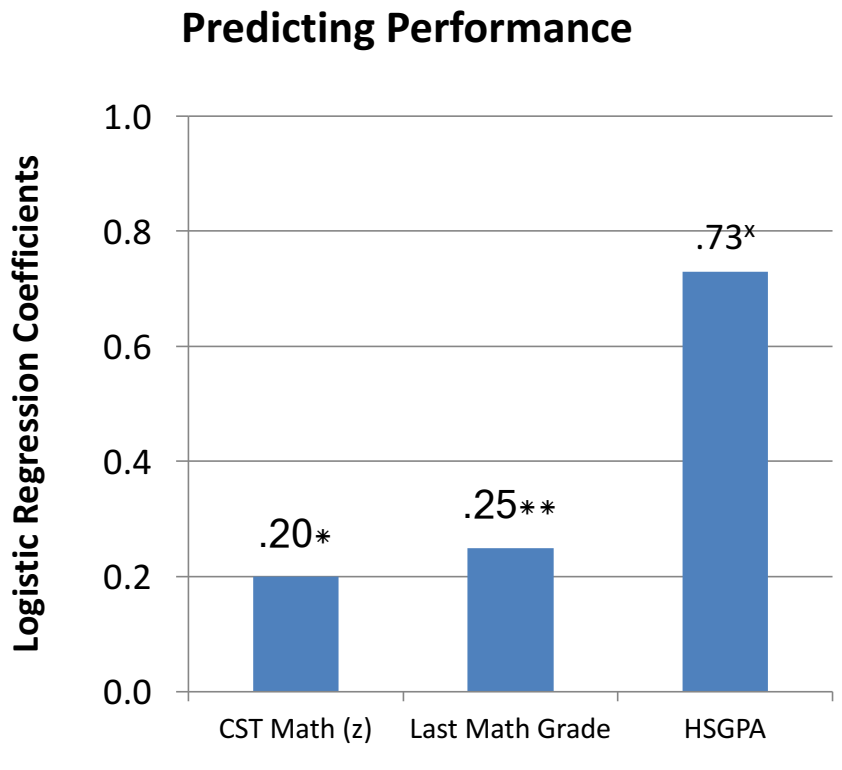




* p <.05 **, p <.01, *** p<.001, x = p< 1 x 10^{-10}

Predicting placement and performance in Math at LBCC





* p <.05 **, p <.01, *** p<.001, x = p< 1 x 10^{-10}

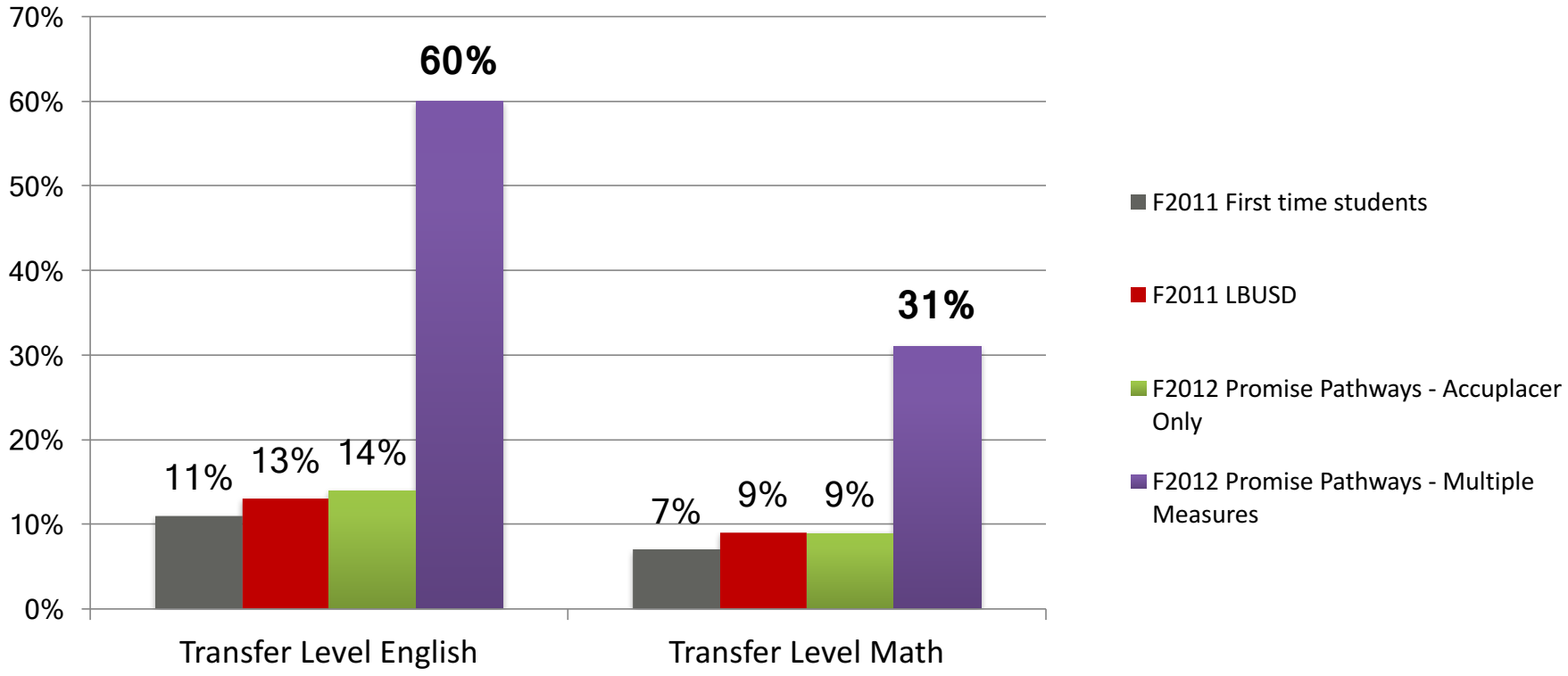
Key Takeaways

- Assessment should predict **how students will perform at our colleges**
- **Instead:**
  - Previous standardized tests predict later standardized tests
  - Previous classroom performance predicts later **classroom performance**
  - More information tells us more about student capacity than less information

Re-imagined student capacity

- Reverse engineered analysis to place students using:
  - Overall HSGPA
  - Last high school course in discipline
  - Grade in last course in discipline
  - Last standardized test in discipline (and level)
- Placed students in highest course where predicted success rate higher than average success rate for that course.

Implementing Multiple Measures Placement: Initial LBCC Transfer-level Placement Rates F2012

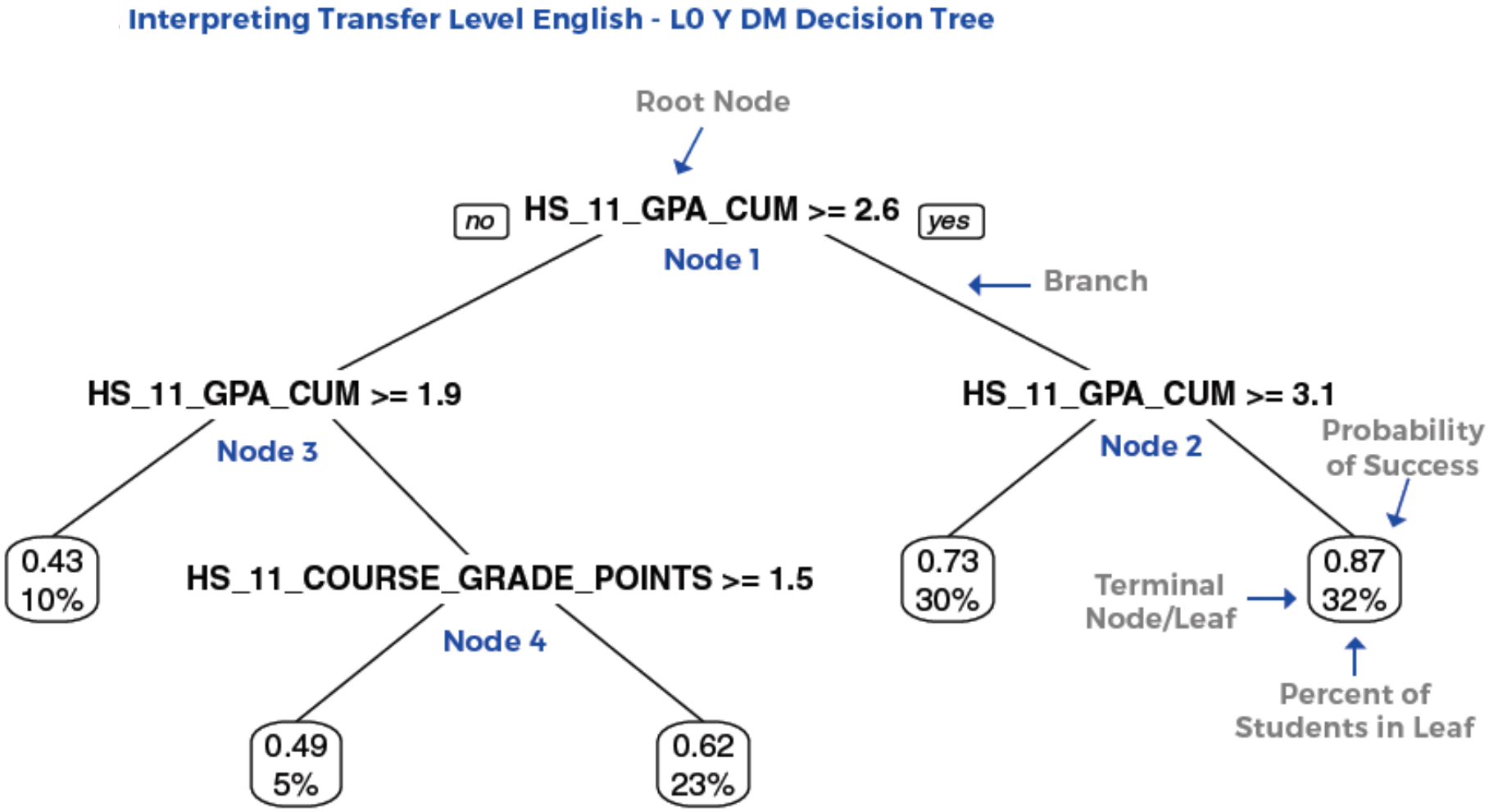


Multiple Measures Assessment Project

- Collaborative effort of CCCCO, Common Assessment Initiative (CAI), RP Group, Cal-PASS Plus (Educational Results Partnership & San Joaquin Delta College), and now >70 CCC pilot colleges
- Identify, analyze, & validate multiple measures data (including HS transcript data, non cognitive variable data, & self-report HS transcript data)
  - Focus on predictive validity (success in course) using categorization and regression tree models (robust to missing data, non-linear effects, and interactions)
  - Very conservative approach: target ≥70% success rate in college level course
- Engage pilot colleges to conduct local replications, test models and pilot use in placement, and provide feedback

bit.ly/MMAP2017

How to Read a Decision Tree for English



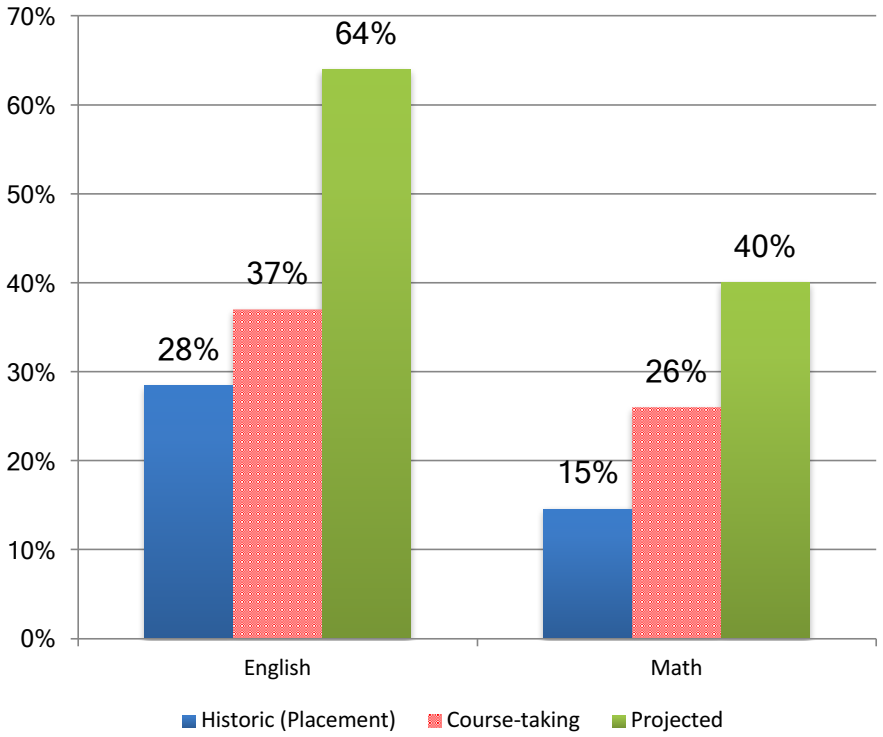
English & Math Transfer-Level Placement Recommendations

Transfer Level Course	Direct Matriculants	Non-Direct Matriculants
College Algebra Passed Algebra II (or better)	HS 11 GPA >=3.2 OR HS 11 GPA >=2.9 AND Pre-Calculus C (or better)	HS 12 GPA >=3.2 OR HS 12 GPA >=3.0 AND Pre-Calculus or Statistics (C or better)
Statistics Passed Algebra I (or better)	HS 11 GPA >=3.0 OR HS 11 GPA >=2.3 AND Pre-Calculus C (or better)	HS 12 GPA >=3.0 OR HS 12 GPA >=2.6 AND Pre-Calculus (C or better)
English	HS 11 GPA >=2.6	HS 12 GPA >=2.6

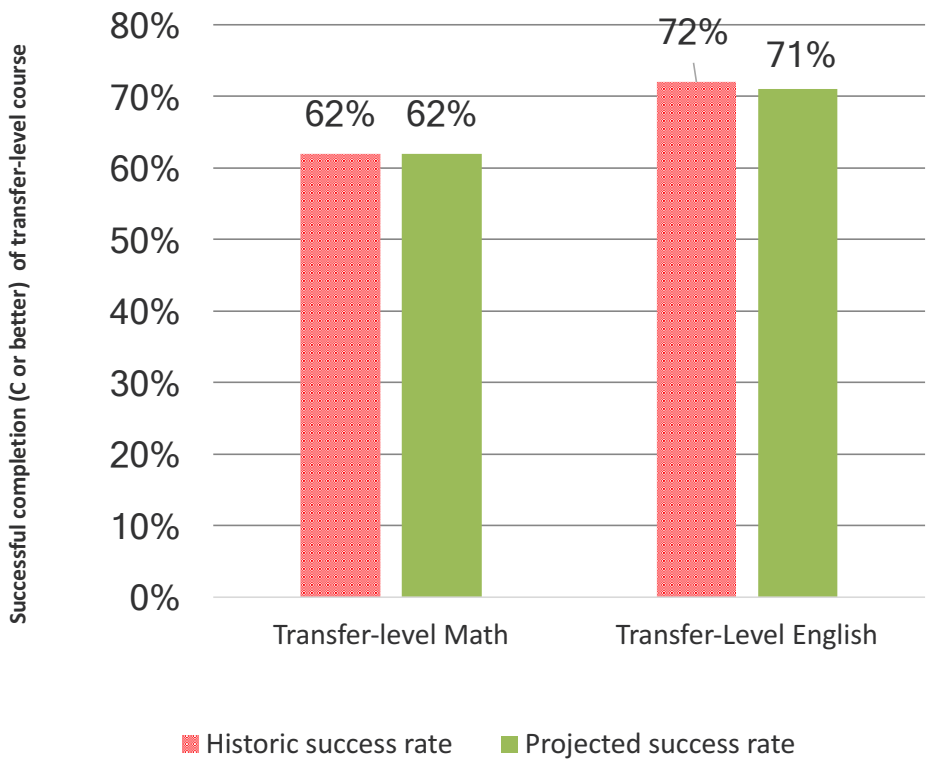
bit.ly/RulesMMAP

Projected impact on placement and success

Placement into transfer-level



Projected success sates



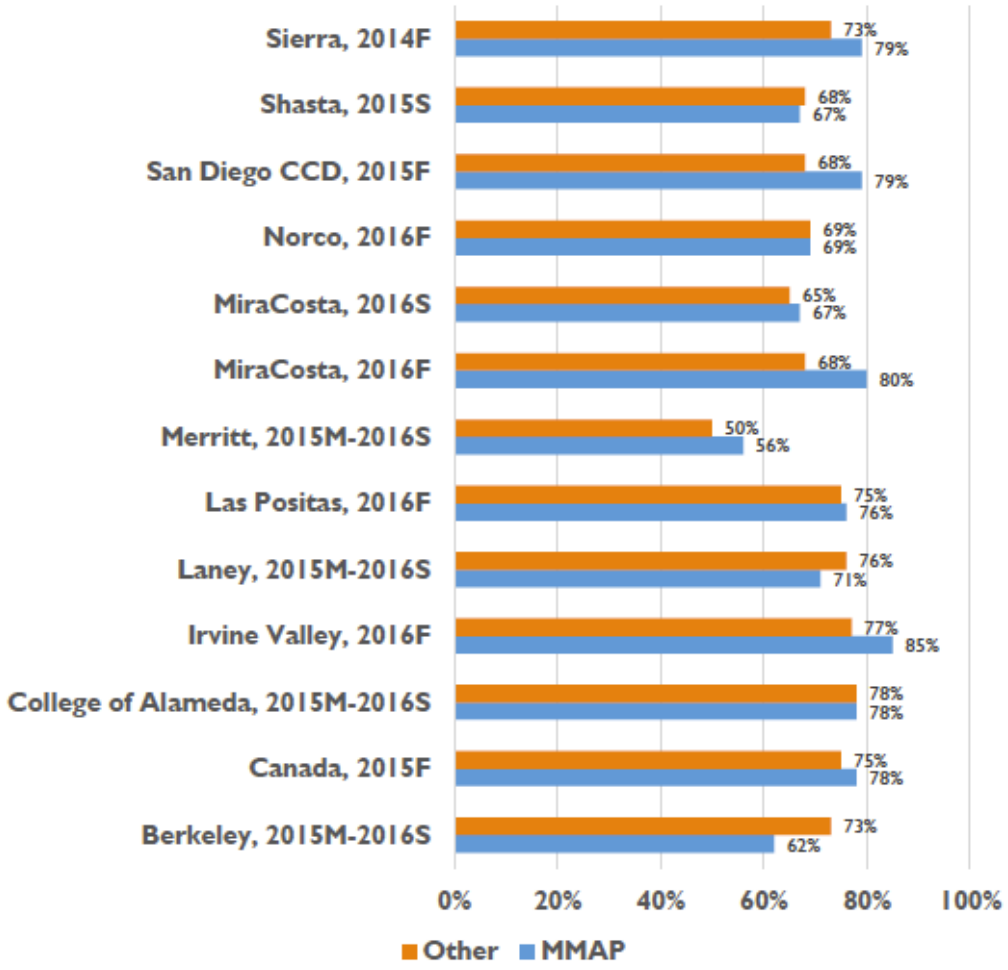
bit.ly/BSI2012 and bit.ly/MMAPProjection

Common Concerns/Multiple Measures Myths

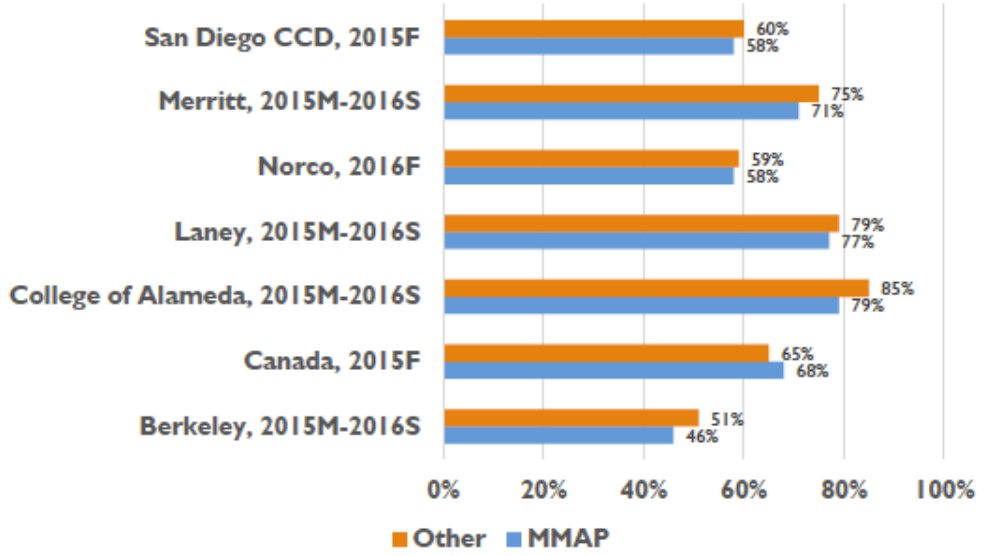
- Students placed via multiple measures will not be successful
- High school grades only predictive for recent graduates
- High school grades validity threatened by grade inflation/social promotion
- High school transcripts are too hard to get or use transcripts

Students placed by multiple measures are just as if not more successful

Success Rates in Transfer-level English

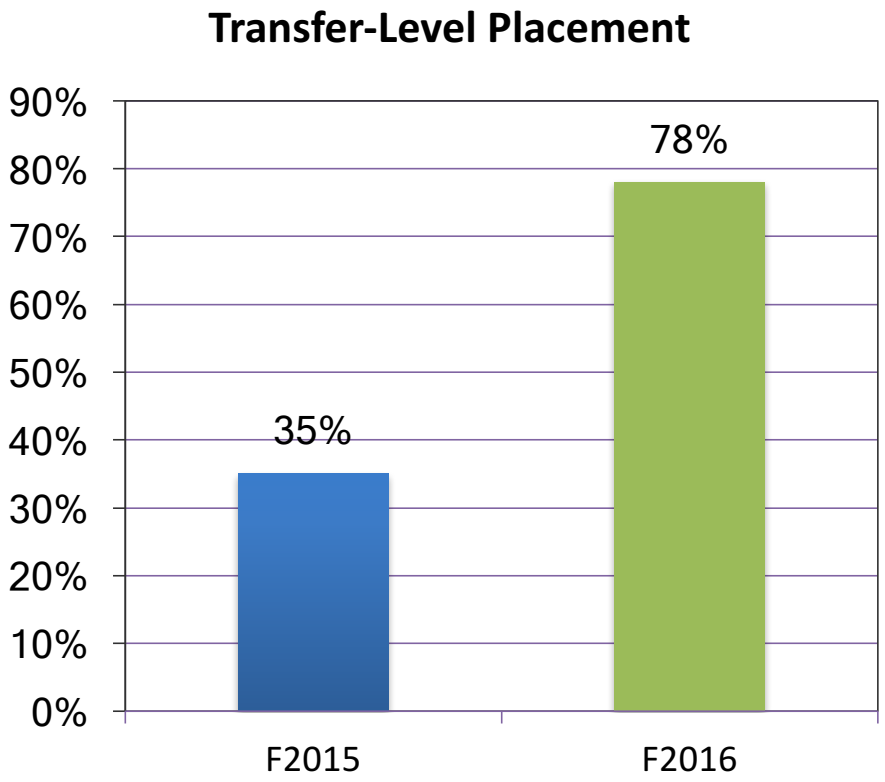


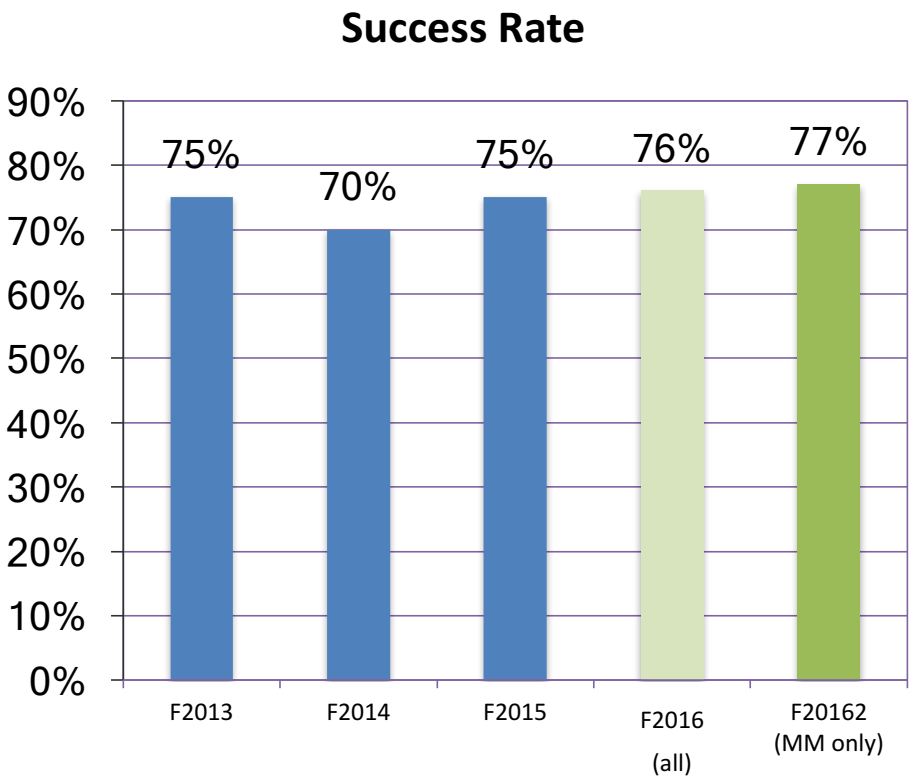
Success Rates in Transfer-level Math



bit.ly/MMAPSummary2017

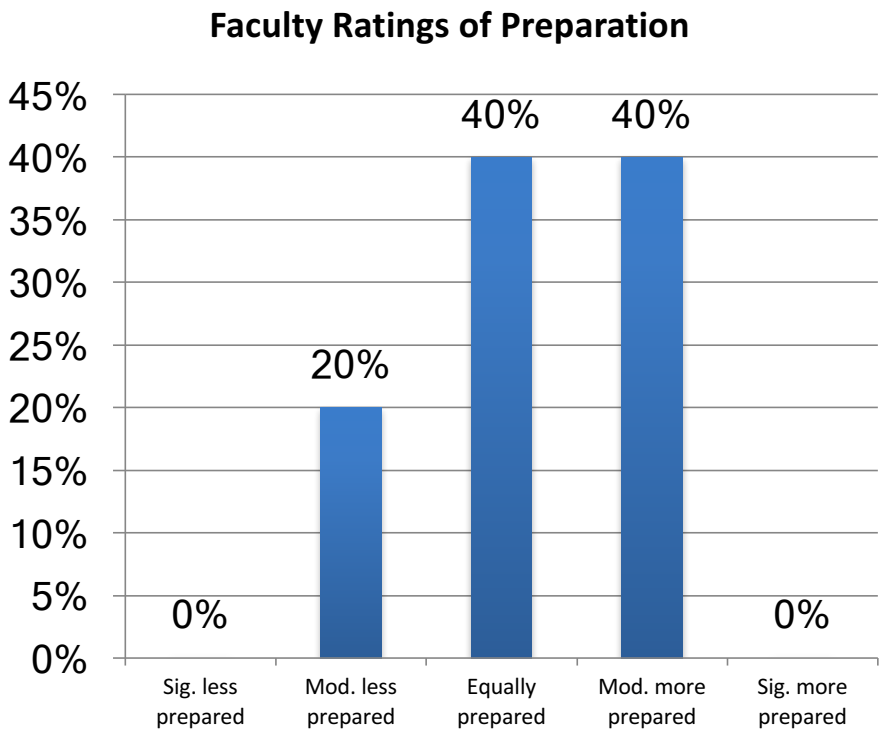
Las Positas F2016 results: English

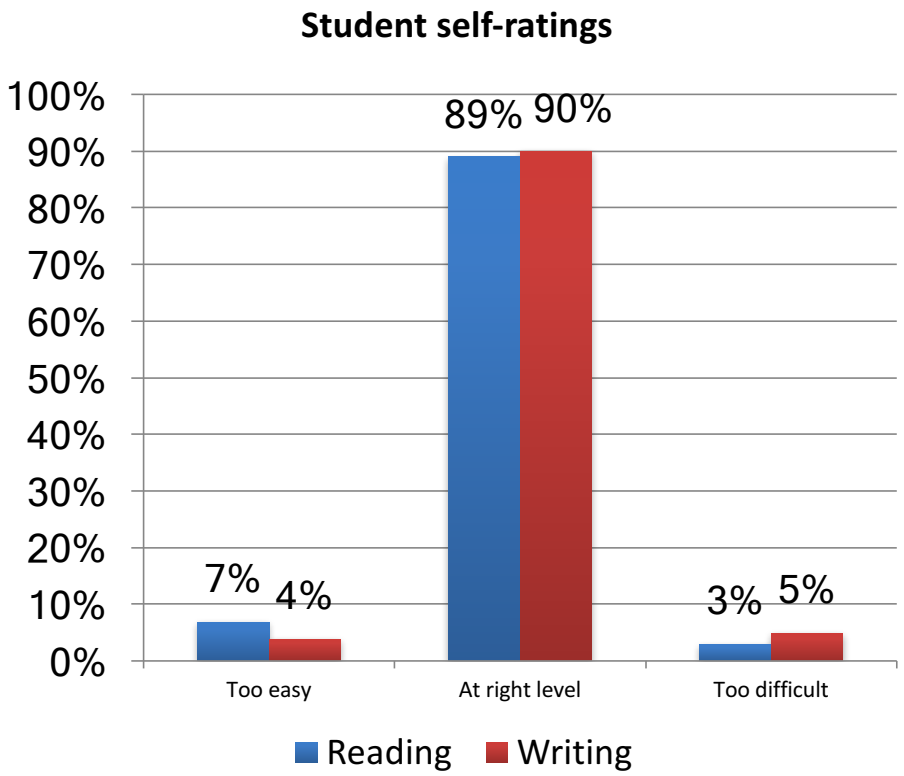




*Used student self-reported HSPGA ≥2.5 within 10 years of high school

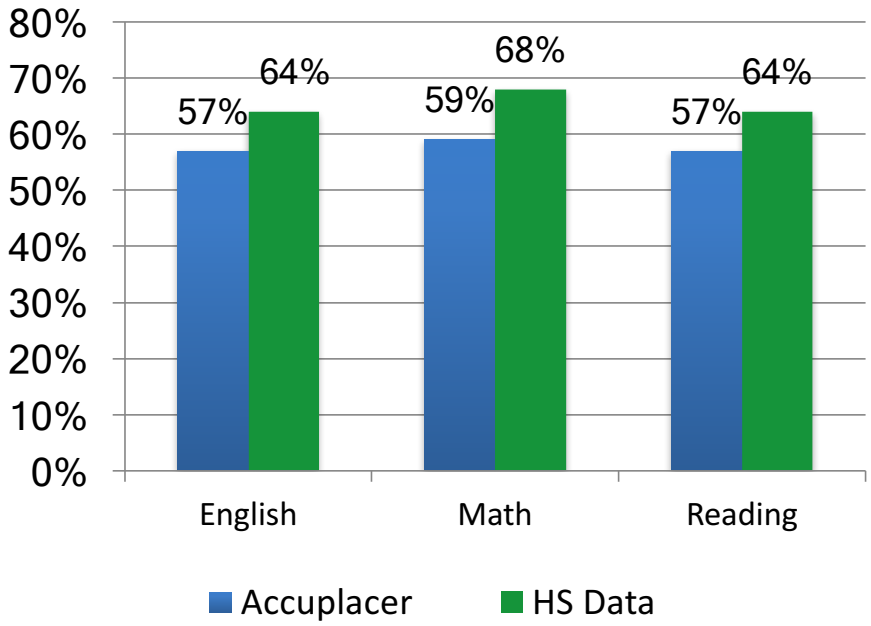
Were they prepared?





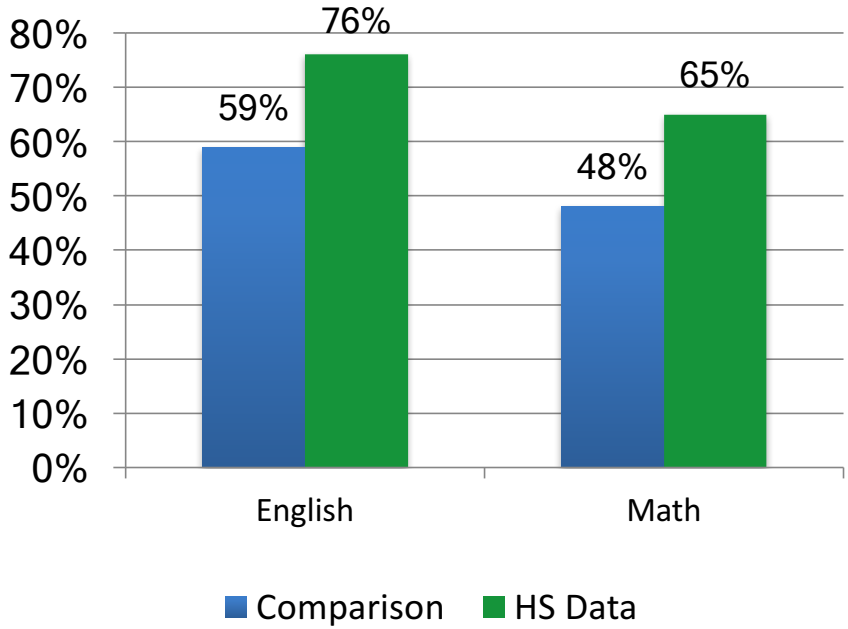
Transfer-level course completion, recent national examples at scale: http://bit.ly/CCCSEMM

Ivy Tech 2014-2015



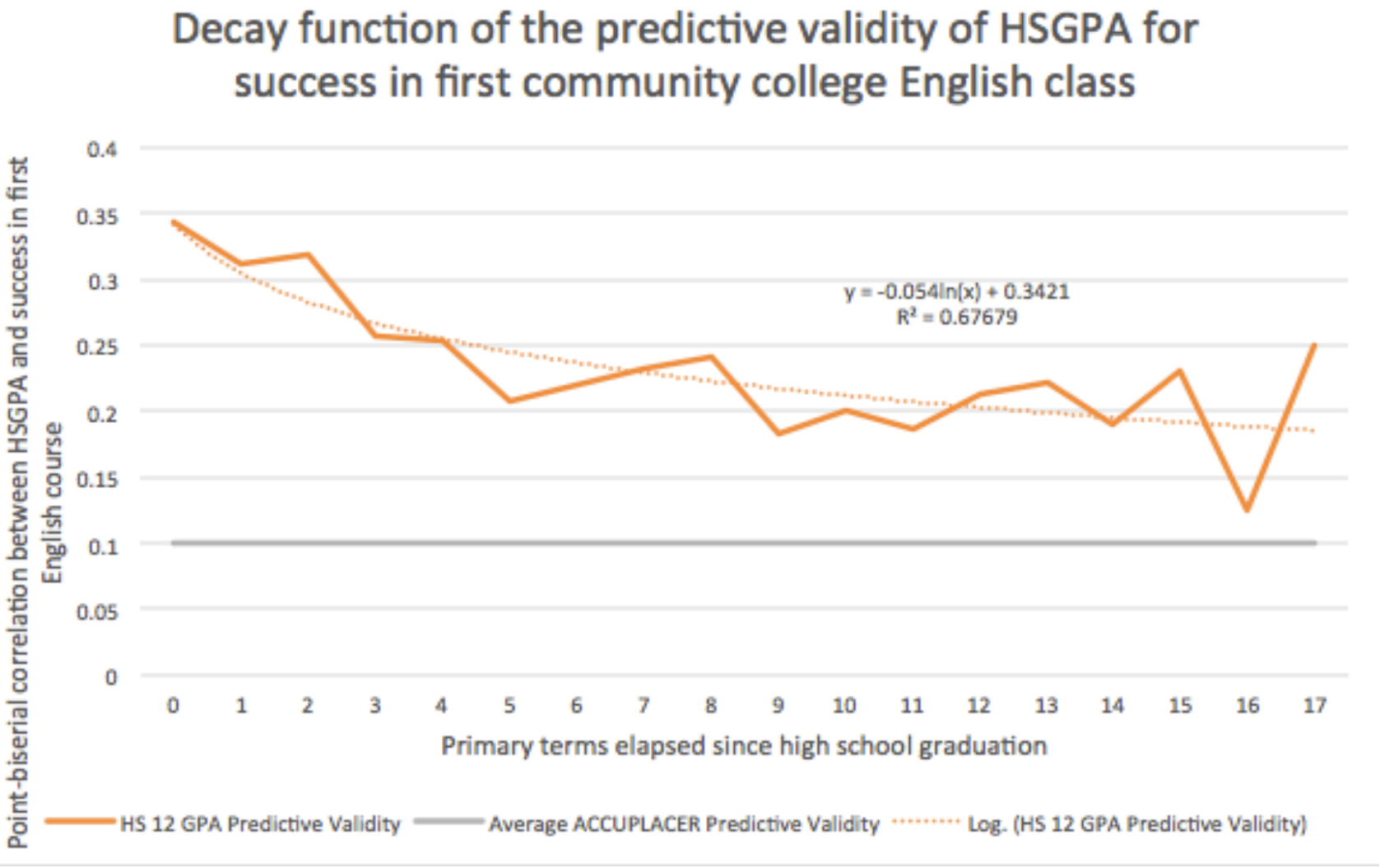
Rules used for English and Math: HSGPA >=2.6

Davidson County CC 2013-2015

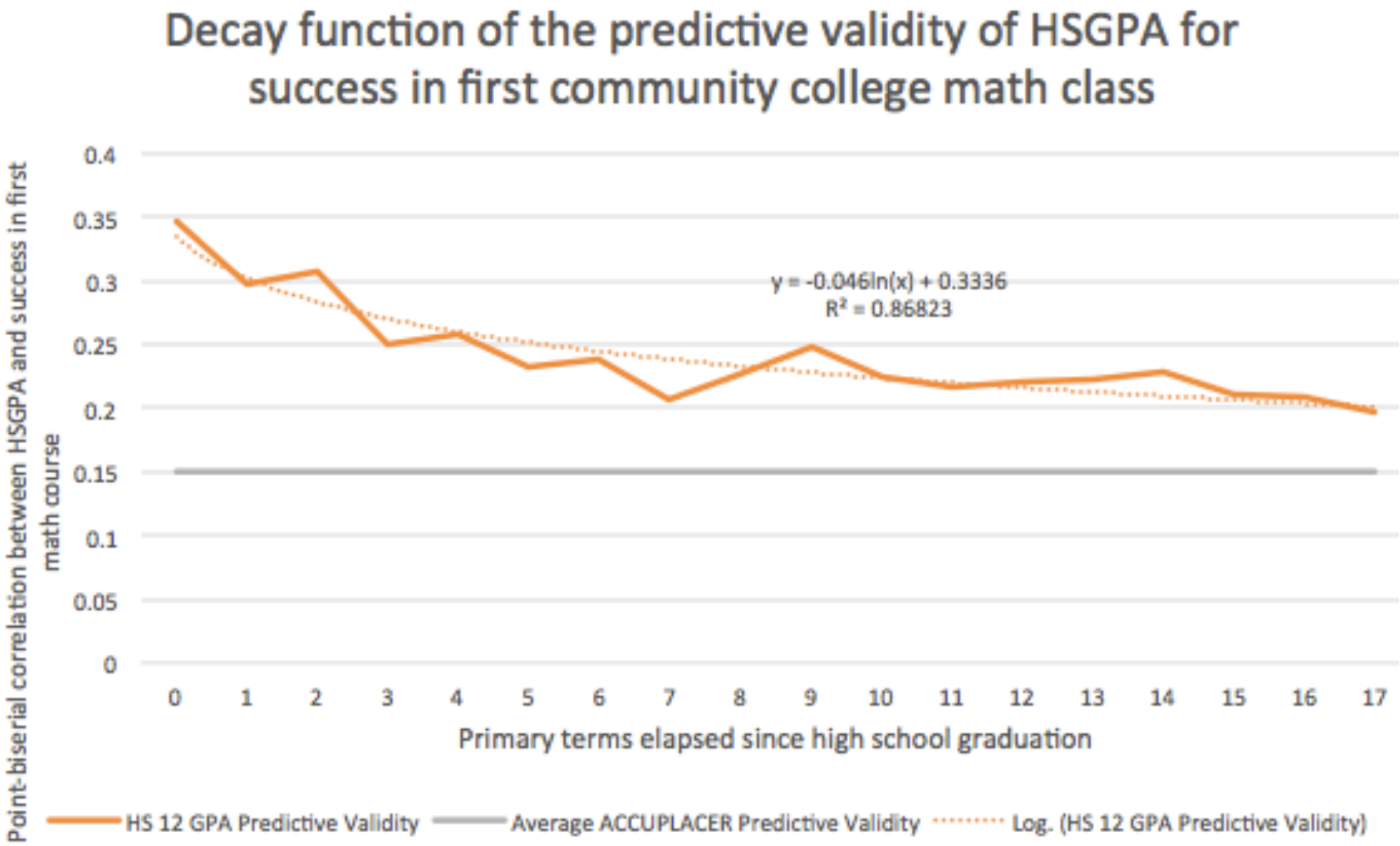


Rules used for English and Math: HSGPA >=2.6 and college directed (completion of four years of mathematics including one year beyond Algebra 2)

High School GPA is as or more predictive than tests for far longer than people think



Hayward et al (in preparation). Decay Function of the Predictive Validity of High School GPA



Hayward et al (in preparation). Decay Function of the Predictive Validity of High School GPA

Concerns about grade inflation and social promotion do not fit evidence

- Concern posits that there should be little to no predictive utility of HS grades for college performance because HS grades unrelated to actual performance/capacity
  - If everyone gets As and Bs, that would mean no variation to predict outcomes
- Yet, predictive utility **strongly observed**
  - Stronger than standardized tests
  - Even by standardized test companies

It doesn’t have to be hard or expensive

Free resources to get started

- Multiple Measures Assessment Project (free)
  - Main website: bit.ly/MMAP2017
  - Pilot college resources: bit.ly/ResourcesMMAP
    - Webinars: bit.ly/WebinarsMMAP
      - bit.ly/ImplementMMAP
    - Provision of statewide model placement recommendations bit.ly/MMAPRecs
    - Placement matrix for local data or transcript-based implementation: http://bit.ly/MMAPPlacementMatrix
    - Summary paper: bit.ly/Bahr2017
    - Additional supplemental tools, resources (NCVs, questionnaires, exercises)
  - Some additional support available for colleges/systems interested in conducting a randomized controlled trial (jhetts@edresults.org)

Up to 11th grade transcript available (formerly Direct Matriculant)

Highest math course taken in high school[2] \ Total non-weighted GPA[1]	GPA ≥ 3.6	GPA ≥ 3.4	GPA ≥ 3.3	GPA ≥ 3.2	GPA ≥ 3.0	GPA ≥ 2.9	GPA ≥ 2.8	GPA ≥ 2.6	GPA ≥ 2.4	GPA ≥ 2.3	GPA ≥ 2.0	GPA < 2.0
Calculus 1 (C or better)[3]	Calc	Calc	Calc	Calc	Pre-Calc	Pre-Calc	Pre-Calc	Pre-Calc	Stats	Stats	Pre-Alg	Arith
Calculus 1 (enrolled)[4]	Calc	Calc	Calc	Calc	Pre-Calc	Pre-Calc	Pre-Calc	Pre-Calc	Stats	Stats	Pre-Alg	Arith
Pre-Calculus (C+ or better)	Calc	Calc	Calc	Calc	Trig	Col Alg	Stats	Stats	Stats	Stats	Pre-Alg	Arith
Pre-Calculus (C or better)	Calc	Calc	Calc	Calc	Trig	Col Alg	Stats	Stats	Stats	Stats	Pre-Alg	Arith
Trigonometry (C or better)	Calc	Pre-Calc	Trig	Trig	Trig	Alg 2	Alg 2	Alg 1	Alg 1	Pre-Alg	Pre-Alg	Arith
Algebra 2 (B or better)	Pre-Calc	Pre-Calc	Trig	Trig	Trig	Alg 2	Alg 2	Alg 1	Alg 1	Pre-Alg	Pre-Alg	Arith
Algebra 2 (C or better)	Pre-Calc	Pre-Calc	Col Alg	Col Alg	Stats	Alg 2	Alg 2	Alg 1	Alg 1	Pre-Alg	Pre-Alg	Arith
Algebra 1 (C or better)	GE Math	GE Math	GE Math	Stats	Stats	Alg 2	Alg 2	Alg 1	Alg 1	Pre-Alg	Pre-Alg	Arith
All other	Alg 1	Alg 1	Alg 1	Alg 1	Alg 1	Alg 1	Alg 1	Alg 1	Alg 1	Pre-Alg	Pre-Alg	Arith

Legend

Calc	Calculus 1
Pre-Calc	Pre-Calculus
Trig	Trigonometry, College Algebra, GE Math, Statistics
Col Alg	College Algebra, GE Math, Statistics
GE Math	GE Math, Statistics
Stats	Statistics
Alg 2	Intermediate Algebra
Alg 1	Elementary Algebra
Pre-Alg	Pre-Algebra
Arith	Arithmetic

[1] Refers to the total non-weighted GPA. Do not include weighted, academic, term-based, or yearly GPA.
[2] Highest math course taken in high school by increasing difficulty.
[3] Grade received in course.
[4] Student enrolled in Calculus 1 (no grade requirement).

Up to 12th grade transcript available (formerly Non-Direct Matriculant)

Total non-weighted GPA[1]
CST scores[2]

Last Math course taken in high school[3]

	GPA ≥ 3.5	GPA ≥ 3.3	GPA ≥ 3.2	GPA ≥ 3.1	GPA ≥ 3.0 and Algebra 2 CST ≥ 340	GPA ≥ 3.0	GPA ≥ 2.9	GPA ≥ 2.8	GPA ≥ 2.6	GPA ≥ 2.5 and Algebra 2 CST ≥ 302	GPA ≥ 2.5	GPA ≥ 2.3	GPA ≥ 2.1 and Algebra 1 CST ≥ 302	GPA ≥ 2.1	GPA < 2.1
Calculus 1 (C or better)[4]	Calc	Calc	Calc	Calc	Pre-Calc	Pre-Calc	Trig	Trig	Stats	Alg 2	Alg 2	Alg 1	Alg 1	Pre-Alg	Arith
Calculus 1 (enrolled)[5]	Calc	Calc	Calc	Calc	Pre-Calc	Trig	Trig	Trig	Stats	Alg 2	Alg 2	Alg 1	Alg 1	Pre-Alg	Arith
Pre-Calculus (C or better)	Calc	Pre-Calc	Trig	Trig	Pre-Calc	Trig	Trig	Trig	Stats	Alg 2	Alg 2	Alg 1	Alg 1	Pre-Alg	Arith
Trigonometry (C or better)	Calc	Pre-Calc	Col Alg	Col Alg	Pre-Calc	Col Alg	GE Math	Alg 1	Alg 1	Alg 2	Alg 1	Alg 1	Alg 1	Pre-Alg	Arith
Statistics (C or better)	Pre-Calc	Pre-Calc	Col Alg	Col Alg	Pre-Calc	Col Alg	GE Math	Alg 1	Alg 1	Alg 2	Alg 1	Alg 1	Alg 1	Pre-Alg	Arith
Algebra 2 (C or better)	Pre-Calc	Pre-Calc	Col Alg	Stats	Pre-Calc	Stats	Alg 2	Alg 1	Alg 1	Alg 2	Alg 1	Alg 1	Alg 1	Pre-Alg	Arith
Algebra 1 (C or better)	GE Math	GE Math	GE Math	Stats	Stats	Stats	Alg 2	Alg 1	Alg 1	Alg 2	Alg 1	Pre-Alg	Alg 1	Pre-Alg	Arith
All other	Alg 1	Alg 1	Alg 1	Alg 1	Alg 1	Alg 1	Alg 1	Alg 1	Alg 1	Alg 1	Alg 1	Pre-Alg	Pre-Alg	Pre-Alg	Arith

[1] Refers to the total non-weighted GPA. Do not include weighted, academic, term-based, or yearly GPA.
[2] California Standardized Test (CST) score in Math. Current MMAP rules do not include Smarter Balanced test scores.
[3] Highest math course taken in high school by increasing difficulty.
[4] Grade received in course.
[5] Student enrolled in Calculus 1 (no grade requirement).

Legend

Calc	Calculus 1
Pre-Calc	Pre-Calculus
Trig	Trigonometry, College Algebra, GE Math, and Statistics
Col Alg	College Algebra, GE Math, and Statistics
GE Math	GE Math and Statistics
Stats	Statistics
Alg 2	Intermediate Algebra
Alg 1	Elementary Algebra
Pre-Alg	Pre-Algebra
Arith	Arithmetic

Up to 11th grade transcript available

(Formerly Direct Matriculant)

Last English course taken in high school[2] / Total non-weighted GPA[1]	GPA ≥ 2.6	GPA ≥ 2.3	GPA ≥ 2.0	GPA ≥ 1.4	GPA < 1.4
No requirement[3]	**Transfer**	One-below	Two-below	Three-below	Four-below

[1] Refers to the total non-weighted GPA. Do not include weighted, academic, term-based, or yearly GPA.
[2] Last English course taken in high school.
[3] No English course-taking requirement.

Legend

Transfer	Transfer level English
One-below	One level below transfer
Two-below	Two levels below transfer
Three-below	Three levels below transfer
Four-below	Four levels below transfer

Up to 12th grade transcript available

(Formerly Non-Direct Matriculant)

Last English course taken in high school[3] / Total non-weighted GPA[1] CST scores[2]	GPA ≥ 2.6	GPA ≥ 2.2	GPA ≥ 1.8 *and* CST ≥ 288	GPA ≥ 1.8	GPA ≥ 1.7	GPA ≥ 1.5 *and* CST ≥ 268	GPA < 1.7
12th grade English (C or better)[4]	**Transfer**	One-below	Two-below	Two-below	Three-below	Three-below	Four-below
12th grade English (D or better)	**Transfer**	Two-below	Two-below	Two-below	Three-below	Three-below	Four-below
All other	**Transfer**	Three-below	Three-below	Three-below	Three-below	Three-below	Four-below

[1] Refers to the total non-weighted GPA. Do not include weighted, academic, term-based, or yearly GPA.
[2] California Standardized Test (CST) score in English. Current MMAP rules do not include Smarter Balanced test scores.
[3] Last English course taken in high school.
[4] Grade received in course.

Self-reported HSGPA as potential alternative

- Ease of immediate implementation at very low to no cost (possibly savings)
- UC, CSU, & others uses self-report in admissions, verifying after admission
  - 2008: 9 campuses, 60000+ students. No campus had >5 discrepancies b/w reported grades and transcripts: bit.ly/UCSelfReportGPA
- College Board: Shawn & Matten, 2009: "Students are quite accurate in reporting their HSGPA", r(40,299) = .73: bit.ly/CBSRGPA
- ACT brief found SR HSGPA to be highly correlated with students actual GPA: ACT, 2013: *r*(1978) = .84 bit.ly/ACTSRGPA

Key intersection with corequisite support

- Both demonstrate that students have far higher capacity to successfully complete college-level work than previously thought
  - Existing systemic underplacement of students may underpin effectiveness of corequisite developmental education (and other acceleration approaches)

- May still be assigning too many students to required support – opportunity to improve effectiveness and efficiency of corequisite support

Key intersection with corequisite support

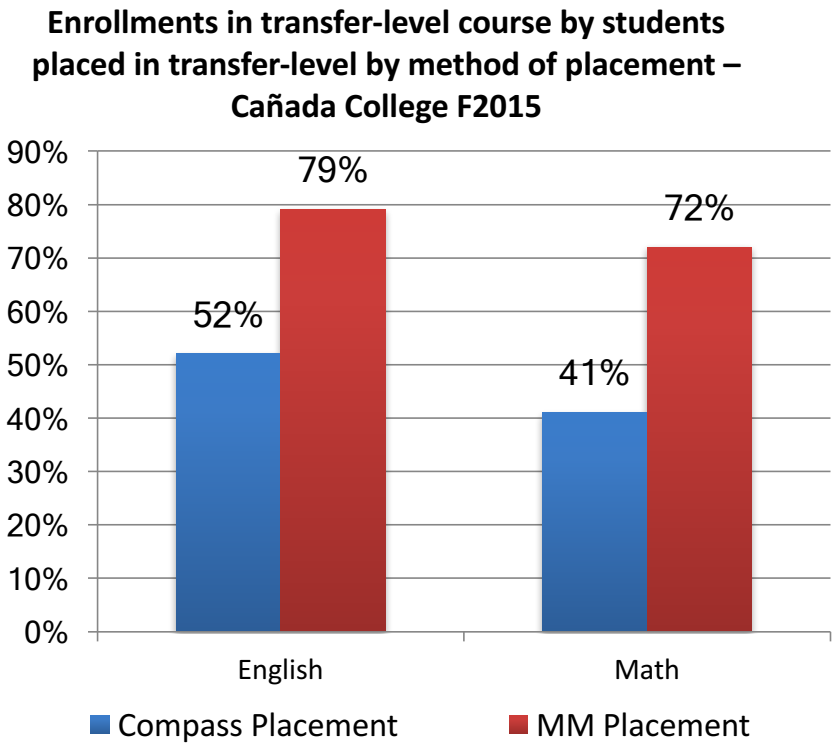
- Combination of multiple measures with corequisites could \:
  - more accurately identify which students actually need corequisite support
  - assist targeting with different types of corequisite support
  - further reduce both direct educational costs and opportunity costs for students
  - further minimize second order effects
    - frictional and real costs of unneeded but required, additional activity
    - self-fulfilling prophecy/expectation effects

Examples of combination

- Webinar: Implementing and Improving Your MMAP Process - Examples from Pilot Colleges: bit.ly/WebinarsMMAP (Cuyamaca College & Skyline College
  - Recent publications by the California Acceleration Project: accelerationproject.org
    - Leading the Way: bit.ly/CAPCuyamaca and Up to the Challenge: bit.ly/CAPChallenge
- CSU adoption of full scale combination of multiple measures and corequisite support for Fall 2018 (EO 1110)
  - Weighted self-reported GPA of 3.0 + appropriate senior year course (80% SR standard)
  - bit.ly/CSUMultipleMeasures
- CCC adoption of full scale combination of multiple measures and corequisite support coming very soon – AB705: bit.ly/AB705MM
  - Maximize probability of completion of college-level coursework in first year
  - No developmental education without evidence that it improves outcomes

Potential additional benefits

- Jump start low cost early alert systems
- Better evidence basis to evaluate interventions (e.g., tutoring, supplemental instruction)
- Re-energize even strong K-12 relationships
- Mitigate biggest loss point in foundational skills sequence: failure to enroll in first course in sequence



Summary

- Many have been working from a presumption of student inadequacy rather than following the evidence
  - Using ineffective tools to mismeasure, misplace, and misdirect students

- Evidence and best practices strongly suggests:
  - systematic and substantial underestimation of our students' capacity
  - multiple measures hold dramatic potential to improve placement and outcomes
  - successful students should progress normally and very rarely be placed backwards as they move between segments (**just as within each segment)**

What do we gain through reimagining our students' capacity?

- Better, evidence-based understanding of students
- Transformation of student outcomes
- Powerful levers to address student equity gaps
- Renewed opportunities to:
  - collaborate with K-12 colleagues
  - stop meeting students at front door and imply that they may not belong

- A reminder of Daedalus' second instruction to Icarus
  - It's just as important not to fly too low.

Thank you!

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- bit.ly/MMAP2017
- **bit.ly/MMCCA2017 (slides)**

The Fierce Urgency of Now

- ~Two million new community college students per year
- "We are now faced with the fact that tomorrow is today. We are confronted with the fierce urgency of now. In this unfolding conundrum of life and history, there "is" such a thing as being too late. This is no time for apathy or complacency. This is a time for vigorous and positive action."
  - Dr. Martin Luther King, Jr.

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