ACKNOWLEDGEMENTS

ADVISORY CIRCLE

3CSN
Career Ladders Project
CORE Districts
Education Insights Center
Educational Results Partnership
PACE
WestEd

FUNDERS

The James Irvine Foundation
College Futures Foundation
California Education Policy Fund
“Decisions about math requirements and expectations will have a major impact on the academic opportunities of millions of students nationally.”
COLLEGE MATH PLACEMENT: The California Context

PAMELA BURDMAN
Higher Education Policy Analyst
## CHALLENGE: Developmental Placements

### NOT PROFICIENT

<table>
<thead>
<tr>
<th>Institution</th>
<th>Percentage of Students</th>
<th>Total Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>California Community Colleges</td>
<td>~ 85 percent</td>
<td>~ 234,000</td>
</tr>
<tr>
<td>California State University</td>
<td>~ 33 percent</td>
<td>~ 20,000</td>
</tr>
<tr>
<td>University of California</td>
<td>unknown</td>
<td>unknown</td>
</tr>
<tr>
<td></td>
<td>(~ 18 percent UC-Riverside)</td>
<td>(749 students UCR)</td>
</tr>
</tbody>
</table>
OUTCOMES: Developmental Math

**CCC**
- About 30 percent of developmental math students complete a “gatekeeper” math class required for transferring. (AA students don’t require transfer-level math.)
- (Alternative pathways for non-math-intensive majors have far better gatekeeper completion rates, but only some are accepted for transfer.)

**CSU**
- About 5 percent of Cal State students leave un-remediated (in English, math, or both) and 2 percent of students are permitted to re-enroll for a second year even though they are un-remediated.
FOCUS FOR TODAY

Placing More Students Into College-Level Math

Ensuring Students Have Quantitative Skills for Success in College and Life

Improving College Readiness and Completion
STATUS QUO:
UC Admissions & Placement

Selective Admissions:
+ Top 1/8 of high school grads
+ Minimum high school of GPA or 3.0
+ C or better in a-g courses (Includes: Algebra 1, Geometry, Algebra 2)
+ Sufficiently high SAT or ACT scores

Presumed Readiness:
At most UC campuses students are not required to take placement exams unless they wish to enroll in calculus without taking a prerequisite course.
STATUS QUO:
CSU Admissions Standards

+ Moderately Selective Admissions:
  – Top 1/3 of high school grades
  – Minimum GPA of 2.0
  – Completion of a-g courses (Includes: Algebra 1, Geometry, Algebra 2)
  – High school diploma or equivalent
# DEV MATH PLACEMENT IN THE CSU: Assessed Readiness Statewide

## ENTRY LEVEL MATHEMATICS EXAMINATION (ELM)

<table>
<thead>
<tr>
<th>EXEMPT FROM ELM – 51%</th>
<th>REQUIRED TO TAKE ELM – 49%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SAT math</strong> (550 or above)</td>
<td><strong>Pass ELM</strong> (score ≥ 50) 16%</td>
</tr>
<tr>
<td><strong>ACT math</strong> (23 or above)</td>
<td><strong>Not proficient</strong> (score &lt; 50) 33%</td>
</tr>
<tr>
<td><strong>AP Statistics</strong> (3 or above)</td>
<td></td>
</tr>
<tr>
<td><strong>AP Calculus</strong> (3 or above)</td>
<td></td>
</tr>
<tr>
<td><strong>Early Assessment Program</strong></td>
<td></td>
</tr>
<tr>
<td>•EAP test (ready)</td>
<td></td>
</tr>
<tr>
<td>•Conditionally ready + 12th grade math</td>
<td></td>
</tr>
<tr>
<td><strong>Transferable college math course</strong></td>
<td></td>
</tr>
<tr>
<td>•C or better in approved course</td>
<td></td>
</tr>
</tbody>
</table>

Source: CSU Analytic Studies Proficiency Reports, 2014 data
STATUS QUO:
CCC Admissions Standards

OPEN ADMISSIONS:
- Top 100% of students.
- High school graduation requires two years of mathematics, including Algebra 1
- High school graduation is not required for admission.
## Placement in the CCC: Assessed Readiness by College

<table>
<thead>
<tr>
<th>Until Now</th>
<th>Going Forward</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Multiple Tests</strong></td>
<td><strong>Single Test</strong></td>
</tr>
<tr>
<td>ACCUPLACER (49%)</td>
<td>CCCAssess</td>
</tr>
<tr>
<td>MDTP (35%)</td>
<td></td>
</tr>
<tr>
<td>Compass (13%)</td>
<td></td>
</tr>
<tr>
<td>Self-assessment (4%)</td>
<td></td>
</tr>
<tr>
<td>Locally developed (7%)</td>
<td></td>
</tr>
<tr>
<td><strong>Cut Scores: Vary by college</strong>&lt;br&gt;(In 2010 ACCUPLACER college-level score ranged from 43 to 63.)</td>
<td><strong>Cut Scores: Vary by college</strong>&lt;br&gt;(may include enhanced multiple measures)</td>
</tr>
<tr>
<td><strong>Below transfer-level: ~ 85%</strong></td>
<td><strong>?????</strong></td>
</tr>
</tbody>
</table>

Research on community college placement tests illustrates their limitations.

Nationally, community college students are 19 percent more likely to require remedial math courses than university students with similar records.

Research on SAT tests suggests similar limitations.
### MISPLACEMENT: Reasons & Responses

<table>
<thead>
<tr>
<th>Reasons</th>
<th>Responses</th>
<th>CA Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor alignment of curriculum</td>
<td>Re-design tests/align curriculum</td>
<td>CCCAssess, SBAC / CAASPP / EAP</td>
</tr>
<tr>
<td>Over-reliance on tests for placing students</td>
<td>De-emphasize tests</td>
<td>CCC multiple measures CCC differentiated placement</td>
</tr>
<tr>
<td>Need for better HS preparation</td>
<td>Strengthen high school math courses</td>
<td>CSU EAP/senior-year courses</td>
</tr>
</tbody>
</table>

(See Burdman, 2012, *Where to Begin?*)
RECOMMENDATION: Intersegmental Dialogue

"Intersegmental conversations are needed to deepen alignment across segments in math education."
TRADEOFFS & TENSIONS

+ System-wide consistency vs. institutional autonomy
  (also system autonomy)

+ Efficiency vs. effectiveness

+ Supporting student progression vs. enforcing standards

(See: Jaggars, Hodara, 2013. *The Opposing Forces That Shape Developmental Education*)
FOR MORE INFORMATION:

**DEGREES OF FREEDOM 1:**
Diversifying Requirements for College Readiness and Graduation

**DEGREES OF FREEDOM 2:**
Varying Routes to Math Readiness and the Challenge of Intersegmental Alignment

**DEGREES OF FREEDOM 3:**
Probing Placement Policies at California Colleges and Universities

**PRIOR LEARNINGWORKS REPORT:**

**CHANGING EQUATIONS:**
How Community Colleges are Re-Thinking College Readiness in Math

**ALSO SEE (BY PAMELA BURDMAN):**

**WHERE TO BEGIN?**
The Evolving Role of Placement Exams for Students Starting College

www.edpolicyinca.org
www.LearningWorksCA.org

PAMELA BURDMAN
info@changingequations.org
PLACEMENT TESTS:
What Do We Know About Efficacy and Equity?

OLGA RODRIGUEZ
Public Policy Institute of California
Community College Research Center
Columbia University

TATIANA MELGUIZO
University of Southern California

TERRENCE WILLETT
Cabrillo College
Research and Planning Group
Improving the Accuracy of Remedial Placement

Olga Rodriguez, Ph.D.
Research Fellow, PPIC
Research Affiliate, CCRC

Funding for this research was provided by the Bill & Melinda Gates Foundation
Focus on the accuracy of the assignment mechanism—placement exam scores—which determine whether someone receives remediation (Scott-Clayton, 2012; Belfield & Crosta, 2012; Scott-Clayton, Crosta & Belfield, 2014).

Using administrative data and a rich predictive model of college grades, this study ask the following questions:

- How accurately do placement exams distinguish between those likely/unlikely to succeed?
- How much could assignment accuracy be improved by incorporating information from high school transcripts into the screening process?
What is “placement accuracy”?  

<table>
<thead>
<tr>
<th>Placed into remediation</th>
<th>Would succeed at college-level</th>
<th>Would not succeed at college-level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Placed into college-level</td>
<td>Accurately placed</td>
<td>Over-placed</td>
</tr>
<tr>
<td>Placed into college-level</td>
<td>Accurately placed</td>
<td>Over-placed</td>
</tr>
</tbody>
</table>

- We can’t directly observe potential outcomes in the top row, but we can:
  - Estimate relationship between test scores & outcomes for those placed directly into college level using logistic regression, then
  - Predict outcomes for those placed into remediation
  - Use predicted outcomes to simulate overall accuracy & error rates under different placement rules

- Focus on placement error rates:
  - **Severe Under-Placement**: Proportion of students predicted to earn a B or better in college-level but instead placed into remediation
  - **Severe Over-Placement**: Proportion of students placed in to college-level but predicted to fail there
  - **Severe Error Rate**: Combines the severe under-placement rate with the severe under-placement rate
Findings
Figure 2 (Schematic). Percent Succeeding in College-Level Math, by Math Test Score

- [A] Accurately Placed in Remediation
- [B] Severely Underplaced
- [C] Severely Overplaced
- [D] Accurately Placed in College Level
- [E] Severely Overplaced
- [F] C or better
- [G] B or better
- [H] Pass

Math Placement Test Score (Cutoff=42)
<table>
<thead>
<tr>
<th>Student Ability</th>
<th>Developmental</th>
<th>College Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Developmental</td>
<td>✔️</td>
<td>Over-placed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(SWCCS: Math – 6%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(LUCCS: Math – 5%)</td>
</tr>
<tr>
<td>College Level</td>
<td>Under-placed</td>
<td>✔️</td>
</tr>
<tr>
<td></td>
<td>(SWCCS: Math – 28%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(LUCCS: Math – 19%)</td>
<td></td>
</tr>
</tbody>
</table>

- Resulting Severe Error Rates:
  - SWCCS: 34% = 28% + 6%
  - LUCCS: 24% = 19% + 5%
Using high school achievement can result in fewer misplacements

Predicted Severe Error Rate (Sum of Under- and Over-Placements) and College-Level Course Success by Assessment Method

<table>
<thead>
<tr>
<th>Assessment Method</th>
<th>LUCCS</th>
<th>SWCCS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severe Error Rate</td>
<td>24%</td>
<td>23%</td>
</tr>
<tr>
<td></td>
<td>21%</td>
<td>21%</td>
</tr>
<tr>
<td></td>
<td>34%</td>
<td>34%</td>
</tr>
<tr>
<td></td>
<td>27%</td>
<td>27%</td>
</tr>
<tr>
<td></td>
<td>27%</td>
<td>27%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Assessment Method</th>
<th>LUCCS</th>
<th>SWCCS</th>
</tr>
</thead>
<tbody>
<tr>
<td>College-Level Success Rate (C or Better)</td>
<td>68%</td>
<td>70%</td>
</tr>
<tr>
<td></td>
<td>72%</td>
<td>72%</td>
</tr>
<tr>
<td></td>
<td>76%</td>
<td>76%</td>
</tr>
<tr>
<td></td>
<td>89%</td>
<td>88%</td>
</tr>
</tbody>
</table>
Case Study: Reforms to Assessment and Placement in the Virginia Community College System
The Virginia Developmental Math Reform

- Redesigned developmental math curricula into one-credit modules.
- Introduced a customized diagnostic assessment to place students into individual modules.
After the introduction of the VPT-Math:

- College Math placement more than doubled
- College Math enrollment more than doubled
- Among those who placed and enrolled, average pass rates declined from 69% to 62%
- But overall, increasing access to college math resulted in more than twice as many students successfully completing college math within one-year

![Bar Chart]

Pre-Reform, Fall 2010
- Placement: 18%
- Enrollment: 11%
- Completion: 7%

Post-Reform, Fall 2012
- Placement: 43%
- Enrollment: 29%
- Completion: 18%
For more information:

Please visit us on the web at

http://ccrc.tc.columbia.edu,
where you can download presentations, reports, 
CCRC Briefs, and sign-up for news announcements.

Community College Research Center
Institute on Education and the Economy, Teachers College, Columbia University
525 West 120th Street, Box 174, New York, NY 10027
E-mail: ccrc@columbia.edu
Telephone: 212.678.3091

CCRC is funded in part by: Alfred P. Sloan foundation, Bill & Melinda Gates Foundation, Lumina Foundation for Education, The Ford Foundation, National Science Foundation (NSF), Institute of Education Sciences of the U.S. Department of Education
LOST IN TRANSITION
DOCUMENTED PROBLEMS WITH ASSESSMENT AND PLACEMENT POLICIES AND PRACTICES IN DEVELOPMENTAL MATH SEEM TO DISPROPORTIONALLY AFFECT STUDENTS OF COLOR

Testing and Beyond: The Future of College Math Placement in California
Learning Works
Oakland, November 10, 2015

Tatiana Melguizo
Associate Professor, University of Southern California
melguizo@usc.edu

This research was funded by a grant from the U.S. Department of Education’s Institute of Education Sciences (IES).
Problem Statement

- Every year about 80 percent of community college students in California are placed into preparatory mathematics. This percentage is higher than the national average.

- Community college students have widely varying initial skills levels.

- Colleges have to offer classes to meet these levels and have to keep heterogeneity in the classrooms manageable.

- Placing students incorrectly can reduce the likelihood that students succeed.
Literature on Inequities in Placement by Race and Ethnicity

- Potential explanations for the over-representation of students of color in basic skills courses
  - Students of color on average attend lower-quality high schools (Fryer & Levitt, 2004; Ladson-Billings & Tate, 1995)
  - Students lack awareness of the A&P process and consequences of performance on tests (Bunch, Endris, Panayotova, Romero, & Llosa, 2011; Venezia, Bracco, & Nodine, 2010)
  - Commercially developed tests are not placing students correctly (Scott-Clayton, Crosta & Belfield, 2014; Melguizo et al., 2015; Ngo & Melguizo, 2015)
Setting

Large Urban Community College District - a natural laboratory

- Diverse student population that varies by college
- Nine colleges with 130,000 plus students
- “Common data system”
- Large number of observations.
- Presumption of representativeness—likely to capture the wide variation across community colleges in the United States.
Developmental Math Sequence


Developmental Math
Remediation needs of LUCCD students

- 6% Transfer
- 14% Intermediate Algebra
- 22% Elementary Algebra
- 24% Pre-algebra
- 31% Arithmetic
- 3% Below Arithmetic
How are community college students assessed and placed in math at LUCCD?

1. Student enters the assessment and placement office.
2. Student fills out requisite paperwork.
3. He or she either takes the computer adaptive test (ACCUPLACER or COMPASS) or the diagnostic placement test (MDTP).
4. He or she fills out the background questionnaire which is used to award additional multiple measure points.
5. Students’ scores on the assessment sub-test are combined with any points they are awarded via multiple measures.
6. Students are placed into a level of math based on their adjusted score.
7. Students decide whether or not to enroll.
50% of students chose a test that could place them in a course below the last math course they passed in high school.

Diagnostic Tests such as MDTP allow students to choose the sub-test to take instead of using a branching system as commercially developed tests.

We analyzed the data for students in one community college and found that over 50% chose a sub-test which could place them at a lower-level math than the one completed in high school.
A substantial proportion of students are placed in developmental math courses below the last course taken in high school.

### College Math Level Placement vs. Highest Math Level Passed Prior to College

**Colleges B, D, F, G, H**  

<table>
<thead>
<tr>
<th>Race</th>
<th>Higher than Prior Passed</th>
<th>Same as Prior Passed</th>
<th>Lower than Prior Passed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asian</td>
<td>28.1</td>
<td>49.9</td>
<td>23.4</td>
</tr>
<tr>
<td>Black</td>
<td>28.1</td>
<td>30.7</td>
<td>33.4</td>
</tr>
<tr>
<td>Hispanic</td>
<td>14.2</td>
<td>54.4</td>
<td>31.4</td>
</tr>
<tr>
<td>White</td>
<td>29.1</td>
<td>37.1</td>
<td>33.7</td>
</tr>
<tr>
<td>Other</td>
<td>23.4</td>
<td>43.2</td>
<td>33.4</td>
</tr>
</tbody>
</table>

**Note.** Source: District's student background questionnaire and administrative data (Highest level math completed with a C or better?). Assumes California math sequence order (www.cde.ca.gov/be/st/ss/documents/mathstandards.pdf): Algebra I, Geometry, Algebra II, Trigonometry, Calculus. \( \chi^2 (8, n = 42334) = 1296, p < .001 \) (Pearson's \( \chi^2 \) test for independence among categories).
There is substantial variation by college

College Math Level Placement vs. Highest Math Level Passed Prior to College

Note. Source: District’s student background questionnaire and administrative data (Highest level math completed with a C or better?). Assumes California math sequence order (www.cde.ca.gov/be/st/ss/documents/mathstandards.pdf): Algebra I, Geometry, Algebra II, Trigonometry, Calculus. \( \chi^2 (8, n = 13371) = 387, p < .001 \) (Pearson’s \( \chi^2 \) test for independence among categories).

College H

Note. Source: District’s student background questionnaire and administrative data (Highest level math completed with a C or better?). Assumes California math sequence order (www.cde.ca.gov/be/st/ss/documents/mathstandards.pdf): Algebra I, Geometry, Algebra II, Trigonometry, Calculus. \( \chi^2 (8, n = 8264) = 83, p < .001 \) (Pearson’s \( \chi^2 \) test for independence among categories).
In addition to low placements over 30% of the non-compliers attempted a lower level course.

**Attempted Math Level Among Placement Non-Compliers**

**Colleges B, D, F, G, H**

<table>
<thead>
<tr>
<th></th>
<th>Higher than Placed</th>
<th>Lower than Placed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asian</td>
<td>63.9</td>
<td>36.1</td>
</tr>
<tr>
<td>Black</td>
<td>65.2</td>
<td>34.8</td>
</tr>
<tr>
<td>Hispanic</td>
<td>66.4</td>
<td>33.6</td>
</tr>
<tr>
<td>White</td>
<td>58.6</td>
<td>41.4</td>
</tr>
<tr>
<td>Other</td>
<td>66.1</td>
<td>33.9</td>
</tr>
</tbody>
</table>

Note. Source: District’s student background questionnaire and administrative data. Based on first math enrollment after assessment. "Higher than placed" if student enrolled in a higher level than placed. "Lower than placed" if student enrolled in a lower level than placed. Vast majority of students were in compliance with placement. Large variation among colleges. Low statistical significance level resulting from small sample size: $\chi^2(4, n = 3385) = 12$, $p < .05$ (Pearson’s $\chi^2$ test for independence among categories).
Substantial variation by college that might be related to counseling

College G

<table>
<thead>
<tr>
<th></th>
<th>Higher than Placed</th>
<th>Lower than Placed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asian</td>
<td>22.6</td>
<td>77.4</td>
</tr>
<tr>
<td>Black</td>
<td>23.8</td>
<td>76.2</td>
</tr>
<tr>
<td>Hispanic</td>
<td>18.9</td>
<td>81.1</td>
</tr>
<tr>
<td>White</td>
<td>14.3</td>
<td>85.7</td>
</tr>
<tr>
<td>Other</td>
<td>21.7</td>
<td>78.3</td>
</tr>
</tbody>
</table>

College H

<table>
<thead>
<tr>
<th></th>
<th>Higher than Placed</th>
<th>Lower than Placed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asian</td>
<td>50.5</td>
<td>49.5</td>
</tr>
<tr>
<td>Black</td>
<td>45.3</td>
<td>54.7</td>
</tr>
<tr>
<td>Hispanic</td>
<td>30.9</td>
<td>69.1</td>
</tr>
<tr>
<td>White</td>
<td>43.4</td>
<td>56.6</td>
</tr>
<tr>
<td>Other</td>
<td>47.6</td>
<td>52.4</td>
</tr>
</tbody>
</table>

Note. Source: District’s student background questionnaire and administrative data. Based on first math enrollment after assessment. “Higher than placed” if student enrolled in a higher level than placed. “Lower than placed” if student enrolled in a lower level than placed. Vast majority of students were in compliance with placement. Large variation among colleges. Low statistical significance level resulting from small sample size: $\chi^2(4, \ n = 843) = 2$, $p = .8200000000000001$ (Pearson’s $\chi^2$ test for independence among categories).
There were no differences in courses attempted of non-compliers by gender.

**Attempted Math Level Among Placement Non–Compliers**

Colleges B, D, F, G, H  

- **Male**
  - Higher than Placed: 63.2%
  - Lower than Placed: 36.8%

- **Female**
  - Higher than Placed: 65.6%
  - Lower than Placed: 34.4%

---

Source: District's student background questionnaire and administrative data. Based on first math enrollment after assessment. "Higher than placed" if student enrolled in a higher level than placed. "Lower than placed" if student enrolled in a lower level than placed. Vast majority of students were in compliance with placement. Large variation among colleges. Low statistical significance level resulting from small sample size: $\chi^2(1, n = 3383) = 2, \ p = .15$ (Pearson's $\chi^2$ test for independence among categories).
The inclusion of multiple measures can increase access w/out decreasing student success (Ngo & Kwon, 2015)

<table>
<thead>
<tr>
<th>College</th>
<th>Academic Background</th>
<th>College Plans</th>
<th>Motivation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HS Diploma/GED</td>
<td>HS GPA</td>
<td>Prior Math</td>
</tr>
<tr>
<td>A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>E</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>G</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>H</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>J</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>
Findings

- Only 6% of the students benefitted from multiple measures at the LUCCD
- Major benefits for African American and Latino students who could enroll in higher-level math courses
- No evidence that “boosted” students were less likely to complete the course
  - Performed at similar levels to similar-scoring and higher-scoring peers
Conclusions

- The state’s community colleges are moving in the right direction in terms of using high school transcript information to inform the assessment and placement policies and practices in developmental math.

- California colleges have been and can continue to lead the way in terms of effectively using “multiple measures” to improve placement in particular for students of color.
Other Relevant Work


Policy Briefs and Working Papers available at:
THANK YOU!

Questions
Tatiana Melguizo
melguizo@usc.edu

Enhanced Multiple Measures for Math Placement

Terrence Willett
Director of Planning and Research
Cabrillo College
November 10, 2015
\[ y = f(x) \]
Level of and Success (C or better) in First College Math for Students whose Last High School Course was Algebra 2 with Grade of B or Better (n=35,806)

- Pre-Algebra/Elementary Algebra (back one or more levels)
  - Percent enrolled in course at community college: 24%
  - Success rate in course at community college: 67%
  - URM: 69%
  - Male: 37%
  - CST: 275
  - Acc: 57

- Intermediate Algebra (repeating same level)
  - Percent enrolled in course at community college: 37%
  - Success rate in course at community college: 63%
  - URM: 58%
  - Male: 42%
  - CST: 301
  - Acc: 84

- Transfer Level (moved up 1+ levels)
  - Percent enrolled in course at community college: 41%
  - Success rate in course at community college: 65%
  - URM: 44%
  - Male: 49%
  - CST: 334
  - Acc: 97

Level of First Community College (CC) Course:
- Blue bar: Percent enrolled in course at community college
- Orange bar: Success rate in course at community college
MMAP Project Overview

• Collaborative effort of CCCCOC Common Assessment Initiative (CAI) designed to develop, pilot, and assess implementation of placement tool using multiple measures through joint efforts of Cal-PASS Plus, RP Group and now 28 CCCs

• Develop multiple measures models for English and Mathematics and, in 2015-2016, Reading and ESL

• Identify, analyze and validate multiple measures data, including high school transcript data, non cognitive variable data, and self-reported HS transcript data

• Engage pilot colleges to conduct local replications, test models and pilot their use in placement, and provide feedback

• bit.ly/MMAP2015
Tests Predict Tests, Grades Predict Grades*
Simple correlations with community college success rates (grade of C or better)

<table>
<thead>
<tr>
<th>Math</th>
<th>11th Grade GPA</th>
<th>Accuplacer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transfer-STEM</td>
<td>0.24</td>
<td>0.19</td>
</tr>
<tr>
<td>Transfer-Stats</td>
<td>0.31</td>
<td>0.16</td>
</tr>
<tr>
<td>Transfer-LAM</td>
<td>0.26</td>
<td>0.09</td>
</tr>
<tr>
<td>1 level below</td>
<td>0.28</td>
<td>0.21</td>
</tr>
<tr>
<td>2 levels below</td>
<td>0.26</td>
<td>0.11</td>
</tr>
<tr>
<td>3 levels below</td>
<td>0.23</td>
<td>0.11</td>
</tr>
<tr>
<td>4 levels below</td>
<td>0.19</td>
<td>0.05</td>
</tr>
</tbody>
</table>

* with some caveats for higher level math
Statistics Tree – Direct Matriculants

- If HS_11_GPA_CUM >= 3:
  - Yes: 0.88, 30%
  - No:
    - If HS_11_GPA_CUM >= 2.3: 0.4, 12%
      - If PRE_CALC_UP11_C >= 0.5:
        - No: 0.49, 10%
        - Yes: 0.58, 19%
      - Yes: 0.7, 4%
    - Yes: 0.7, 16%
  - Yes: 0.81, 8%
Transfer Level Placement Rules for Non-Direct Matriculants
(delay of at least one year between high school and college)

Statistics
- Cumulative high school GPA through 11th grade ≥ 3.0
  - OR
- Cumulative high school GPA through 11th grade ≥ 2.3
  AND C or better in high school PreCalculus

Pre-Calculus
- HS GPA≥3.3
  - OR
- HS GPA≥3 AND Algebra II CST≥=340
Applying Multiple Measures

Disjunctive Placement
Test score
OR
High School Transcript
OR
AP score
OR
EAP

 Conjunctive Placement
Test score
AND
(High School Transcript
OR
AP score
OR
EAP)
Transfer Level Placement

- **English**
  - Current: 38% (n=103,510)
  - Disjunctive MM: 61%

- **Math**
  - Current: 31% (n=143,253)
  - Disjunctive MM: 42%
Transfer Level Math Placement

- **Afr Am**: Current - 15%, Disjunctive MM - 22%
- **Latino**: Current - 21%, Disjunctive MM - 32%
- **Asian**: Current - 41%, Disjunctive MM - 53%
- **White**: Current - 51%, Disjunctive MM - 65%
For questions

Terrence Willett
Director of Planning and Research
Cabrillo Community College
terrence@cabrillo.edu

Multiple Measures Assessment Project
http://rpgroup.org/projects/multiple-measures-assessment-project/pilot-college-resources

Common Assessment Initiative
http://cccassess.org/
MATH READINESS: Seeking a Shared Definition

KATHY BOOTH
WestEd

DISCUSSANTS:
EVELYN YOUNG SPATH
CSU-Bakersfield

BRUCE YOSHIWARA
Pierce College (retired)
Alignment of Math Competencies

WestEd Analysis of the Common Core, ICAS, CSU, and CCC Standards

November 2015
Comparing Descriptions of Standards and Competencies

- Common Core State Standards Clusters, by Grade
- Intersegmental Committee for the Academic Senate (ICAS) Statements of Competencies
- California State University Entry Level Mathematics Examination (ELM) Topics List
- California Community Colleges’ Common Assessment Initiative (CCCAssess) Assessment Competencies
Degrees of Consistency

Pre-High School
- Common Core, ELM, and CCCAssess focus on the same core set of standards
- Both college tests are more focused on basic math skills and number sense than ICAS

High School
- Common Core, ICAS, ELM, and CCCAssess all put a heavy emphasis on algebra and functions
- Differences emerge in geometry and statistics
Areas of Inconsistency

Geometry
• Common Core and ICAS focus on a broader range of topics than the college tests
• ELM tests geometry concepts in more contexts than CCCAssess (geometric theorems in conjunction with the coordinate plane and algebra, compared to application of volume formulas and trigonometry)

Statistics
• Common Core and ICAS focus on a broader range of topics than the college tests
• The statistics standards for ICAS, ELM, and CCCAssess do not align
• ELM tests more statistics concepts than CCCAssess
Ongoing Discussion

CCCAssess

- The test is still under development

ELM

- CSU plans to re-evaluate the ELM beginning in 2016
- CSU also plans to update its quantitative reasoning requirement over the next 2-3 years
BREAKOUT DISCUSSIONS: Math Readiness

ORANGE | toward entrance
Facilitator: KATHY BOOTH
WestEd

GREEN | toward windows
Facilitator: ELISHA SMITH ARRILLAGA
Career Ladders Project
ENHANCING PLACEMENT: Using High School Transcripts

LONG BEACH
ROBERT TAGORDA
Long Beach Unified School District

LAUREN SOSENKO
Long Beach City College

BAKERSFIELD
VICKIE SPANOS
Kern High School District

JANET FULKS
Bakersfield College
Promise Pathways: Multiple Measures at Long Beach City College

Lauren Sosenko
Director of Institutional Research
lsosenko@lbcc.edu

November 10, 2015
LBCC’s Promise Pathways: Background

Promise Pathways is a first year experience program for students matriculating directly from high school

• Alternative assessment using multiple measures
• Prescriptive scheduling emphasizing full-time enrollment and early completion of basic skills courses
• Priority registration
• Achievement coaches

Note: Students may now get alternative placement without signing up for Promise Pathways
Alternative Assessment

• Analysis revealed high school performance dramatically predicts success in college courses.

• Traditional placement ignored high school performance relying only on standardized assessment exam (Accuplacer).

• Devised a new assessment model that leveraged the predictive utility of multiple measures of student achievement.
Built upon partnerships
Critical faculty voice
Math Placement Criteria

Math alternative placement criteria has stayed relatively stable over the four cohort years. Students’ alternative placement is based upon:

- high school GPA,
- highest-level math course in high school,
- grade in the highest-level math course, and
- California State Test (CST) proficiency level

*Used highest score: Accuplacer assessment results or the alternative placement score*
% of all 1st time intent to complete students participating in alternative placement by fall term

- Fall 12 (n=2,700)
  - Promise Pathways: 35%
  - Other intent to complete 1st time students: 65%

- Fall 13 (n=2,982)
  - Promise Pathways: 44%
  - Other intent to complete 1st time students: 56%

- Fall 14 (n=2,989)
  - Promise Pathways: 54%
  - Other intent to complete 1st time students: 46%
Transfer math placements are slightly rising
Number of students moved via alternative placement by the number of semesters in math

<table>
<thead>
<tr>
<th>Number of Semesters</th>
<th>Cohort 1</th>
<th>Cohort 2</th>
<th>Cohort 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>119</td>
<td>90</td>
<td>165</td>
</tr>
<tr>
<td>1</td>
<td>198</td>
<td>184</td>
<td>263</td>
</tr>
</tbody>
</table>
How can we best study the Promise Pathways outcomes?

Matched comparison group looks like Promise Pathways group

- LBUSD students from fall 2011, 2010, and 2009
- HS GPA
- English CST proficiency
- Algebra II in HS
- # of units attempted at LBCC during 1st term (at least 9 units)

Cohort 1 – 785  
Cohort 2 – 891  
Cohort 3 – 998

Only LBUSD students due to data availability
Promise Pathways students successfully complete transfer-level math at similar rates as similar students.

- Promise Pathways: 73% (n=348)
- Matched Cohort: 75% (n=259)
% Promise Pathway and matched comparison students who successfully completed transfer-level courses in math and English within three years.
% of Promise Pathway and matched comparison students who successfully completed transfer-level courses in math within three years by ethnicity

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Promise Pathway</th>
<th>Matched Comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asian</td>
<td>28%</td>
<td>26%</td>
</tr>
<tr>
<td>Black/African American</td>
<td>15%</td>
<td>10%</td>
</tr>
<tr>
<td>Hispanic/Latino</td>
<td>23%</td>
<td>14%</td>
</tr>
<tr>
<td>White</td>
<td>40%</td>
<td>24%</td>
</tr>
</tbody>
</table>
By the end of their 3rd year, Pathway students are more successful in achieving milestones than similar students.
SEIZING THE 12TH GRADE:
Supporting Math Readiness

EAP SENIOR YEAR MATH COURSE

JOHN MONTGOMERY
Roseville Joint Union High School District

PAUL NEAL
Sierra College

RAVIN PAN
Sacramento State University

SOUTH LOS ANGELES (SLAM) PROJECT

ROBERT BOSLEY
Santee Education Complex, LAUSD

KRISTIN WEBSTER
CSU Los Angeles
EAP Senior Year Mathematics Course

• Origin
• Content
  Problem solving
  Linear
  Quadratic
  Systems of Equations and Inequalities
  Exponential
  Logarithm
  Absolute Value and Piecewise
  Math of Finance
• Scaling Up
<table>
<thead>
<tr>
<th>Participating District</th>
<th>Participating High School</th>
</tr>
</thead>
<tbody>
<tr>
<td>Placer Union High</td>
<td>Del Oro High School</td>
</tr>
<tr>
<td>Western Placer</td>
<td>Lincoln High School</td>
</tr>
<tr>
<td>Roseville Joint Union</td>
<td>Antelope Creek High School</td>
</tr>
<tr>
<td></td>
<td>Granite Bay High</td>
</tr>
<tr>
<td></td>
<td>Oakmont High</td>
</tr>
<tr>
<td></td>
<td>Roseville High</td>
</tr>
<tr>
<td>Rocklin Unified</td>
<td>Woodcreek High</td>
</tr>
<tr>
<td></td>
<td>Whitney High School</td>
</tr>
</tbody>
</table>
High School EAP Data

Students who took the EAP Math course and enrolled at Sierra College:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Placer Union`</td>
<td>22</td>
<td>17</td>
</tr>
<tr>
<td>Rocklin Unified</td>
<td>5</td>
<td>19</td>
</tr>
<tr>
<td>Roseville Joint Union</td>
<td>1</td>
<td>22</td>
</tr>
<tr>
<td>Western Placer Unified</td>
<td>5</td>
<td>2</td>
</tr>
</tbody>
</table>
## Preliminary Outcomes Data

### Course Success Rate at Sierra College

<table>
<thead>
<tr>
<th></th>
<th>STEM Math</th>
<th>Non-STEM Math</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2013-14</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EAP Course Completers</td>
<td>50%</td>
<td>64%</td>
<td>56%</td>
</tr>
<tr>
<td>Non-EAP Students</td>
<td>55%</td>
<td>74%</td>
<td>61%</td>
</tr>
<tr>
<td><strong>2014-15</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EAP Course Completers</td>
<td>64%</td>
<td>73%</td>
<td>69%</td>
</tr>
<tr>
<td>Non-EAP Students</td>
<td>55%</td>
<td>74%</td>
<td>61%</td>
</tr>
<tr>
<td><strong>Summer ‘15</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EAP Course Completers</td>
<td>67%</td>
<td>88%</td>
<td>79%</td>
</tr>
<tr>
<td>Non-EAP Students</td>
<td>60%</td>
<td>76%</td>
<td>66%</td>
</tr>
</tbody>
</table>

STEM math course = College Algebra, Trigonometry, Int Algebra, Pre-Calculus, Calculus I or II

Non-STEM math course = Statistics, Concepts of Mathematics, Modern Business Mathematics

(italicized courses were added in year two)
Persistence Rates at Sierra College

- On average, students enrolled in a course at Sierra College had a 74% persistence rate (i.e. persistence from first to second semester).

- Students who completed the EAP Math course and enrolled in a math course at Sierra College had a 95% persistence rate.

- Students who completed the EAP Math course and did not enroll in a math course, but still enrolled in a course at Sierra College, had a 96% persistence rate.
South Los Angeles Math (SLAM) Project

Mr. Robert Bosley
SLAM Teacher
Santee Education Complex
LAUSD

Dr. Kristin Webster
Assistant Professor Math
Director of Developmental Math
Cal State LA
Math Remediation Rates*

*Regular Incoming CSU Freshman, Fall 2013. Obtained from CSU Proficiency Reports
http://asd.calstate.edu/performance/proficiency.shtml
SLAM (MATH 109) Pass Rates
Concurrent* Cal State LA vs SLAM Students

Cal State LA Average: 67% (N = 332)
SLAM Average: 66% (N = 55)

*Aggregate pass rates for fall 2013 and fall 2014.
Remediation Rates
Cal State LA vs SLAM Students*

*Maximum possible remediation rate based on pass rate of MATH 109. Placement test data not included.
SLAM Cohort 1
Actual College Access and Remediation Rates with Preliminary Persistence Rates*

College Access – Fall 2014: 86%
College Access – Winter 2015: 93%
Persistence from Year 1 to Year 2: 89%
Math Remediation: 15%

*Persistence rate based on survey data with 93% of students reporting. NSC data available in late November.
SLAM Cohorts 2 & 3
Preliminary College Access* & Remediation Rates**

College Access – Fall 2015: 73%
Math Remediation: 39%

*Minimum matriculation rate based on survey data with 83% of students reporting. NSC data available in late November.
**Maximum possible remediation rate based on pass rate of MATH 109. Placement test data not included.
Change in Mathematical Practices (Aggregate)

<table>
<thead>
<tr>
<th>Class Average</th>
<th>Pre-Test</th>
<th>Final Exam</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aggregate Mathematical Practices Performed</td>
<td>18%</td>
<td>82%</td>
</tr>
</tbody>
</table>
Change in Mathematical Practices from Pre-Test to Final Exam

<table>
<thead>
<tr>
<th>Mathematical Practices</th>
<th>Pre-Test</th>
<th>Final Exam</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attempted Problem</td>
<td>41%</td>
<td>91%</td>
</tr>
<tr>
<td>Demonstrated Understanding</td>
<td>24%</td>
<td>76%</td>
</tr>
<tr>
<td>Tenacity in Problem Solving</td>
<td>7%</td>
<td>96%</td>
</tr>
<tr>
<td>Utilized Appropriate Tools</td>
<td>12%</td>
<td>70%</td>
</tr>
<tr>
<td>All Constraints Considered</td>
<td>12%</td>
<td>97%</td>
</tr>
<tr>
<td>Correct Answers</td>
<td>8%</td>
<td>69%</td>
</tr>
</tbody>
</table>
### Students' Change in Self-Perception of College Readiness

**All Students (Cohorts 1-3)**

<table>
<thead>
<tr>
<th>Category</th>
<th>PRE-SLAM</th>
<th>POST-SLAM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ready for College</td>
<td>23</td>
<td>76</td>
</tr>
<tr>
<td>Not Ready for College</td>
<td>56</td>
<td>3</td>
</tr>
<tr>
<td>Undecided/No Response</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>
ALIGNING OPPORTUNITIES:
An Intersegmental Dialogue

PHYLLIS BRAXTON
Los Angeles Harbor College

ROBERT GOULD
UCLA

KATE STEVENSON
Cal State Northridge

PHIL TUCHER
Oakland Unified School District
MOVING FORWARD: Next Steps
THANK YOU for your participation in

Testing and Beyond: The Future of College Math Placement

Please share your feedback and recommendations!

www.LearningWorksCA.org