BRANCHING OUT: REDESIGNING HIGH SCHOOL MATH PATHWAYS FOR EQUITY

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Too many potential STEM students, especially Latinx and African American students, are being filtered out of opportunities.

At the same time, too many whites, Asians, Latinxs, and African Americans are being blocked from pursuing other careers by irrelevant math hurdles.
Opportunity gaps widen over time.

The rich get richer and the poor get poorer, in terms of math learning.
The most common pathway – from basic math in seventh grade through calculus in 12th – was pursued by only 3.3 percent of students. And the 20 most common pathways were pursued by fewer than a third of students.

Source: WestEd
Education systems must be able to respond as effectively to a future musician who is uninterested in traditional math courses as they would to a student who wants to be an engineer, but hasn’t had a chance to take advanced math courses.
BRANCH PATHWAYS:

New, rigorous offerings as alternatives to existing STEM-oriented math pathways for students with other interests.
GOALS OF DESIGNING BRANCH PATHWAYS

- STEM-interested students will learn mathematics needed for STEM careers.
- BRANCH-interested students will learn mathematics needed for BRANCH careers without irrelevant hurdles.
- Latinx and African American students (and female students of all ethnicities) will have opportunities to thrive in college and expand their representation in STEM fields.
- Students who start in a BRANCH pathway will be able to switch to a STEM pathway, and vice versa.
Students can be offered options based on their own aspirations and interests – similar to students choosing, rather than being placed in, their college majors.
DESIGNING PATHWAYS – NOT TRACKS

- rigorous pathways articulate with postsecondary
- more weight to student aspirations
- support for addressing the role of bias and privilege
- instruction and support to address uneven prior opportunities
- early, public, and clear communication of pathway options
- summer or semester bridge courses
Positive academic identity and agency cannot happen without deliberate work on the part of educators to address implicit bias, assumptions about student capabilities, and the ways that math traditionally reinforces privilege.
POSTSECONDARY POLICY CONTEXT

- College Admissions
  emphasis on Algebra 2 and Calculus
FIRST COLLEGE MATH COURSE FOR THOSE WHO TOOK CALCULUS IN HIGH SCHOOL

- **Repeat Calculus 1, earn A or B**
- **Repeat Calculus 1, earn C or lower**
- **Take precalculus, college algebra, or remedial math**
- **Take Calculus II or higher**
- **Take non-mainstream course such as business calculus or statistics, or no math at all**

*Source: Bressoud, 2017*
College Admissions
emphasis on Algebra 2 and Calculus

College Readiness
remedial requirements
general ed requirements and pre-requisites
ELEMENTS OF SOLUTIONS

- pathways as **options** that lead to postsecondary opportunities, with some flexibility to switch pathways;
- **relevance** of pathway content, expertise, and goals;
- **recruitment** of students to pathways; and
- **support** for students within pathways.
PATHWAY OPTION
Escondido Union School District

Math 1

Math 2

Math 3S with statistics

Math 3C with calculus

Math 4

AP Statistics

AP Calculus
PROPOSED 2 + 1 COURSE MODEL
Oregon Department of Education

**Mathematics**

- K-8 Content

**Math 1**

- High School Content

**Math 2**

- High School Content

**HS Algebra 2/ Precalculus**

- (Preparation for Engineering & Physical Science Careers)

**HS Statistics and Modeling**

- (Preparation for Life Science, Social Science and Business Careers)

**Applied Mathematics & Mathematical Modeling**

- Construction Geometry, Financial Algebra, Math in Computer Science, Other Applied Courses
- (Preparation for technical careers)

Optional additional high school math electives or dual credit college math

College and career math opportunities
San Francisco Unified School District

MATHEMATICS PATHWAYS
San Francisco Unified School District

9th Grade
- CCSS* Algebra I

10th Grade
- CCSS* Geometry
- CCSS* Algebra II
- CCSS* Algebra II + Precalculus (Compression)

11th Grade
- Precalculus
- AP Statistics
- AP Calculus (AB or BC)

12th Grade
- Fall: Math 110A (Calculus I)
- Spring: Math 110B (Calculus II)
- Fall: Math 92 (College Algebra)
- Spring: Math 95 (Trigonometry)

City College of San Francisco
San Francisco Unified School District
BRANCH COURSES

- an 11th grade alternative to traditional Algebra 2.
- a fourth-year course.
- an honors or AP version of the fourth-year course that does not require acceleration.
To begin, we shift from thinking of pathways as tracks based on levels of student ability to thinking of pathways in terms of the valuable postsecondary opportunities they offer.
One key is to maintain a singular focus on the coherence of students’ pathways through these institutions.
K-12 SCHOOLS, DISTRICTS, AND SYSTEMS

- Conduct equity audits of existing math pathway policies and practices—e.g., teacher assignments, classroom practices, grading, policies, and bell schedules—to uncover “Matthew Effect” mechanisms that widen opportunity gaps.

- Shift from tracking students by “ability” to offering pathways as options for students, while implementing strategies to dislodge preconceived notions of student abilities.

- Design ninth and 10th grade courses that prioritize content important for BRANCH pathways, while shifting more technical STEM-applicable content into junior and senior year STEM courses.

- Design junior and senior year BRANCH courses, including an AP mathematics course that seniors can take without accelerating through the curriculum, as well as junior and senior STEM courses that prepare students for calculus in high school or college.

- Support teachers, counselors, administrators, students, and families to understand the new options.

POSTSECONDARY INSTITUTIONS AND SYSTEMS

- Adopt changes to admissions and placement criteria that support the redesign of high school math pathways (including accepting BRANCH pathway courses and reducing the emphasis on acceleration for AP Calculus).

- Ensure that prerequisites for general education quantitative reasoning courses are relevant to BRANCH courses and majors.

- Design, implement, and evaluate corequisite courses that can (a) support student success in required courses and (b) serve as bridges between STEM and BRANCH pathways for students who choose to switch pathways.

- Conduct equity audits of math pathways and corequisite math courses to ensure they are meeting equity goals by diminishing racial and socio-economic gaps.

RESEARCH COMMUNITY

- Partner with higher education institutions to evaluate the effectiveness of new postsecondary pathways in preparing students for their chosen fields and in reducing equity gaps in college success, including enrollment disparities in STEM majors.

- Design, develop, and research practices, tools, and systems that replace “Matthew Effect” mechanisms with practices, tools, and systems that reduce equity gaps.

- Partner with K-12 to develop and evaluate new common ninth and 10th grade courses as well as new 11th and 12th grade BRANCH and STEM courses.

- Work with systems to design, develop, and evaluate student support systems and practices, including high school and college corequisite math courses.