Math Pathways and Equity: Using Corequisites in Math

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Tammi Marshall
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2018 Strengthening Student Success
Video (SMAC) at BOG Meeting
About Cuyamaca College

- 9,586 students in fall 2017
- 60% of our students are under 25 years old
- 63% have waived or reduced tuition
- 37% first generation
- 33% Latinx
- 8 full-time & 23 part-time MATH faculty
- A multi-campus district (one of two colleges)
Math Pathways Goals

• Annihilate equity gaps
• Increase the proportion of incoming students who complete transfer-level math in one year
• Increase the proportion of students who complete (transfer and/or earn a degree or certificate)
The Problem: Structural Bias

Source: 2018 CCCCO Student Success Scorecard
The Problem: Structural Bias

Statewide one-year transfer-level math achievement

<table>
<thead>
<tr>
<th>Ethnicity/Race</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFRICAN AMERICAN</td>
<td>9.1</td>
</tr>
<tr>
<td>AMERICAN INDIAN/ALASKA NATIVE</td>
<td>10.6</td>
</tr>
<tr>
<td>ASIAN</td>
<td>42.3</td>
</tr>
<tr>
<td>FILIPINO</td>
<td>27.3</td>
</tr>
<tr>
<td>HISPANIC</td>
<td>12.2</td>
</tr>
<tr>
<td>PACIFIC ISLANDER</td>
<td>9.2</td>
</tr>
<tr>
<td>WHITE</td>
<td>22.4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Age</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNDER 20</td>
<td>20.1</td>
</tr>
<tr>
<td>20-24</td>
<td>11.1</td>
</tr>
<tr>
<td>25-39</td>
<td>8.0</td>
</tr>
<tr>
<td>40 OR OVER</td>
<td>4.1</td>
</tr>
</tbody>
</table>

Source: [2018 CCCCO Student Success Scorecard](#)

The percent of first-time students in 2015-16 who complete six units and attempt any Math in their first year who complete a transfer-level course in Math in their first year.
The Problem: Structural Bias

**Cuyamaca** one-year transfer-level math achievement

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<thead>
<tr>
<th>Ethnicity/Race</th>
<th>%</th>
<th>Age</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFRICAN AMERICAN</td>
<td>35.0</td>
<td>UNDER 20</td>
<td>35.0</td>
</tr>
<tr>
<td>AMERICAN INDIAN/ ALASKA NATIVE</td>
<td>0.0 *</td>
<td>20-24</td>
<td>9.9</td>
</tr>
<tr>
<td>ASIAN</td>
<td>40.5</td>
<td>25-39</td>
<td>7.0</td>
</tr>
<tr>
<td>FILIPINO</td>
<td>22.7</td>
<td>40 OR OVER</td>
<td>4.1</td>
</tr>
<tr>
<td>HISPANIC</td>
<td>28.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PACIFIC ISLANDER</td>
<td>0.0 *</td>
<td></td>
<td></td>
</tr>
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<td>30.1</td>
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<td></td>
</tr>
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Source: [2018 CCCCO Student Success Scorecard](#)

The percent of first-time students in 2015-16 who complete six units and attempt any Math in their first year who complete a transfer-level course in Math in their first year.
The Choice

1. Accept that students who assess three levels below transfer cannot succeed in a college-level math course without multiple layers of decontextualized remediation

2. Recognize that students have the capacity to do college-level work!
   - Provide students with an achievable pathway to attaining their educational goals
   - Some students may need extra support
High Leverage Strategies

• Change placement policies to allow more incoming students to enroll directly in transfer-level math

• Design and implement concurrent-enrollment support models (a.k.a. corequisite models)
Change Placement Policies

Use student’s intent to advise into the appropriate math pathway

- General
- Business
- STEM
- Education
Change Placement Policies

Fall 2016:
Disjunctive placement with early MMAP data

• Transfer level with support (non-stats) if Algebra II w/ C or better & GPA ≥ 2.8

All students are eligible for ...
• Statistics with support
• Intermediate Algebra with support
• PreStatistics
Change Placement Policies

Fall 2018:
Disjunctive placement based on MMAP rules

• If completed Algebra II w/C & GPA ≥ 3.3
  o PreCalculus & Applied Calculus (no support)
• If completed Algebra II w/C & GPA ≥ 3.0
  o Statistics, QR (no support)
  o Math for Elementary Education
• If completed Algebra II w/C & GPA <3.0
  o PreCalculus & Applied Calculus (w/ support)

All students are eligible for
• Statistics with support
Cuyamaca College Model

- Math pathways approach
- Introductory transfer-level courses have corequisite support, e.g. PreCalculus, Applied Calculus, Statistics, Quantitative Reasoning (starting in fall 2019)
- Pre-AB 705
  - Intermediate algebra plus support was the lowest placement level, but will not be offered starting in fall 2019
  - Statistics plus support is open access
Cuyamaca College Model

• Cohorted model
  o Same instructor
  o Back-to-back scheduling
  o Contextualized remedial support
  o Attention to the affective domain
Paradigm Shifts in Teaching & Learning

• The activity-based math classroom
• Intentional support for the affective domain
• Change expectations: students, teachers, staff, and administrators
• Culturally responsive teaching and learning
  o CORA Teaching Men of Color certificate
  o Equity-minded workshop series
  o UMOJA Conference
  o Comprehensive Math Instruction workshop series
## Schedule Changes

<table>
<thead>
<tr>
<th>Course Level</th>
<th>Fall 2015</th>
<th>Fall 2016</th>
<th>Fall 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>2+ levels below</td>
<td>18</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Intermediate Algebra</td>
<td>15</td>
<td>19 (10 w/support)</td>
<td>7 (3 w/support)</td>
</tr>
<tr>
<td>PreStatistics</td>
<td>3</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Statistics</td>
<td>11</td>
<td>22 (10 w/support)</td>
<td>21 (8 w/support)</td>
</tr>
<tr>
<td>Transfer-Level (no Statistics)</td>
<td>18</td>
<td>25 (3 w/support)</td>
<td>29 (4 w/support)</td>
</tr>
</tbody>
</table>
AB 705 Compliance: The Sticks

• AB 705 compliance is tied to college funding:
  o Eligibility for Guided Pathways funding
  o Eligibility for College Promise grants
  o The success portion of the new Student Centered Funding Formula includes student completion of transfer-level English and math within a year (one study suggests that this is about $880 per completer)

• More restrictive legislation if we do not comply
  o AB 705 passed both the Assembly and the Senate unanimously
  o Assembly Member Irwin is tracking its implementation
AB 705 Compliance: The Carrots

• Improved student completion of transfer-level math, an important milestone to transfer
• Improved transfer rates
• Better outcomes for students of color and low-income students
• Students experience math that is relevant to their programs... increased MOTIVATION and appreciation of math
Caleb Rendon-Guerrero

**Background:** High school dropout who had been in and out of criminal justice system

**Goal:** To “be the solution not the problem” in his family, create a non-profit to help kids like him

**Placement via Standardized Test:**
Elementary Algebra

**Probability of completing transfer-level math:** 19%

**Corequisite Remediation:**
Enrolled directly in College Statistics with two units of concurrent support

**Grade in Statistics:** B

**Follow Up:** Second-year student, 3.6 GPA
Karly Franz

**Background:** Returning adult student, away from math for five years; studied fashion design, worked as a historical costumer

**Goal:** Teach high school biology

**Placement via Standardized Test:** Intermediate Algebra

**Probability of completing transfer-level math:** 36%

**Given access to transfer-level:** Enrolled directly in Pre-Calculus with two units of concurrent support

**Grade in Pre-Calculus:** 89

**Subsequent grade in Calculus:** A (instructor said she was one of the best students in class)
The Players

- Instruction
- Student Services
- Institutional Research
- Students
- Institutional Technology
- Successful implementation requires ALL players to participate
What Does this Affect?

- **Assessment/Placement**
  - Adapt to higher placement options and multiple measures placement developments
  - Open-access courses
- **Prerequisite clearances**
  - How courses were input into our system
- **Student education planning**
  - Achievable 4-6 semester ed plans
Challenges and Considerations

• Technology
  o Solutions to work with our current system (Ellucian)
  o Increased manual input of math clearances by counselors
  o Online advising

• Multi-college district
  o Sister college did not have similar math pathways
  o Confusion of giving students too many options

• Appropriate placement (driven by intent)
  o Placement charts vs. decision tree
  o Consideration for the “undecided” students
Challenges and Considerations

• AA Math Competency
  o Interpreting the graduation requirement
  o Old beliefs vs. new perspectives

• Consistency across multiple student services areas
  o Training for both FT and PT Counselors
  o Confusion of giving students too many options

• If you offer it, they will come
Benefits

• If you offer it, they will come
• Streamlined math from high school to college
• The “two-year” ed plan is real
• AB 705 ready
One-Year Throughput at Cuyamaca: Before and After Structural Changes

First-Time Student One-Year Throughput Rate by Race/Ethnicity

- **Asian**
  - 2015-16: 48%
  - 2017-18: 65%
- **Black/African American**
  - 2015-16: 16%
  - 2017-18: 27%
- **Latinx**
  - 2015-16: 33%
  - 2017-18: 55%
- **White**
  - 2015-16: 35%
  - 2017-18: 61%
- **Two or more**
  - 2015-16: 28%
  - 2017-18: 54%
- **Overall**
  - 2015-16: 33%
  - 2017-18: 56%

Note: Unknown/other race/ethnicity excluded from chart
One-Year Throughput at Cuyamaca: Before and After Structural Changes

**BSTEM First-Time Student One-Year Throughput Rate by Race/Ethnicity**

<table>
<thead>
<tr>
<th>Year</th>
<th>Asian</th>
<th>Black/African American</th>
<th>Latinx</th>
<th>White</th>
<th>Two or more</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015-16</td>
<td>50%</td>
<td>13%</td>
<td>35%</td>
<td>36%</td>
<td>29%</td>
<td>35%</td>
</tr>
<tr>
<td>2017-18</td>
<td>70%</td>
<td>24%</td>
<td>49%</td>
<td>68%</td>
<td>50%</td>
<td>58%</td>
</tr>
</tbody>
</table>

Note: Unknown/other race/ethnicity excluded from chart
One-Year Throughput at Cuyamaca: Before and After Structural Changes

First-Time Student One-Year Throughput Rate by Disability and Financial Need Status

<table>
<thead>
<tr>
<th>Year</th>
<th>Student with at least one disability</th>
<th>Student with no disabilities</th>
<th>Student with financial need</th>
<th>Student with no financial need</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015-16</td>
<td>15%</td>
<td>35%</td>
<td>30%</td>
<td>39%</td>
<td>33%</td>
</tr>
<tr>
<td>2017-18</td>
<td>39%</td>
<td>57%</td>
<td>53%</td>
<td>59%</td>
<td>56%</td>
</tr>
</tbody>
</table>
One-Year Throughput at Cuyamaca: Before and After Structural Changes

First-Time Student One-Year Throughput Rate by Age

<table>
<thead>
<tr>
<th>Age Group</th>
<th>2015-16</th>
<th>2017-18</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;20 Years</td>
<td>35%</td>
<td>57%</td>
</tr>
<tr>
<td>20-24 Years</td>
<td>35%</td>
<td>49%</td>
</tr>
<tr>
<td>25-39 Years</td>
<td>30%</td>
<td>59%</td>
</tr>
<tr>
<td>40+ Years</td>
<td>9%</td>
<td>36%</td>
</tr>
<tr>
<td>Overall</td>
<td>33%</td>
<td>56%</td>
</tr>
</tbody>
</table>
One-Year Throughput at Cuyamaca: Before and After Structural Changes

First-Time Student One-Year Throughput Rate by Traditional Placement

<table>
<thead>
<tr>
<th>Transfer Level</th>
<th>2015-16</th>
<th>2017-18</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>62%</td>
<td>75%</td>
</tr>
<tr>
<td>1 Level Below</td>
<td>18%</td>
<td>50%</td>
</tr>
<tr>
<td>2 Levels Below</td>
<td>5%</td>
<td>45%</td>
</tr>
<tr>
<td>3 Levels Below</td>
<td>1%</td>
<td>23%</td>
</tr>
<tr>
<td>Overall</td>
<td>25%</td>
<td>49%</td>
</tr>
</tbody>
</table>

Note: Students with unknown placement level excluded from analysis.
Highlights of Public Policy Institute of California (PPIC) Study

Larger share of students starting in transfer-level math correlates with higher transfer-level math completion in one year

Source: Remedial Education Reforms at California Community Colleges: Early Evidence on Placement and Curricular Reforms (Rodriguez, Cuellar Mejia, and Johnson, 2018)
Highlights of PPIC Study

Increased access to transfer-level math correlates with higher transfer-level math completion in one year

Source: Remedial Education Reforms at California Community Colleges: Early Evidence on Placement and Curricular Reforms (Rodriguez, Cuellar Mejia, and Johnson, 2018)
Highlights of PPIC Study

“Early implementers” had the highest one-year transfer-level math completion statewide in 2016

• Statewide: 28%
• College of the Siskiyous 58%
  All students are eligible for Statistics; support via embedded lab
• Cuyamaca College 57%, Los Medanos College 51%
  All students are eligible for Statistics with 2-unit corequisite support; Algebra 2 completers are eligible for PreCalculus and Applied Calculus, some with a required 2-unit corequisite at Cuyamaca.

Source: Remedial Education Reforms at California Community Colleges: Early Evidence on Placement and Curricular Reforms (Rodriguez, Cuellar Mejia, and Johnson, 2018)
At “early implementer” colleges, transfer-level math completion for low-income students and students of color is substantially higher than the statewide average.

Average one-year math throughput for early implementers vs. statewide average:

- Low-income: 49% vs. 23%
- Latinx: 48% vs. 19%
- African American: 46% vs. 13%

Source: Remedial Education Reforms at California Community Colleges: Early Evidence on Placement and Curricular Reforms (Rodriguez, Cuellar Mejia, and Johnson, 2018)
Highlights of PPIC Study

The corequisite model for Statistics produced much better outcomes than one-year accelerated Statistics pathway models

About 70% of corequisite students completed Statistics in one year—over two to three times higher than accelerated students

Source: Remedial Education Reforms at California Community Colleges: Early Evidence on Placement and Curricular Reforms (Rodriguez, Cuellar Mejia, and Johnson, 2018)
Activity

• Scenario 1: Admissions and IT tells us we cannot create corequisites.
• Scenario 2: Curriculum is opposed to requiring support courses for certain student groups.
• Scenario 3: Counselors refuse to recommend Statistics if students have not completed Algebra II.
• Scenario 4: Math faculty believe students will not be successful in transfer-level math unless they have had Algebra II.
Activity

• Who needs to be involved in the implementation of this process at your college?
• What is each player’s role in the implementation?
• What are your concerns?
• What are some obstacles you are running into?
Parking Lot Questions

1. So they get access and they’re more successful in *your math* classes, but how are they doing in *classes with a math prereq*?

2. Do the accelerated math pathways work for all modalities (e.g. face-to-face, online, hybrid)?

3. Do you find that it takes longer to get through the same curriculum? Have you had to reduce or eliminate any of the curriculum?
Resources & Contacts

• Tammi Marshall, Math Department Chair
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