K-12 Education Landscape: Tracking and De-tracking

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Call for STEM Literacy

- Modern STEM education imparts not only skills such as critical thinking, problem solving, higher order thinking, design, and inference, but also behavioral competencies such as perseverance, adaptability, cooperation, organization, and responsibility. (p. 1)

- STEM skills such as computational thinking, problem-finding and solving, and innovation are crucial for people working to manufacture smarter products, improve healthcare, and safeguard the Nation, and these skills are valuable assets across many other fields and job categories. (p.2)

Call for Mathematical Literacy

Each and every student should learn the Essential Mathematical Concepts in order to expand professional opportunities, understand and critique the world, and experience the joy, wonder, and beauty of mathematics.

Key Recommendations

- High school mathematics should discontinue the practice of tracking teachers as well as the practice of tracking students into qualitatively different or dead-end course pathways.

- High schools should offer continuous four-year mathematics pathways with all students studying mathematics each year, including two to three years of mathematics in a common shared pathway focusing on the Essential Concepts, to ensure the highest-quality mathematics education for all students.

Three Significant Structural Barriers within Educators’ Sphere of Influence

- Tracking students into course pathways that do not prepare students for continued study of mathematics.
- Tracking teachers in ways that deny certain students access to high-quality instruction.
- Providing inadequate instructional supports both before and during high school.

FIGURE 4: Percentage of high schools offering mathematics and science courses

Examples of Effective Mathematics Departments from the Research

- Railside High School (Boaler & Staples 2008).
- Union High (Gutiérrez, 1999, 2002)
- Monterey High School (Gutiérrez, 2000)
- East High School (Horn, 2006)

Characteristics of the Effective Mathematics Departments:

- Effective mathematics learning communities (teacher collectives);
- More advanced-level courses than low-level courses, with expectations that students will matriculate through the courses well; and
- Teachers who used pedagogical strategies aimed at engaging all students in learning meaningful mathematics:
  - Using cooperative learning groups (Cohen et al. 1999), and
  - Applying culturally relevant practices (Ladson-Billings 1994 and 1995).

Double Periods

Students developed a statistical question and gathered data, which suggested inequities in course enrollment by race/ethnicity. The question was personally meaningful to many students, as their teacher had provided opportunities for students who were not on the “honors” track but who had good grades in ninth-grade Algebra I to accelerate their course taking so that they could enroll in AP statistics. While some members of the class were initially taken aback by the implication that race/ethnicity may play a role in course taking, the personal experiences of these non-“honors” students helped to frame the class’ discourse about causes for this inequity in course taking as being largely about opportunity rather than ability or interest. Students’ use of mathematics and data empowered them to inform the principal of the school of their findings and start making changes in their school culture.

- Common experience with Geometry in grade 9
- New course names to emphasize that they are not the “same old, same old”
  - Same content for all students through Algebra II
- Accelerated pathway in middle grades for student who are particularly interested or motivated -- they then take either Algebra I or II in grade 10
- Possible acceleration in grade 9 by taking Algebra I and Geometry concurrently to meet the needs of more students
- Inclusion of optional “lab courses”

Fourth-Year Courses

- Precalculus
- Applications of Finite Mathematics
- Mathematical Modeling
- AP Courses
- Other Approved Courses

According to Nasir (2002), the relationship between learning and identity is bidirectional, with access to learning supporting stronger identities, and identity, in turn, supporting learning.

Terrica, an African American female senior who was hesitant about taking AP Calculus, successfully presented a complex mathematical topic that had not been covered in her course to her peers at the end of the semester with poise and confidence. According to Frank and Hickson (2018), students like Terrica were often overlooked when teachers were selecting students to move on to AP Calculus, a course that many students saw as only meant for a few “math whizzes” in their school (p. 78). Terrica’s teacher, Mrs. Hickson, had talked Terrica into taking the class because Terrica had always demonstrated a keen ability to think critically about complex mathematical topics even though her grades did not reflect this. Mrs. Hickson knew that Terrica would be successful with the right support.

### Publications Calling for Change in Grades K-12 Mathematics

<table>
<thead>
<tr>
<th>Date</th>
<th>Document</th>
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</thead>
<tbody>
<tr>
<td>1980</td>
<td><em>Agenda for Action</em> (NCTM)</td>
</tr>
<tr>
<td>1989</td>
<td><em>Curriculum and Evaluation Standards</em> (NCTM)</td>
</tr>
<tr>
<td>1991</td>
<td><em>Professional Standards for Teaching Mathematics</em> (NCTM)</td>
</tr>
<tr>
<td>1995</td>
<td><em>Assessment Standards</em> (NCTM)</td>
</tr>
<tr>
<td>2000</td>
<td><em>Principles and Standards for School Mathematics</em> (NCTM)</td>
</tr>
<tr>
<td>2001</td>
<td><em>Adding It Up</em> (NRC)</td>
</tr>
<tr>
<td>2006</td>
<td><em>Curriculum Focal Points for Prekindergarten through Grade 8 Mathematics: A Quest for Coherence</em> (NCTM)</td>
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<td>2009</td>
<td><em>Focus in High School Mathematics: Reasoning and Sense Making</em> (NCTM)</td>
</tr>
<tr>
<td>2010</td>
<td><em>Common Core State Standards</em> (NGA and CCSSO)</td>
</tr>
<tr>
<td>2014</td>
<td><em>Principles to Actions: Ensuring Success for All</em> (NCTM)</td>
</tr>
<tr>
<td>2018</td>
<td><em>Catalyzing Change in High School Mathematics: Initiating Critical Conversations</em> (NCTM)</td>
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Calls for Reform Beyond K-12 Schools

- A Report to the President-- *Engage to Excel: Producing One Million Additional College Graduates with Degrees in Science, Technology, Engineering, and Mathematics* from the Executive Office of the President’s Council of Advisors on Science and Technology ([PCAST], 2012)
- The Common Vision project
- Association of Mathematics Teacher Educators. (2017). *Standards for Preparing Teachers of Mathematics*
- Transforming Post-Secondary Education in Mathematics (TPSE Math)
- Mathematics Teacher Education Partnership
- NSF INCLUDES and other NSF Funded Initiatives Focused on Broadening Participation
It’s Time

- To close the opportunity gap,
- For K-12 and higher education to work together to ensure that each and every student has access to meaningful mathematics and are empowered to go in to the profession of her or his choice, and
- To scale up those practices which lead to more student engagement and higher achievement in mathematics.