Multiple Measures in Assessment and the Re-Imagination of Student Capacity

(additional resources at end)

AACC June Pathways Institute

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They had one job
Assessment’s “one” job

- Measure student’s capacity/predict student’s performance to get students into course where they can thrive

- Single instance, single method assessment systematically and substantially underestimates student capacity
  - particularly for students of color, low income students, first generation college students, women
Variance in college level grades by Accuplacer, Compass, Asset - NC

Transitions and intersegmental trust

- **Within systems**
  - Highly reliable progression with C or better

- **Between systems**
  - ~40% of CSU students repeat ≥1 course
    - African Americans/Hispanics ~50% more likely to do so ([bit.ly/CSUProficiency](#))
  - ~85% of CCC students placed into dev ed ([bit.ly/BSI2012](#))
    - ~3/4 repeat ≥ 1 level, ~1/2 repeat ≥ 2 levels
    - African Americans & Hispanics ~60% more likely to do so, Female students ~20% more
  - Noyce Foundation report ([bit.ly/Noyce2010](#))
    - Algebra in 7th grade nearly always advance to Geometry in 8th grade (also 9th to 10th grade)
    - Algebra in 8th grade, ~2/3 repeat including 50% of students with B or better

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### HS to CCC Math transition

<table>
<thead>
<tr>
<th>Transition</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jump ≥ 2 levels</td>
<td>3%</td>
</tr>
<tr>
<td>Jump 1 level</td>
<td>7%</td>
</tr>
<tr>
<td>Normal progress</td>
<td>12%</td>
</tr>
<tr>
<td>Repeat level</td>
<td>31%</td>
</tr>
<tr>
<td>Repeat ≥2 levels</td>
<td>19%</td>
</tr>
<tr>
<td>Repeat ≥3 levels</td>
<td>15%</td>
</tr>
<tr>
<td>Repeat ≥4 levels</td>
<td>14%</td>
</tr>
</tbody>
</table>
Multiple Measures Assessment Project

- Collaborative effort of C CCC CO, Common Assessment Initiative (CAI), RP Group, Cal-PASS Plus (Educational Results Partnership & San Joaquin Delta College), and >90 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 classification and regression tree models (robust to missing data, non-linear effects, and interactions)
  - Conservative approach: **identify students with ≥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

Interpreting Transfer Level English - L0 Y DM Decision Tree

Root Node

\[ \text{HS\_11\_GPA\_CUM} \geq 2.6 \]

Node 1

\[ \text{HS\_11\_GPA\_CUM} \geq 1.9 \]

Node 3

\[ \text{HS\_11\_COURSE\_GRADE\_POINTS} \geq 1.5 \]

Node 4

\[ \text{HS\_11\_GPA\_CUM} \geq 3.1 \]

Node 2

Terminal Node/Leaf

- Probability of Success: 0.73 (30%)
- Percent of Students in Leaf: 0.49 (5%)
- Percent of Students in Leaf: 0.62 (23%)
- Percent of Students in Leaf: 0.87 (32%)

# English & Math Transfer-Level Placement Recommendations

<table>
<thead>
<tr>
<th>Transfer Level Course</th>
<th>Direct Matriculants</th>
<th>Non-Direct Matriculants</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>College Algebra</strong></td>
<td>HS 11 GPA &gt;=3.2 OR</td>
<td>HS 12 GPA &gt;=3.2 OR</td>
</tr>
<tr>
<td>Passed Algebra II (or better)</td>
<td>HS 11 GPA &gt;=2.9 AND Pre-Calculus C (or better)</td>
<td>HS 12 GPA &gt;=3.0 AND Pre-Calculus or Statistics (C or better)</td>
</tr>
<tr>
<td><strong>Statistics</strong></td>
<td>HS 11 GPA &gt;=3.0 OR</td>
<td>HS 12 GPA &gt;=3.0 OR</td>
</tr>
<tr>
<td>Passed Algebra I (or better)</td>
<td>HS 11 GPA &gt;=2.3 AND Pre-Calculus C (or better)</td>
<td>HS 12 GPA &gt;=2.6 AND Pre-Calculus (C or better)</td>
</tr>
<tr>
<td><strong>English</strong></td>
<td>HS 11 GPA &gt;=2.6</td>
<td>HS 12 GPA &gt;=2.6</td>
</tr>
</tbody>
</table>

Impact on placement into transfer-level

- English: Historic (Placement) - 28%, Projected - 64%
- Math: Historic (Placement) - 15%, Projected - 40%

## Comparisons Between MMAP & Traditionally Placed Students

<table>
<thead>
<tr>
<th>Comparison Group</th>
<th>Metric</th>
<th>English Difference</th>
<th>Math difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students in transfer-level courses in same term</td>
<td>Success rates (Completion with C or better)</td>
<td>2 percentage points (PP) higher</td>
<td>Equal</td>
</tr>
<tr>
<td>Students placed 1 level below (previous cohort)</td>
<td>Completion of transfer-level course in 2 years (2 year throughput)</td>
<td>26 PP higher (72% vs. 46%)</td>
<td>41 PP higher (68% vs 27%)</td>
</tr>
<tr>
<td>Students placed 2 levels below (previous cohort)</td>
<td>Completion of transfer-level course in 2 years (2 year throughput)</td>
<td>40 PP higher (72% vs. 32%)</td>
<td>53 PP higher (68% vs. 15%)</td>
</tr>
</tbody>
</table>
What about everyone else? What maximizes their completion of gateway English and Math?

- Previously identified students highly likely to successfully complete (~70% or higher)

- Can we identify any students more likely to complete gateway English or Math if they start in developmental education?
  - Let’s examine the students least likely to succeed based on their HS performance
How to Read a Decision Tree for English

Interpreting Transfer Level English - L0 Y DM Decision Tree

Root Node

No  HS_11_GPA_CUM >= 2.6

Yes

Node 1

Branch

HS_11_GPA_CUM >= 1.9

Node 3

HS_11_COURSE_GRADE_POINTS >= 1.5

Node 4

Probability of Success

Node 2

0.73

0.30

Terminal Node/Leaf

0.87

0.32

Percent of Students in Leaf

Source: MMAP English Decision Rules, page 8:
Maximizing Throughput: English

One-year English throughput rate by placement level for students with less than a 1.9 high school GPA

- 43% pass rate
- ~10% of students

11th grade GPA < 1.9
Maximizing Throughput: Statistics

One-year Math throughput rate by placement level for students with less than a 2.3 high school GPA

11th grade GPA < 2.3
- 40% pass rate
- ~12% of students

Note – Throughput adjusted upward by removing students with educational goals that don’t require transfer—level math and by counting any transfer-level math success
Maximizing Throughput: Pre-Calculus

Note – Throughput adjusted **upward** by removing students with educational goals that don’t require transfer, further reducing cohort (denominator) by 75% to approximate proportion of BSTEM oriented students, and by counting any transfer-level math success. Precalculus used as most rigorous, entry level BSTEM course – colleges with earlier entry level BSTEM (e.g., College Algebra or Trigonometry).
Adjusting for Selection Bias

- Differences in HS GPA, test scores, and other factors exist among students at different placement levels.

- If low HS GPA students who would have previously been placed into below transfer level are allowed direct access to transfer level course, what are the expected success rates compared to throughput rates from remedial sequences?

- Using success rate predictions from the MMAP decision-tree analyses may not fully account for letting “weaker” students into transfer level.

- We examine this issue for college composition, statistics, and precalculus focusing on the lowest node of each decision tree.
Adjusting Projected Success Rates

- Difference in GPA and placement test score can be statistically accounted for and the projected success rates of students from lower placement levels can be adjusted (lowered).

- The magnitude of the adjustment depends on:
  - the extent of the differences in test scores and GPA between those in the MMAP models and those who would potentially be entering via the decision rules, and;
  - the strength of the association between the test scores/GPA and success in the target class.
Technical Details of Adjustment Process

- Use multivariate regression to predict success rate in the target transfer-level using GPA and test scores.
- The gaps in predicted success rates among the five placement levels are fitted to observed success rates to preserve proportionality.
- Relative gaps are applied to the original PPV and predicted success rates for students from each level are derived.
- A weighted average based on the number of students at each level who would be affected is calculated to yield the overall adjusted predicted success rate.
Regression Models

- **English**
  - Success Indicator = HS GPA + ACCUPLACER sentence skills score + ACCUPLACER reading comprehension score
  - Weakest model ($R^2=0.011$) with sentence skills not significant

- **Statistics and Precalculus**
  - Success Indicator = HS GPA + ACCUPLACER college algebra score
  - Stronger yet still modest models ($R^2=0.10$ for statistics; $R^2=0.09$ for precalculus)
  - Other test scores (arithmetic and elementary algebra) for statistics did not yield useful results so only college algebra was used
Regression Adjusted Success Rates
(error bars represent ±1 se)

<table>
<thead>
<tr>
<th>Course</th>
<th>Lowest Node Success in Target Course</th>
<th>Regression Adjusted Success in Target Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>College Composition</td>
<td>43.0% ±1</td>
<td>42.6% ±1</td>
</tr>
<tr>
<td>(HS GPA &lt; 1.9)</td>
<td>Regression N=7,294</td>
<td>Regression N=1,749</td>
</tr>
<tr>
<td>Statistics</td>
<td>40% ±1</td>
<td>29% ±1</td>
</tr>
<tr>
<td>(HS GPA &lt; 2.3)</td>
<td>Regression N=1,485</td>
<td>Regression N=809</td>
</tr>
<tr>
<td>Precalculus</td>
<td>38% ±1</td>
<td>28% ±1</td>
</tr>
<tr>
<td>(HS GPA &lt; 2.6)</td>
<td>Regression N=1,753</td>
<td>Regression N=661</td>
</tr>
</tbody>
</table>

Remember – these are the rates for those least likely to succeed. Any observed throughput at colleges needs to similarly take that into account.
Future of (California) Placement

- Moderate to high-performing high school students should be placed directly into transfer-level courses.
- Even lowest performing HS students are more likely to complete college-level English & math if placed in college-level work (especially with additional supports).
- Flipped our understanding & responsibility
  - Students don’t have to prove their way in
  - We have to affirmatively demonstrate that this won’t work for them
Eligibility for/Support Recommendations for English

<table>
<thead>
<tr>
<th>High School Performance</th>
<th>AB 705-Compliant Eligibility/Support Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSGPA ≥ 2.6</td>
<td>Transfer-Level English Composition&lt;br&gt;No additional academic or corequisite support required</td>
</tr>
<tr>
<td>HSGPA 1.9 - 2.6</td>
<td>Transfer-Level English Composition&lt;br&gt;Additional academic and corequisite support recommended</td>
</tr>
<tr>
<td>HSGPA &lt; 1.9</td>
<td>Transfer-Level English Composition&lt;br&gt;Additional academic and corequisite support strongly recommended</td>
</tr>
</tbody>
</table>

For students with high school transcripts within 10 years of enrollment at CC, excluding students who are locally advised to take the ESL test.
<table>
<thead>
<tr>
<th>High School Performance</th>
<th>AB 705-Compliant Eligibility/Support Recommendations</th>
</tr>
</thead>
</table>
| HSGPA ≥ 3.0             | Transfer-Level Statistics
| Or                      | No additional academic or corequisite support required |
| HSGPA ≥ 2.3 & C or      | Transfer-Level Statistics
| Better in Precalculus   | Additional academic and corequisite support recommended |
| HSGPA 2.3–3.0           | Transfer-Level Statistics
|                         | Additional academic and corequisite support recommended |
| HSGPA < 2.3             | Transfer-Level Statistics
|                         | Additional academic and corequisite support strongly recommended |

For students with high school transcripts within 10 years of enrollment at CC.
### Eligibility for/Support Recommendations for Gateway STEM Math

<table>
<thead>
<tr>
<th>High School Performance</th>
<th>AB 705-Compliant Eligibility/Support Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSGPA ≥ 3.4 OR HSGPA ≥ 2.6 AND enrolled in HS Calculus</td>
<td>Transfer-Level Gateway STEM Math No additional academic or corequisite support required</td>
</tr>
<tr>
<td>HSGPA ≥2.6 or Enrolled in HS Precalculus</td>
<td>Transfer-Level Gateway STEM Math Additional academic and corequisite support recommended</td>
</tr>
<tr>
<td>HSGPA ≤ 2.6 and no Precalculus</td>
<td>Transfer-Level Gateway STEM Math Additional academic and corequisite support strongly recommended</td>
</tr>
</tbody>
</table>

For students with high school transcripts within 10 years of enrollment at CC and who had taken Algebra 2/Intermediate Algebra/Integrative Math 3 or higher in high school.
Summary

- We have been working from inaccurate 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
  - dramatic potential to improve student outcomes
  - successful students should progress normally and very rarely be placed backwards as they move between segments (just as within each segment)
  - direct placement with corequisite support is likely to be the most effective strategy for everyone else
Questions?

Contact Information

- John Hetts
- Educational Results Partnership
- jhetts@edresults.org
- 714-380-2678 cell
- Twitter: @jjhetts #LetIcarusFly
- bit.ly/MMAP2017
- bit.ly/AACCMM

The Fierce Urgency of Now

- “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.
Wait – I have more questions!

Resources for Addressing 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 and often more successful in college level courses as traditionally placed students.
Las Positas F2016 results: English

Transfer-Level Placement

F2015: 35%
F2016: 78%

Success Rate

- F2013: 75%
- F2014: 70%
- F2015: 75%
- F2016 (all): 76%
- F2016 (MM only): 77%

*Used student self-reported HSPGA ≥2.5 within 10 years of high school, doubled placement into transfer level English, success rates improved slightly.
Faculty were twice as likely to rate students (massive numbers of whom would have previously been denied access to transfer level English) as more prepared than as less prepared.
Similar outcomes for transfer-level course completion in other national examples at scale:

Ivy Tech 2014-2015

<table>
<thead>
<tr>
<th>Subject</th>
<th>Accuplacer</th>
<th>HS Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>57%</td>
<td>59%</td>
</tr>
<tr>
<td>Math</td>
<td>64%</td>
<td>68%</td>
</tr>
<tr>
<td>Reading</td>
<td>57%</td>
<td>64%</td>
</tr>
</tbody>
</table>

Davidson County CC 2013-2015

<table>
<thead>
<tr>
<th>Subject</th>
<th>Comparison</th>
<th>HS Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>59%</td>
<td>76%</td>
</tr>
<tr>
<td>Math</td>
<td>48%</td>
<td>65%</td>
</tr>
</tbody>
</table>

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.

Still more predictive than assessment tests at 9-10 years.
Decay function of the predictive validity of HSGPA for success in first community college English class

$y = -0.054\ln(x) + 0.3421$

$R^2 = 0.67679$

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
  - Summary paper: bit.ly/Bahr2017
  - Additional supplemental tools, resources (NCVs, questionnaires, exercises)
- Some additional support available for colleges/systems interested in setting up regional/systemwide data sharing and/or conducting a randomized controlled trial (jhetts@edresults.org)
### Up to 11th grade transcript available

(Formerly Direct Matriculant)

<table>
<thead>
<tr>
<th>GPA ≥ 3.6</th>
<th>GPA ≥ 3.4</th>
<th>GPA ≥ 3.3</th>
<th>GPA ≥ 3.2</th>
<th>GPA ≥ 3.0</th>
<th>GPA ≥ 2.9</th>
<th>GPA ≥ 2.8</th>
<th>GPA ≥ 2.6</th>
<th>GPA ≥ 2.4</th>
<th>GPA ≥ 2.3</th>
<th>GPA ≥ 2.0</th>
<th>GPA &lt; 2.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calculus 1 (C or better)&lt;sup&gt;3&lt;/sup&gt;</td>
<td>Calc</td>
<td>Calc</td>
<td>Calc</td>
<td>Calc</td>
<td>Pre-Calc</td>
<td>Pre-Calc</td>
<td>Pre-Calc</td>
<td>Pre-Calc</td>
<td>Stats</td>
<td>Stats</td>
<td>Pre-Alg</td>
</tr>
<tr>
<td>Calculus 1 (enrolled)&lt;sup&gt;4&lt;/sup&gt;</td>
<td>Calc</td>
<td>Calc</td>
<td>Calc</td>
<td>Calc</td>
<td>Pre-Calc</td>
<td>Pre-Calc</td>
<td>Pre-Calc</td>
<td>Pre-Calc</td>
<td>Stats</td>
<td>Stats</td>
<td>Pre-Alg</td>
</tr>
<tr>
<td>Pre-Calculus (C+ or better)</td>
<td>Calc</td>
<td>Calc</td>
<td>Calc</td>
<td>Calc</td>
<td>Trig</td>
<td>Col Alg</td>
<td>Stats</td>
<td>Stats</td>
<td>Stats</td>
<td>Stats</td>
<td>Pre-Alg</td>
</tr>
<tr>
<td>Pre-Calculus (C or better)</td>
<td>Calc</td>
<td>Calc</td>
<td>Calc</td>
<td>Calc</td>
<td>Trig</td>
<td>Col Alg</td>
<td>Stats</td>
<td>Stats</td>
<td>Stats</td>
<td>Stats</td>
<td>Pre-Alg</td>
</tr>
<tr>
<td>Trigonometry (C or better)</td>
<td>Calc</td>
<td>Pre-Calc</td>
<td>Trig</td>
<td>Trig</td>
<td>Trig</td>
<td>Alg 2</td>
<td>Alg 2</td>
<td>Alg 1</td>
<td>Alg 1</td>
<td>Pre-Alg</td>
<td>Pre-Alg</td>
</tr>
<tr>
<td>Algebra 2 (B or better)</td>
<td>Pre-Calc</td>
<td>Pre-Calc</td>
<td>Trig</td>
<td>Trig</td>
<td>Trig</td>
<td>Alg 2</td>
<td>Alg 2</td>
<td>Alg 1</td>
<td>Alg 1</td>
<td>Pre-Alg</td>
<td>Pre-Alg</td>
</tr>
<tr>
<td>Algebra 2 (C or better)</td>
<td>Pre-Calc</td>
<td>Pre-Calc</td>
<td>Col Alg</td>
<td>Col Alg</td>
<td>Stats</td>
<td>Alg 2</td>
<td>Alg 2</td>
<td>Alg 1</td>
<td>Alg 1</td>
<td>Pre-Alg</td>
<td>Pre-Alg</td>
</tr>
<tr>
<td>Algebra 1 (C or better)</td>
<td>GE Math</td>
<td>GE Math</td>
<td>GE Math</td>
<td>Stats</td>
<td>Stats</td>
<td>Alg 2</td>
<td>Alg 2</td>
<td>Alg 1</td>
<td>Alg 1</td>
<td>Pre-Alg</td>
<td>Pre-Alg</td>
</tr>
<tr>
<td>All other</td>
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<td>Alg 1</td>
<td>Alg 1</td>
<td>Alg 1</td>
<td>Alg 1</td>
<td>Alg 1</td>
<td>Alg 1</td>
<td>Alg 1</td>
<td>Alg 1</td>
<td>Pre-Alg</td>
<td>Pre-Alg</td>
</tr>
</tbody>
</table>

**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
- Pre-Alg: Pre-Algebra
- Calc: Arithmetic

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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).
<table>
<thead>
<tr>
<th>GPA ≥ 3.5</th>
<th>GPA ≥ 3.3</th>
<th>GPA ≥ 3.2</th>
<th>GPA ≥ 3.1</th>
<th>GPA ≥ 3.0 and Algebra 2 CST ≥ 340</th>
<th>GPA ≥ 2.9</th>
<th>GPA ≥ 2.8</th>
<th>GPA ≥ 2.6 and Algebra 2 CST ≥ 302</th>
<th>GPA ≥ 2.5 and Algebra 2 CST ≥ 302</th>
<th>GPA ≥ 2.3 and Algebra 1 CST ≥ 302</th>
<th>GPA ≥ 2.1 and Algebra 1 CST ≥ 302</th>
<th>GPA ≥ 2.1</th>
<th>GPA &lt; 2.1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Calc</strong></td>
<td><strong>Calc</strong></td>
<td><strong>Calc</strong></td>
<td><strong>Calc</strong></td>
<td><strong>Pre-Calc</strong></td>
<td><strong>Trig</strong></td>
<td><strong>Trig</strong></td>
<td><strong>Stats</strong></td>
<td><strong>Alg 2</strong></td>
<td><strong>Alg 1</strong></td>
<td><strong>Alg 1</strong></td>
<td><strong>Pre-Alg</strong></td>
<td><strong>Arith</strong></td>
</tr>
<tr>
<td><strong>Calc</strong></td>
<td><strong>Calc</strong></td>
<td><strong>Calc</strong></td>
<td><strong>Calc</strong></td>
<td><strong>Pre-Calc</strong></td>
<td><strong>Trig</strong></td>
<td><strong>Trig</strong></td>
<td><strong>Stats</strong></td>
<td><strong>Alg 2</strong></td>
<td><strong>Alg 1</strong></td>
<td><strong>Alg 1</strong></td>
<td><strong>Pre-Alg</strong></td>
<td><strong>Arith</strong></td>
</tr>
<tr>
<td><strong>Pre-Calc</strong></td>
<td><strong>Calc</strong></td>
<td><strong>Trig</strong></td>
<td><strong>Trig</strong></td>
<td><strong>Pre-Calc</strong></td>
<td><strong>Trig</strong></td>
<td><strong>Trig</strong></td>
<td><strong>Stats</strong></td>
<td><strong>Alg 2</strong></td>
<td><strong>Alg 1</strong></td>
<td><strong>Alg 1</strong></td>
<td><strong>Pre-Alg</strong></td>
<td><strong>Arith</strong></td>
</tr>
<tr>
<td><strong>Trigonometry</strong></td>
<td><strong>Calc</strong></td>
<td><strong>Pre-Calc</strong></td>
<td><strong>Col Alg</strong></td>
<td><strong>Col Alg</strong></td>
<td><strong>Pre-Calc</strong></td>
<td><strong>Col Alg</strong></td>
<td><strong>GE Math</strong></td>
<td><strong>Alg 1</strong></td>
<td><strong>Alg 1</strong></td>
<td><strong>Alg 1</strong></td>
<td><strong>Pre-Alg</strong></td>
<td><strong>Arith</strong></td>
</tr>
<tr>
<td><strong>Statistics</strong></td>
<td><strong>Pre-Calc</strong></td>
<td><strong>Pre-Calc</strong></td>
<td><strong>Col Alg</strong></td>
<td><strong>Col Alg</strong></td>
<td><strong>Pre-Calc</strong></td>
<td><strong>Col Alg</strong></td>
<td><strong>GE Math</strong></td>
<td><strong>Alg 1</strong></td>
<td><strong>Alg 1</strong></td>
<td><strong>Alg 1</strong></td>
<td><strong>Pre-Alg</strong></td>
<td><strong>Arith</strong></td>
</tr>
<tr>
<td><strong>Algebra 2</strong></td>
<td><strong>Pre-Calc</strong></td>
<td><strong>Pre-Calc</strong></td>
<td><strong>Col Alg</strong></td>
<td><strong>Stats</strong></td>
<td><strong>Pre-Calc</strong></td>
<td><strong>Stats</strong></td>
<td><strong>Alg 2</strong></td>
<td><strong>Alg 1</strong></td>
<td><strong>Alg 1</strong></td>
<td><strong>Alg 1</strong></td>
<td><strong>Pre-Alg</strong></td>
<td><strong>Arith</strong></td>
</tr>
<tr>
<td><strong>Algebra 1</strong></td>
<td><strong>GE Math</strong></td>
<td><strong>GE Math</strong></td>
<td><strong>GE Math</strong></td>
<td><strong>Stats</strong></td>
<td><strong>Stats</strong></td>
<td><strong>Alg 2</strong></td>
<td><strong>Alg 1</strong></td>
<td><strong>Alg 1</strong></td>
<td><strong>Alg 1</strong></td>
<td><strong>Alg 1</strong></td>
<td><strong>Pre-Alg</strong></td>
<td><strong>Arith</strong></td>
</tr>
<tr>
<td><strong>All other</strong></td>
<td><strong>Alg 1</strong></td>
<td><strong>Alg 1</strong></td>
<td><strong>Alg 1</strong></td>
<td><strong>Alg 1</strong></td>
<td><strong>Alg 1</strong></td>
<td><strong>Alg 1</strong></td>
<td><strong>Alg 1</strong></td>
<td><strong>Alg 1</strong></td>
<td><strong>Alg 1</strong></td>
<td><strong>Alg 1</strong></td>
<td><strong>Pre-Alg</strong></td>
<td><strong>Arith</strong></td>
</tr>
</tbody>
</table>

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 course.
### Up to 11th grade transcript available

**Formerly Direct Matriculant**

<table>
<thead>
<tr>
<th>Requirement</th>
<th>GPA ≥ 2.6</th>
<th>GPA ≥ 2.3</th>
<th>GPA ≥ 2.0</th>
<th>GPA ≥ 1.4</th>
<th>GPA &lt; 1.4</th>
</tr>
</thead>
<tbody>
<tr>
<td>No requirement</td>
<td>Transfer</td>
<td>One-below</td>
<td>Two-below</td>
<td>Three-below</td>
<td>Four-below</td>
</tr>
</tbody>
</table>

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.

### Total non-weighted GPA

#### CST scores

### Up to 12th grade transcript available

**Formerly Non-Direct Matriculant**

<table>
<thead>
<tr>
<th>Requirement</th>
<th>GPA ≥ 2.6</th>
<th>GPA ≥ 2.2 and CST ≥ 288</th>
<th>GPA ≥ 1.8 and CST ≥ 268</th>
<th>GPA ≥ 1.7 and CST ≥ 268</th>
<th>GPA &lt; 1.7</th>
</tr>
</thead>
<tbody>
<tr>
<td>12th grade English (C or better)</td>
<td>Transfer</td>
<td>One-below</td>
<td>Two-below</td>
<td>Three-below</td>
<td>Four-below</td>
</tr>
<tr>
<td>12th grade English (D or better)</td>
<td>Transfer</td>
<td>Two-below</td>
<td>Two-below</td>
<td>Three-below</td>
<td>Four-below</td>
</tr>
<tr>
<td>All other</td>
<td>Transfer</td>
<td>Three-below</td>
<td>Three-below</td>
<td>Three-below</td>
<td>Four-below</td>
</tr>
</tbody>
</table>

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
# GPA vs. Self-reported HSGPA

<table>
<thead>
<tr>
<th>HSGPA Level</th>
<th>N</th>
<th>Mean HSGPA</th>
<th>Mean diff.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Actual</td>
<td>Self-reported</td>
</tr>
<tr>
<td>3.50–4.00</td>
<td>599</td>
<td>3.79</td>
<td>3.75</td>
</tr>
<tr>
<td>3.00–3.49</td>
<td>451</td>
<td>3.24</td>
<td>3.23</td>
</tr>
<tr>
<td>2.50–2.99</td>
<td>408</td>
<td>2.81</td>
<td>2.76</td>
</tr>
<tr>
<td>2.00–2.49</td>
<td>265</td>
<td>2.24</td>
<td>2.35</td>
</tr>
<tr>
<td>1.50–1.99</td>
<td>172</td>
<td>1.77</td>
<td>2.04</td>
</tr>
<tr>
<td>0.00–1.49</td>
<td>85</td>
<td>1.03</td>
<td>1.85</td>
</tr>
<tr>
<td>Total</td>
<td>1,980</td>
<td>2.95</td>
<td>3.02</td>
</tr>
</tbody>
</table>

# GPA vs. Self-reported HSGPA

## Self-Reported HSGPA

<table>
<thead>
<tr>
<th>School-Reported HSGPA</th>
<th>A (n = 14,825)</th>
<th>A− (n = 10,547)</th>
<th>B+ (n = 7,795)</th>
<th>B (n = 4,796)</th>
<th>B− (n = 1,649)</th>
<th>C+ (n = 550)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>78%</td>
<td>32%</td>
<td>8%</td>
<td>3%</td>
<td>1%</td>
<td>2%</td>
</tr>
<tr>
<td>A−</td>
<td>17%</td>
<td>45%</td>
<td>34%</td>
<td>14%</td>
<td>4%</td>
<td>2%</td>
</tr>
<tr>
<td>B+</td>
<td>4%</td>
<td>17%</td>
<td>39%</td>
<td>35%</td>
<td>16%</td>
<td>7%</td>
</tr>
<tr>
<td>B</td>
<td>1%</td>
<td>4%</td>
<td>17%</td>
<td>35%</td>
<td>40%</td>
<td>29%</td>
</tr>
<tr>
<td>B−</td>
<td>0%</td>
<td>1%</td>
<td>2%</td>
<td>10%</td>
<td>28%</td>
<td>36%</td>
</tr>
<tr>
<td>C+</td>
<td>0%</td>
<td>0%</td>
<td>1%</td>
<td>2%</td>
<td>9%</td>
<td>19%</td>
</tr>
<tr>
<td>C</td>
<td>3%</td>
<td>3%</td>
<td>3%</td>
<td>3%</td>
<td>3%</td>
<td>28%</td>
</tr>
<tr>
<td>C−</td>
<td>2%</td>
<td>4%</td>
<td>8%</td>
<td>17%</td>
<td>15%</td>
<td>29%</td>
</tr>
</tbody>
</table>

Considering alternative math pathways: is intermediate algebra critical for success in statistics?

- Based on statewide data on actual performance in Statistics in the CCC’s, ASCCC allowed implementation of MMAP rules at local discretion of the college for using algebra as prereq
  - Student who met MMAP rules with less math in high school were more successful than students with more math in high school who didn’t meet MMAP rules


<table>
<thead>
<tr>
<th>Highest Math successfully completed in HS</th>
<th>Any</th>
<th>Higher than Algebra 2</th>
<th>Algebra 2</th>
<th>Algebra 1</th>
<th>Neither prereq met</th>
</tr>
</thead>
<tbody>
<tr>
<td>All students</td>
<td>69%</td>
<td>79%</td>
<td>63%</td>
<td>49%</td>
<td>49%</td>
</tr>
<tr>
<td>MMAP statistics placement (or higher) rules met</td>
<td>77%</td>
<td>80%</td>
<td>72%</td>
<td>60%</td>
<td>74%</td>
</tr>
<tr>
<td>MMAP statistics placement rules not met</td>
<td>48%</td>
<td>47%</td>
<td>50%</td>
<td>44%</td>
<td>41%</td>
</tr>
</tbody>
</table>
Potential additional benefits of multiple measures

- Jump start low cost early alert systems (HSGPA strong predictor)
- 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
  - Multiple measures-placed students often more likely to enroll

![Graph showing enrollments in transfer-level course by students placed in transfer-level by method of placement – Cañada College F2015]
Putting it all together: Multiple Measures and Corequisite Support

Mathematics at Cuyamaca College

- Disjunctive placement (higher of test-based placement or multiple measures based placement – adapted from Phase 1 MMAP recommendations
  - Algebra I with C or better plus HSGPA ≥ 2.8: Statistics with corequisite support
  - Algebra II with C or better and HSGPA ≥ 2.8: College algebra or higher w/corequisite support
  - Other MMAP placement recommendations for higher placement without support

English at Skyline College

- Phased transition over three years
  - Accelerated developmental education at one level below
  - Then MMAP implementation of English placement recommendations and corequisite developmental education courses


For more, please see recent publications by the California Acceleration Project:
Gateway Momentum in Math at Cuyamaca

Completion of transfer-level math before and after change by assessment level

- Three+ Levels Below: 4%, Fall 2013, 56%, Fall 2016
- Two Levels Below: 19%, Fall 2013, 36%, Fall 2016
- One Level Below: 23%, Fall 2013, 66%, Fall 2016
- All: 67%, Fall 2013, 70%, Fall 2016

Completion of transfer-level math before and after change by ethnicity

- Asian: 75%, Fall 2013, 76%, Fall 2016
- African American: 55%, Fall 2013, 69%, Fall 2016
- Hispanic: 65%, Fall 2013, 69%, Fall 2016
- White: 33%, Fall 2013, 16%, Fall 2016
- All: 33%, Fall 2013, 15%, Fall 2016

Legend:
- Fall 2013 Cohort (Transfer Math in 2 years)
- Fall 2016 Cohort (Transfer math completion 1 semester w/support)
Gateway Momentum in English at Skyline

**English placement by level and cohort**

- **Transfer Level**: 80% (Fall 2016) vs. 47% (Fall 2013)
- **One Level Below**: 40% (Fall 2016) vs. 17% (Fall 2013)
- **Two Levels Below**: 14% (Fall 2016) vs. 3% (Fall 2013)

**Successful rate by cohort and course type**

- **Fall 2013 Transfer Level**: 67%
- **F2015-S2017 (traditional)**: 65%
- **F2015-2017 (w/support)**: 69%
How can we give students the best chance of completing transfer-level English within a year?

San Diego Mesa College

<table>
<thead>
<tr>
<th>Starting Placement</th>
<th>One-Year Completion of College English Fall 16-Spr 17</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Transfer-Level English with Corequisite (N=300)</strong></td>
<td>74%</td>
</tr>
<tr>
<td>3-unit course linked to 2-unit corequisite for students with who traditionally have begun 1-2 levels below HS GPA below 2.6 (one semester success rate)</td>
<td></td>
</tr>
<tr>
<td><strong>One level below transfer (N= 1180)</strong></td>
<td>39%</td>
</tr>
<tr>
<td><strong>Two levels below transfer (N=67)</strong></td>
<td>13%</td>
</tr>
</tbody>
</table>

If allowed to enroll directly in stand-alone transfer-level classes, statewide students:

- with a HS GPA below 1.9 have a 43% average success rate
- with a HS GPA from 1.9 to 2.6 have a 59% average success rate

From Serpas, S (May 4, 2018): Responding to AB 705 and Supporting Students in English/Reading: Concurrent Support Courses for College Composition. Presentation to AB705 Workshop, Bakersfield College.
Other resources for combination

  - Recent publications by the California Acceleration Project: [accelerationproject.org](accelerationproject.org)

- 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](bit.ly/CSUMultipleMeasures)

- CCC adoption of full scale combination of multiple measures and corequisite support coming very soon – AB705: ([bit.ly/AB705MM](bit.ly/AB705MM) and [assessment.cccco.edu](assessment.cccco.edu))
  - Maximize probability of completion of college-level coursework in 1 year
  - No developmental education without evidence it improves outcomes