EXAMINING EQUITY IN STUDENTS’ MATH PATHWAY CHOICES

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Traditional placement exams under-placed too many students.

+ Students of color more likely to be placed into longer sequences of three and four courses.

+ Algebra-intensive content of traditional remedial math sequences poorly aligned with many students’ eventual fields of study.

= Remedial math sequences were serving as a filter, exacerbating opportunity gaps.
Multiple measures placement

Diversified math pathways aligned with students’ goals

Co-requisites

**From 2010 – 2015:** Remedial math course-taking dropped by 30 percent nationally; arithmetic enrollments dropped by 50 percent.

**By 2016:** More than half of colleges were using multiple measures placement and diversified math pathways

Sources: MDRC, Conference Board on Mathematical Sciences
California Community Colleges AB 705: requires that a community college district or college maximize the probability that a student will enter and complete transfer level coursework in English and math within a one year timeframe and use, in the placement of students into English and math courses, one or more of the following: high school coursework, high school grades, and high school grade point average.

- California Community College Chancellor’s Office website
  https://assessment.cccco.edu/ab-705
Need for intentional design given history of tracking in mathematics

- High-quality, rigorous content
- Alignment of pathways with students’ aspirations
- Student agency in selecting math pathways
- Importance of fostering positive math experiences
Colleges are focusing more explicitly on offering diverse math pathways aligned with students’ goals. Do newly implemented math pathway policies and practices increase/support math success, particularly for those who are historically underrepresented on college campuses and in Science, Technology, Engineering, Mathematics (STEM)-related majors/fields?
METHODOLOGY

- **Data and Information**
  - Literature review
  - CSU and CCC administrator and faculty interviews — 30-45 minutes
  - Student focus groups — 60 minutes

- **Criteria for college preparation**
  - Implemented changes to math counseling and guidance in response to noted math reforms (i.e., AB 705, EO 1100, 1110)
  - Clear STEM and non-STEM pathways
  - A diverse student population
PARTICIPANTS

- Two community colleges (College of Alameda and LA Pierce College) and one CSU (Sacramento)
- Administrator and faculty interviews
  - 3 math chairs, 1 VP of Academic Affairs, 1 counselor, 1 academic success center director, 1 graduate student research assistant
- Student focus groups
  - 37 mainly students of color (15 CoA, 15 CSUS, 7 LA Pierce)
  - Transfer, continuing, and first year students, BSTEM and non-STEM majors
  - Majority pursuing BSTEM areas of study
OVERARCHING FINDINGS

- Information and counseling work best if a student has selected a major or area of interest; undecided students are often directed to complete statistics = more guidance needed upfront.

- Students triangulate information, understanding that what is true and valid may shift due to changes in requirements; authentic agency requires accessing various sources to select the most appropriate math course.

- Structured and proactive strategies have been strengthened and expanded—something that students recognize and appreciate—to ensure more students have needed math support.

- Culturally competent pedagogy and a safe & empowering classroom environment that builds students’ confidence as well as math mastery are critical (= limited use of lecture).
RQ1: What information are students given and in what ways are students counseled to consider math pathways associated with STEM and non-STEM fields regardless of their high school math course taking patterns and grades?
This counselor had told me you need to take like the prerequisite [math course] just to transfer. So I did ask...you need to take the classes to transfer, not like to have an associate degree, right?... So I took it and then after I finished, I met with [a new] counselor ... and I told him this...[he said] your major is engineering, so you need to take Precalculus. So I was like, okay, but the first counselor did not tell me anything. He was just like, just take this and that [for the associate’s degree].

*So what math class did the first counselor tell you you should take?* Statistics.
Eddie Tchertchian, Math Chair, LA Pierce College:
Can you describe how you worked with the counseling dean to help counselors to develop and share information that will help students made an informed decision about their math pathway?

Rebecca Wong, Math faculty, Guided Pathways Coordinator, West Valley College:
What was critical to have in place to advance AB705 so quickly?
THINK-PAIR-SHARE

What are five questions you might ask students - particularly those who are undecided - at college entry to help provide timely and accurate math pathway guidance?
RQ2: How are students given authentic agency in their choice of math pathway regardless of personal characteristics?
It's always full [math classes with] good teachers meaning the ones that people recommend ...this [instructor is] highly recommended, but then [their courses] all get full and then I felt like I don't want to take [math] if I'm not going to take it with someone that will work well with me to learn something, [so] I don't take it. And then I had a pile up ... a couple semesters of two math classes in one semester.
I'm a [science] major and I do have [a counselor]. She helps me a lot ... She actually told me I can enroll in Calculus, but I actually thought that I needed help more. So I placed myself in Precalculus to like help strengthen my algebra a little bit. And, for the science part, she's really been helpful with like my plan. I have like 46 units already in my first year. So I've been doing well and am on track to transfer.
RQ3: What are some intentional strategies to ensure that all math pathways foster quantitative skills in rigorous ways and that students successfully complete their math pathways?
I like this set up that we have in Pre-calculus where you had to enroll in both [courses—the class and a support class]... some people had issues, they were [just enrolled] in the class and not the [support course]. [The instructor] helped everyone [enroll] because he uses... an extra long class to go over stuff and do different things.

*So how did you know to sign up for the extra course?*
[The counselor] helped me...she knew that [I asked if there was anything] I can do to help with the math ... [and] stay on top of it. And she said that [the support course] would work.
WHAT DID YOU DO AND HOW DID YOU DO IT?

Vanson Nguyen, Math Chair, College of Alameda:

How do you create a classroom environment that builds students’ confidence as mathematicians and invites them to be engaged in their learning?

Eddie Tchertchian, Math Chair, LA Pierce College:

Can you share how as a faculty/department liaison to the Center for Academic Success, you ensure students have access to the academic assistance they may need to be successful in math?

Rebecca Wong, Math faculty, Guided Pathways Coordinator, West Valley College:

How can and should Stats be redesigned to prepare students, including STEM students, for 21st century careers?
What is one way to help address students’ lack of confidence and anxiety when selecting a math course/pathway?
**Math 13 (Intro to Stats) Analysis:**
There is an opportunity gap for African American and Latinx students.

<table>
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<th>Math 13 (Intro to Stats)</th>
<th>No. of Students</th>
<th>No. of Success</th>
<th>Success Rate</th>
<th>No. of Retained</th>
<th>Retention Rate</th>
<th>No. of Withdraws</th>
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<td>African American</td>
<td>143</td>
<td>86</td>
<td>60%</td>
<td>115</td>
<td>80%</td>
<td>28</td>
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<tr>
<td>Latinx</td>
<td>188</td>
<td>113</td>
<td>60%</td>
<td>162</td>
<td>86%</td>
<td>26</td>
</tr>
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<td>White</td>
<td>100</td>
<td>76</td>
<td>76%</td>
<td>90</td>
<td>90%</td>
<td>10</td>
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</table>

Source: College of Alameda
Math 13 + 213 (Intro to Stats with Support) Analysis:
Opportunity gap is narrowed.

<table>
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<tr>
<th>Math 13 + 213 (Intro to Stats with Support)</th>
<th>No. of Students</th>
<th>No. of Success</th>
<th>Success Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>African American</td>
<td>35</td>
<td>26</td>
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</tr>
<tr>
<td>Latinx</td>
<td>34</td>
<td>24</td>
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</tr>
<tr>
<td>White</td>
<td>18</td>
<td>15</td>
<td>83%</td>
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</table>

Source: College of Alameda
- Extend length of counseling appointments
- Evaluate instructors and work with them to strengthen their practice
- Provide instructors with promising pedagogical practices
  - More contextualized, hands-on examples
  - Promote peer connections
  - Don’t forget the affective realm; math anxiety is real!
- Expand available tutoring resources, particularly in certain courses (e.g., Stats) where students often need support to succeed
- Proactive outreach from instructors is appreciated!
FUTURE RESEARCH

- Investigate whether and how Guided Pathways affect students’ confidence and agency in the selection of appropriate math pathways.

- Determine what type of guidance and information are critical — and when — to make sure students can make an informed, thoughtful math pathway selection.

- Explore supports to understand what specifically is key to students’ math success.

- Examine the range of non-STEM pathways available to students as well as options for students to bridge to STEM pathways, if desired.
Questions
THANK YOU

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