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EXAMINING STUDENTS' MATH COURSE-TAKING AND EDUCATIONAL OUTCOMES IN THE GARDEN GROVE UNIFIED SCHOOL DISTRICT (YEAR 1)

Manuelito Biag & Imeh Williams

Background

Prior research demonstrates that students' success in rigorous middle and high school math courses is positively linked to their admission to college, earnings in later life, and career prospects, particularly in the fields of science, technology, engineering, and math (STEM; Adelman, 1999; Rose & Betts, 2004; Trusty & Niles, 2003). Compared to students in less rigorous courses, students who enroll and succeed in high-level math are more likely to obtain a postsecondary degree (Adelman, 1999).

Mathematics instruction is typically designed as a linear and hierarchical academic subject where skills and concepts build on one another. Students are generally required to successfully complete one level (e.g., Precalculus) before moving on to the next level in the sequence (e.g., Calculus). This sequential nature of math course-taking can create an opportunity structure and promote certain educational advantages among students (Attewell & Domina, 2008; Schneider, Swanson, & Riegle-Crumb, 1997). For instance, those who start at a higher level in the sequence (e.g., Algebra I in the 8th grade) are likely to have more opportunities to take college-level math (e.g., Calculus) than those who begin lower in the sequence (e.g., general math in the 8th grade) or who fail and have to repeat a course along the way. While the share of high school students in advanced math has increased in the past few decades (Dalton, Ingels, Downing, Bozick, & Owings, 2007), lower-income, Latino, and African American students continue to take fewer rigorous math courses than their higher-income, Asian, and Caucasian counterparts (Attewell & Domina, 2008; Kelly, 2009; National Center for Education Statistics, 2001).

In 2012, the John W. Gardner Center for Youth and Their Communities at Stanford University's Graduate School of Education (Gardner Center) partnered with the Garden Grove Unified School District (GGUSD) on a multi-year study to examine the links between students' math course-taking and their educational outcomes. This research was conducted in response to district leaders' concerns that certain students were being placed in advanced courses they could not master, which, in turn, delayed their graduation. They were also interested in understanding which pathways accelerated and predicted success. By examining students' course-taking patterns, this analysis aims to uncover differences in students' performance levels in specific math subject areas; potential disparities in students' access to college-level courses; and possible differences among high schools in how students are placed in math.

The following questions guide this analysis:

1. What different math trajectories do 7-12th grade students experience in the Garden Grove Unified School District? What are the characteristics of students who enter into these different trajectories (e.g., gender, race/ethnicity, English learner status, socio-economic status, prior achievement)?

2. Are students in certain math trajectories more likely to pass the California High School Exit Exam (CAHSEE)?

3. What are the characteristics of students who deviate from their initial trajectory? Are students in certain math trajectories more likely to diverge from their trajectory because of course failures and, as such, fail to meet A-G requirements?[1]

4. What are the demographic and educational characteristics of students who repeat Algebra?

To answer these questions, we worked closely with the district's Evaluation and Research Department. We obtained administrative records for four cohorts of students who graduated in the 2009-10 to 2012-13 academic years. Using these data, we traced students' math enrollment histories from the 12th grade back to the 8th grade. Employing descriptive statistics and estimating a series of predictive statistical models that accounted for the influence of student and school characteristics, our analysis yielded several findings including the following:

- Eighty-eight percent of students were enrolled in Algebra I in the 8th grade.

- Among all racial/ethnic groups, Asian students were more likely to have completed an *Advanced* math course-taking sequence by the time they graduated.

- Students who deviated from their initial course-taking sequence and transitioned to a more or less rigorous sequence were likely to do so during the transition between grades 9 and 10, or grades 10 and 11.

- Relative to Caucasian students, Latino students were more likely to diverge from their initial course pathway and on to a general or less rigorous track.

In what follows, we first describe the demographic and academic characteristics of students in the analysis, including differences among them based on their course-taking pathways in math. Then, we examine each research question in turn and discuss the analytic strategies and key findings for each question. Finally, we conclude the Brief with a discussion of the potential

[1] Students must complete a pattern of 15 college-preparatory courses drawn from history/social science, English, math, lab science, a language other than English, the visual and performing arts, and a college-preparatory elective. A-G requirements specify at least three years of mathematics with a grade of *C* or better in courses such as Algebra I, Geometry, Algebra II, or some other higher-level course (e.g., Trigonometry).

practice and policy implications raised by the results found in this research.

Data & Methods

We obtained administrative records for four cohorts of students who graduated in the 2009-10 to 2012-13 academic years. We excluded students from this analysis if: 1) data about their math course-taking in the 8th grade were not available; 2) they did not have complete math course histories from grades 8-12; or 3) they transferred from or dropped out of GGUSD. Thus, the current sample is limited to students with complete math course-taking histories and who successfully graduated at the end of four years. In all, we excluded 34% of graduating students (n = 3,983) and an unknown number of students who began but did not graduate from a GGUSD high school.[2] Present findings are based on a total analytic sample of 7,838 students (Exhibit 1). Fifty-three percent of the sample was female, 44% identified as Asian, and 43% identified as Latino. Two-thirds of students were enrolled in the Free and Reduced Price Lunch (FRPL) program, 15% were classified as English Language Learners (ELLs), and very few were Special Education students (1% of the sample). Compared to recent district demographic data, the study sample contained a greater proportion of female, Asian, and Caucasian students, and a lower share of male, Latino, students of other race/ethnicities, Special Education students, and ELLs.

EXHIBIT 1. Demographic characteristics of the study sample vs. district enrollment in 2012-13

	SAMPLE		DISTRICT 2012-13	
STUDENT CHARACTERISTICS	**N**	**%**	**N**	**%**
Gender				
Male	3,712	47%	24,326	51%
Female	4,120	53%	23,273	49%
Race/ethnicity				
Asian	3,447	44%	15,673	33%
Latino	3,345	43%	25,467	54%
Caucasian	924	12%	4,721	10%
Other*	112	1%	1,738	4%
English Language Learner	1,151	15%	18,831	42%
Free and Reduced Price Lunch	5,169	66%	30,326	65%
Special Education*	117	1%	4,987	10%
TOTAL	7,838		47,599	

**Note:* Other race/ethnicities include African Americans; American Indian or Alaska Natives, Native Hawaiian or Pacific Islanders, Filipinos, and Multi-racial students. Estimates for Special Education students come from the 2011-12 academic year; data for the 2012-13 academic year were not yet available.

[2] The filters to the data were necessary to construct the most appropriate sample to address the research questions; these exclusion criteria should be considered when interpreting the results. Further, given the data, we were unable to investigate how course placements in mathematics shaped the outcomes of students who did not successfully earn a diploma from GGUSD.

Research Question #1: What different math trajectories do 7-12th grade students experience in the Garden Grove Unified School District? What are the characteristics of students who enter into these different trajectories (e.g., gender, race/ethnicity, English learner status, socio-economic status, prior achievement)?

To answer the first research question, we engaged in a series of discussions with district officials about how students were placed in math. The district's philosophy is for educators at the school level to place students in the next sequential math course based on past performance, state standardized test scores, and teacher recommendation. Based on district guidance, policy documents (e.g., 7-12 Placement Guidelines), and course information obtained from students' 12th grade administrative records, we categorized students into four course-taking tracks relative to their progress in meeting A-G requirements (Exhibit 2).

EXHIBIT 2. Math course-taking sequences (as observed in the 12th grade)

COURSE-TAKING SEQUENCE	DESCRIPTION	N	%
ON TRACK – Basic	Completed Algebra II by the end of their senior year	1,728	22%
ON TRACK – Intermediate	Completed Trigonometry or Precalculus by the end of their senior year	3,931	50%
ON TRACK – Advanced	Completed Calculus by the end of their senior year	1,799	23%
OFF TRACK	Student was never enrolled in Algebra II at any time between grades 8 and 12	380	5%
	TOTAL	7,838*	100%

**Note:* Due to missing data, we were unable to categorize 33 students into a math course-taking category.

A majority of students were On Track for meeting A-G requirements, affording these students the possibility of enrolling in the required number of courses necessary to be eligible into the California State University and University of California systems. To further examine differences among these On Track students, we divided them into three groups: Basic students were those who had successfully completed Algebra II by the end of their senior year; Intermediate students were those who completed either Trigonometry or Precalculus by the end of 12th grade; and Advanced students were those who completed Calculus by the time they graduated. We considered students to be Off Track for meeting A-G requirements if they failed to enroll in Algebra II by the end of their 12th grade year.[3] We report the demographic breakdown of each course-taking sequence in Exhibit 3.

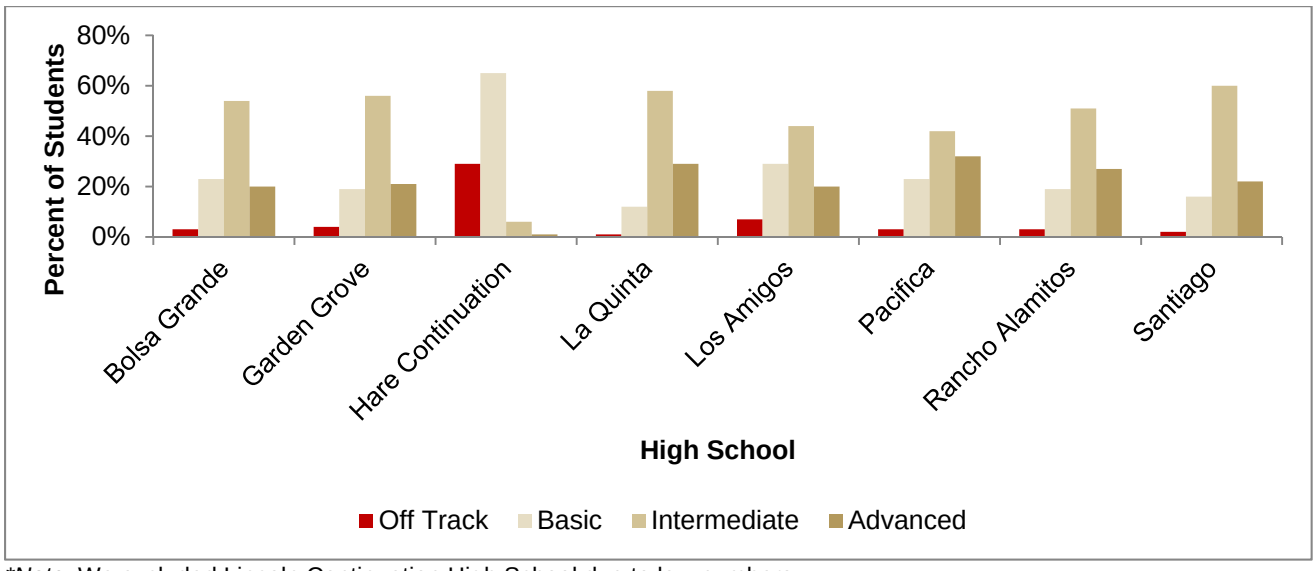
[3] Students are able to graduate from the Garden Grove Unified School District without meeting the A-G requirements.

EXHIBIT 3. Demographic breakdown of each course-taking sequence (as observed in the 12th grade)

	OFF TRACK	ON TRACK – Basic	ON TRACK – Intermediate	ON TRACK – Advanced
Gender				
Male	54%	49%	45%	50%
Female	46%	51%	55%	50%
Race/ethnicity				
Latino	78%	61%	43%	16%
Asian	9%	22%	43%	75%
Caucasian	11%	14%	13%	8%
Other	2%	3%	1%	1%
English Language Learner	44%	24%	13%	4%
Free and Reduced Price Lunch	76%	70%	66%	60%
Special Education	9%	2%	1%	<1%
TOTAL	100%	100%	100%	100%

We observed slightly more males in the Off Track course-taking sequence (54%) and slightly more females in the Intermediate track (55%). Also, a greater proportion of Latinos as well as English Language Learners were Off Track for meeting A-G requirements (78% and 44% respectively), while Asians tended to be more on the Advanced course-taking sequence than any other identified racial/ethnic group. Most students, regardless of their track, were enrolled in the Free and Reduced Price Lunch program. Additionally, we explored whether there were systematic differences among district high schools in how students were being placed in math (Exhibit 4).

EXHIBIT 4. Percent of students in each math course-taking sequence by high school, as observed in the 12th grade*



Note: We excluded Lincoln Continuation High School due to low numbers.

We discovered that a majority of students across schools were on the Intermediate track. We also observed that the schools with the greatest share of students on the Advanced track were Pacifica High School (32% of its students) and La Quinta High School (29% of its students); this finding may not be surprising given that Pacifica High School and La Quinta High School had the two highest graduation rates at 95% and 91% respectively. Further, according to records from the California Department of Education,[4] Pacifica High School had the lowest share of students enrolled in the Free and Reduced Price Lunch program (25%) and the largest proportion of Caucasian students (50%) of any high school in the district, while La Quinta had the highest share of Asian students (77%).

Unlike these schools, we found that Hare Continuation High School had the largest proportion of students Off Track for meeting A-G requirements (29% of its students); the school also enrolled many students on a Basic course-taking path, where students were only able to complete Algebra II by the time they exited the district. Likewise, this finding may not be surprising given that students are often placed in continuation schools because they need additional supports; all students enrolled at Hare Continuation High School, for instance, are credit deficient and are unable to graduate from a comprehensive high school in the district. Additional qualitative research that examines the types of supports continuation high school students receive to help ensure their success in math may help shed further light on the variation in course-taking patterns.

In all, our data indicate that while most students were On Track for meeting A-G requirements, there were racial/ethnic differences within this course-taking pathway where Latino students were often found enrolled in a less rigorous sequence compared to their peers; consequently, these students were exposed less to high-level courses such as Calculus. In addition, our analysis show few differences among district high schools in how students are placed in math, indicating that educators in GGUSD are striving to keep students On Track and enrolling them in courses that help prepare them for college. Together, these findings suggest that school differences in students' course-taking may be correlated with students' demographic characteristics.

Research Question #2: Are students in certain math trajectories more likely to pass the math portion of the California High School Exit Exam (CAHSEE)?

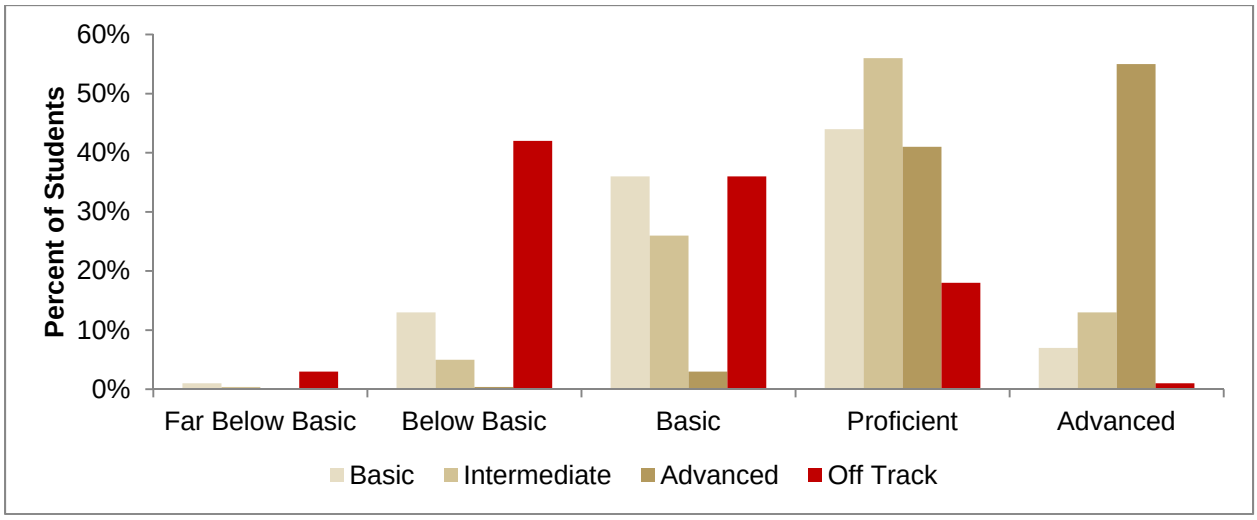
We investigated whether students in particular course-taking sequences were more or less likely to pass the mathematics portion of the California High School Exit Exam (CAHSEE). The mathematics portion of the CAHSEE addresses state academic content standards in grades 6-8 and Algebra I. We discovered that nearly all graduating students, regardless of their course-taking sequence in math, had similar pass rates. Students on the Intermediate and Advanced tracks had a 100% pass rate, while Basic and Off Track students were close behind at 99% and 96%, respectively. These findings are perhaps not surprising given that students in our analysis

[4] http://www.ed-data.k12.ca.us/Pages/Home.aspx

are those who successfully graduated from GGUSD having completed at least Algebra I.

We also investigated students' performance levels on the California Standards Tests (CSTs) in Algebra I, Geometry, and Algebra II according to their course-taking track in math.[5] In all, we observed that students' achievement levels on these exams reflected the rigor of their course-taking placements (Exhibits 5-7). That is, students in a highly rigorous track tended to score Proficient or Advanced on these exams, while those on a less rigorous track tended to score Basic or Far Below Basic. For instance, for Algebra I, we found that 42% of Off Track students scored at the Below Basic level; 56% of Intermediate students scored Proficient; and 55% of Advanced students scored at the Advanced level (Exhibit 5).

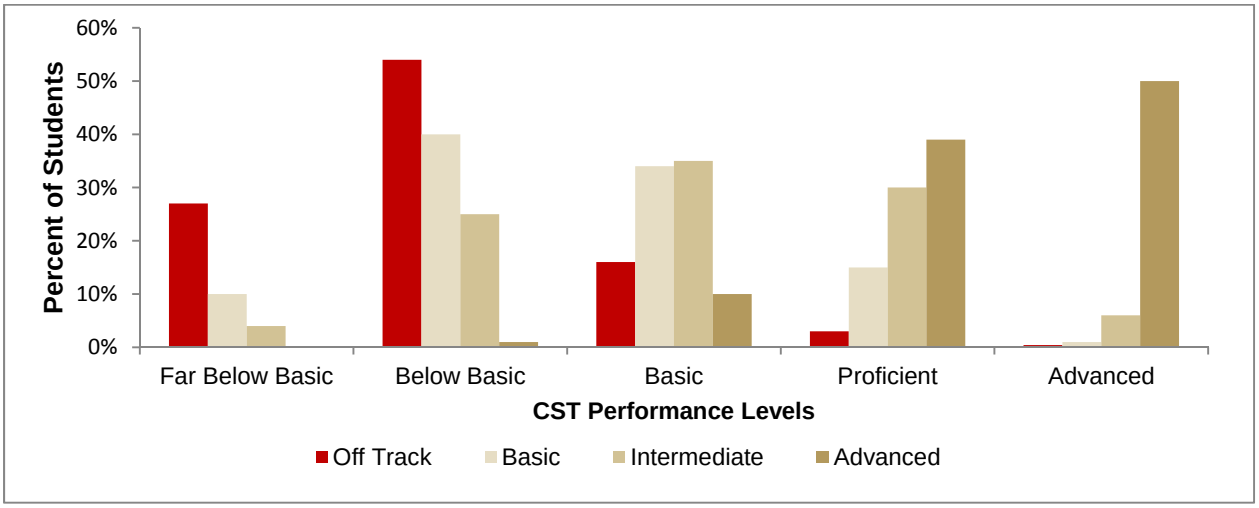
EXHIBIT 5. CST Algebra I performance levels by math course-taking sequence



[5] We observed that students in our analysis took the CST that corresponded to the course they completed that year. For example, students enrolled in Algebra I in the 8th grade took the Algebra I CST upon course completion.

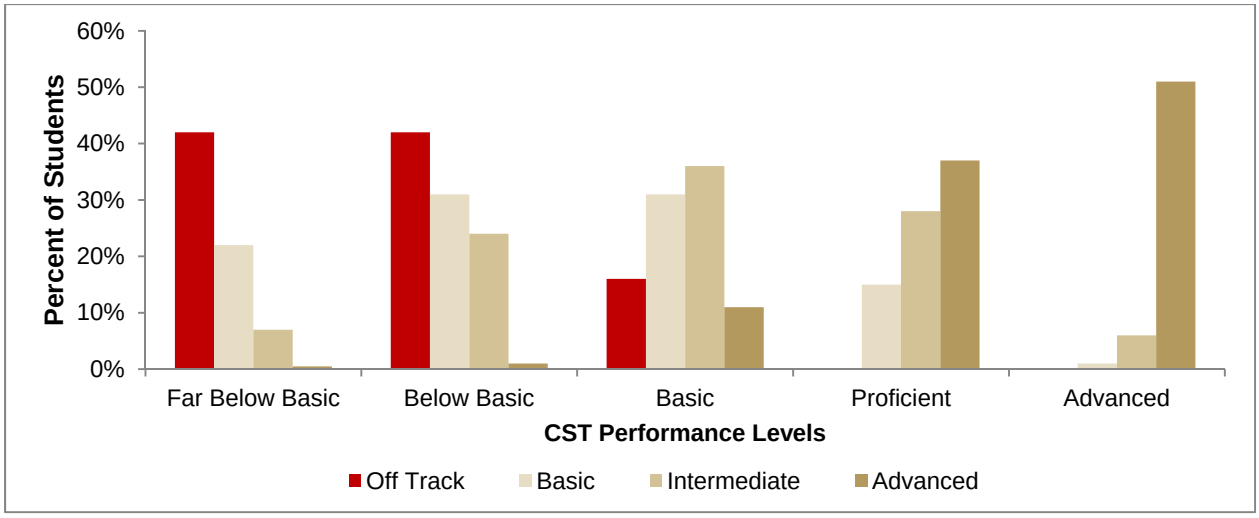
Similarly, for Geometry, we observed that more than half of Off Track students scored Below Basic, and 50% of those on an Advanced math pathway scored Advanced (Exhibit 6).

EXHIBIT 6. CST Geometry performance levels by math course-taking sequence



This finding also holds true for Algebra II (Exhibit 7).

EXHIBIT 7. CST Algebra II performance levels by math course-taking sequence



Overall, our findings show that students enrolled in a lower-level track not only complete fewer math courses in their high school career than their peers in more rigorous tracks, they also do not perform as well on the state's math assessments. These results demonstrate that students' experiences across these course-taking pathways differ in meaningful ways.

Research Question #3: What are the characteristics of students who deviate from their initial trajectory? Are students in certain math trajectories more likely to diverge from their trajectory because of course failures and, as such, fail to meet A-G requirements?

For the third research question, we investigated the proportion of students who began their math course-taking in the 8th grade in one pathway but wound up in another pathway by the end of their 12th grade year. We discovered that relative to Off Track students, those who started in an Intermediate or Advanced pathway were likely to remain there throughout their high school career (Exhibit 8).

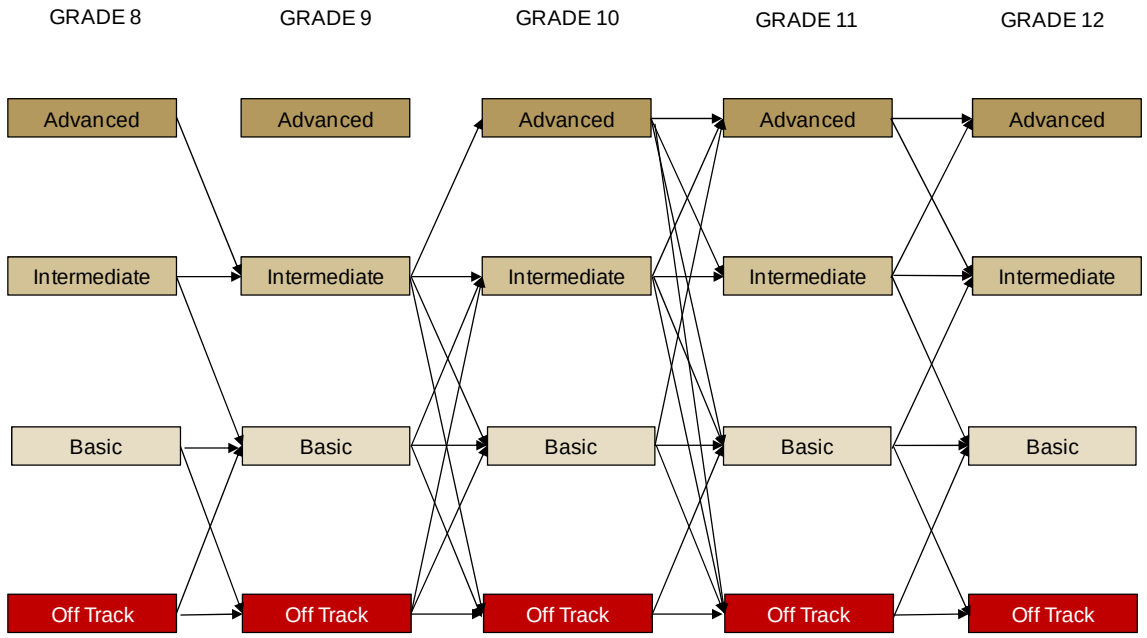
EXHIBIT 8. Initial course-taking sequence in grade 8 vs. final course-taking sequence in grade 12

INITIAL COURSE-TAKING SEQUENCE IN GRADE 8	FINAL COURSE-TAKING SEQUENCE IN GRADE 12								TOTAL	
	OFF TRACK		ON TRACK – Basic		ON TRACK – Intermediate		ON TRACK – Advanced			
	N	%	N	%	N	%	N	%	N	%
OFF TRACK	1	50%	0	0%	1	50%	0	0%	2	100%
ON TRACK – Basic	371	6%	1,670	28%	3,382	56%	607	10%	6,030	100%
ON TRACK – Intermediate*	0	0%	0	0%	1	25%	3	75%	4	100%
ON TRACK – Advanced	8	<1%	58	3%	545	30%	1,189	66%	1,800	100%

**Note:* The four Intermediate students above enrolled in Algebra I and Geometry in the same year.

Our data contained very few 8th grade students who were Off Track, because a majority of GGUSD students (88%) were enrolled in Algebra I. The high number of students enrolled in Algebra I is consistent with state standards and assessments, which have been designed to support the expectation that all students in the state should take Algebra in the 8th grade (Liang, Heckman, & Abedi, 2012). As such, most 8th graders in this analysis were considered to be in the Basic category. We also observed that more than half of students (56%) who began a Basic course-taking sequence transitioned to an Intermediate sequence by the end of their senior year. Lastly, we found that a majority of students (66%) who began in an Advanced pathway remained there until they graduated. To understand when most students' course-taking patterns were more likely to shift (either to a higher- or lower-level track), we provide a diagram in Exhibit 9.

EXHIBIT 9. Grade-level transitions in students' math course-taking sequence



Examining the diagram from left to right, we observed that a majority of students who changed from their initial math sequence in the 8th grade did so either during the transition between grades 9 and 10 or grades 10 and 11 (as depicted by the density of pathways between these grade levels). For example, we found evidence in the data that it was possible for students in a Basic course-taking path in 9th grade to transition to any of the other tracks in the 10th grade. Similarly, during the transition from grades 10 to 11, we discovered that it was possible for those who were in an Off Track pathway to either remain in that trajectory or move on to a more rigorous course-taking sequence. We assumed that these shifts in students' pathways were due to students either repeating a course or enrolling in multiple courses in a given year. Additional research, potentially using qualitative methods, may help elucidate the processes and mechanisms underpinning these shifts in course-taking, particularly those that occur mid-year.

In addition to analyzing when students shifted in their course-taking, we investigated if certain math courses were systematically linked to students' deviation from their initial pathway. We found that among those who "fell out" of their initial sequence and on to a lower track (e.g., going from an Intermediate pathway to a Basic pathway), 38% were enrolled in Algebra I, 22% were enrolled in Geometry, and 21% were enrolled in Precalculus. Thus, not completing Algebra I generally meant a shift to a decreased course-taking sequence, resulting in fewer chances to enroll in high-level math. Among students who "moved up" from their initial trajectory and on to an increased pathway (e.g., going from an Intermediate to an Advanced track), we found that 53% were enrolled in Algebra II prior to the shift in their course-taking, 24% were enrolled in Geometry, and 10% were enrolled in Algebra I. For these students, succeeding in Algebra II secured their opportunities to take part in more rigorous courses.

EXHIBIT 10. Probability that a student would experience a decreased shift in their math course-taking sequence (n = 26,804)

	PROBABILITY
Prior track	
Off Track	not applicable
Basic†	5%
Intermediate	4%*
Advanced	13%*
Gender	
Male†	7%
Female	6%*
Race/ethnicity	
Asian	4%*
Latino	10%*
Caucasian†	8%
Other	11%*
Free and Reduced Price Lunch	
No†	6%
Yes	7%*
English Language Learner	
No†	6%
Yes	10%*
Special Education Student	
No†	6%
Yes	13%*
Grade level	
8	10%*
9	<1%*
10	8%*
11	6%*
12†	21%*

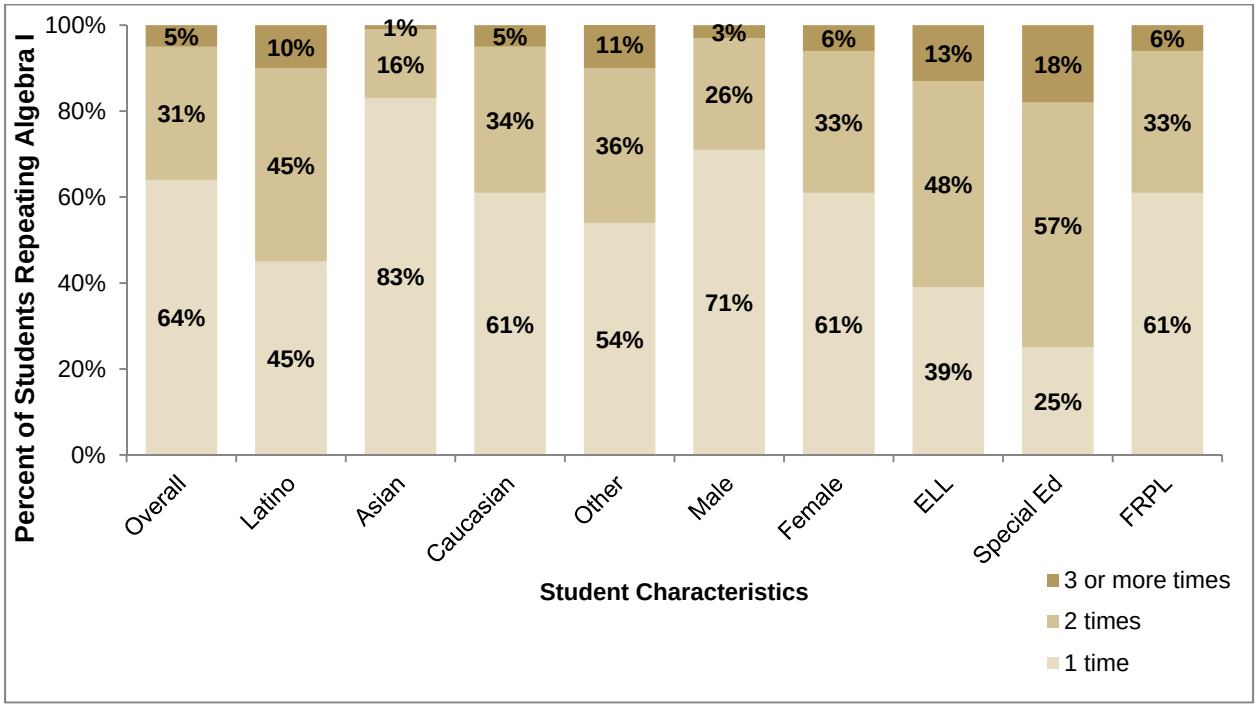
* Statistically significant difference
† Denotes the comparison group for that particular demographic category (e.g., Caucasians served as the reference group for comparing differences among racial/ethnic groups)

To ascertain which factors were predictive of a decrease in students' course-taking sequences, we estimated a series of statistical models that accounted for the influence of student- and school-level characteristics (Exhibit 10). We observed that compared to students who were previously enrolled in a Basic track, Advanced students had a 13% likelihood that they would experience a decrease in their math course-taking pathway. Relative to males, females were less likely to "fall out" of their initial pathway (6%). Likewise, when compared to Caucasian students (11%), Asian students were less likely to transition on to a less rigorous track (4%), while Latinos (10%) and those of other race/ethnicities (11%) were more likely. English Language Learners (10%), Special Education students (13%), and students enrolled in the Free and Reduced Price Lunch program (7%) were also more likely than their counterparts to transition to a lower sequence. Finally, we observed that relative to seniors (21%), students in all other grades were less likely to experience a decreased shift in their math course-taking sequence.

Research Question #4: What are the demographic and educational characteristics of students who repeat Algebra I?

For the final research question, we examined the characteristics of students who had to retake the Algebra I course (Exhibit 11). Examining this population, we found that 64% of these students repeated the course once, 31% repeated it twice, and 5% repeated it three or more times. We discovered that of the Asian students who had to take the course again, 83% of them repeated it once. By contrast, among Latinos, we found that 45% of them repeated the course twice, and, among those who identified with other race/ethnicities, 11% had repeated the course three or more times. Looking at gender differences, we found that 33% of females repeated the course twice versus 26% of males. We also observed that among repeaters, 39% of ELLs, 25% of the Special Education students, and 61% of students enrolled in the Free and Reduced Price lunch program repeated the course once during their high school career.

EXHIBIT 11. Percent of students who repeated Algebra I at least once, by their demographic characteristics



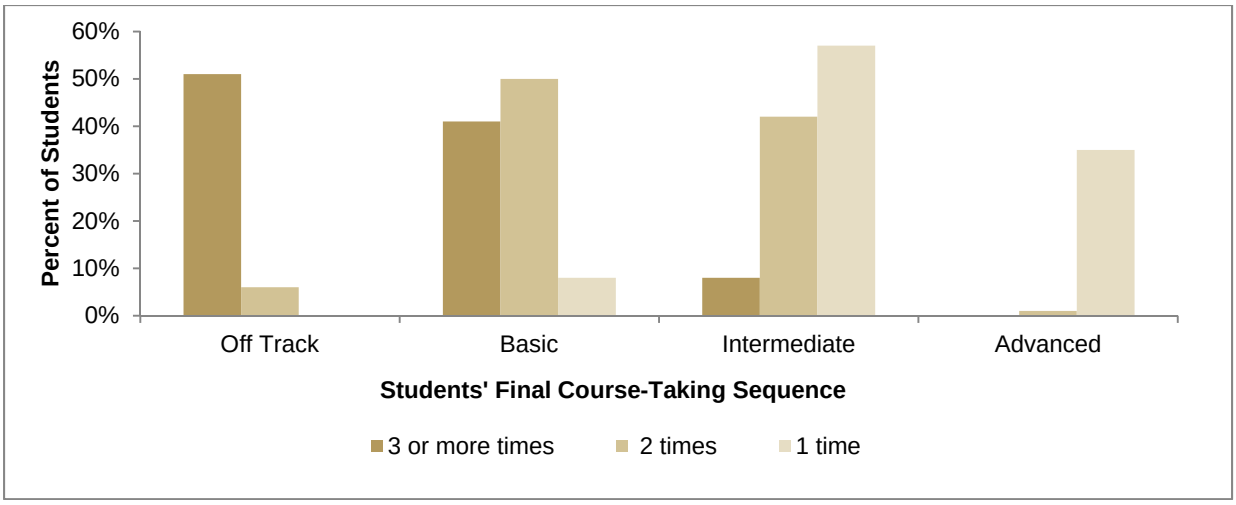
After examining the demographic characteristics of students who repeated Algebra I, we investigated their performance levels on the Algebra I, Geometry, and Algebra II CSTs, as well as the math section of the CAHSEE. Overall, students who had to repeat the course three or more times performed poorly on these assessments relative to those who had to repeat the course only once. For instance, looking at those who had scored Proficient on the Algebra I exam, 54% had repeated the course once, while 21% had repeated it three or more times. Similarly, for Algebra II, those who scored at the Far Below Basic level, 28% were students who had repeated Algebra I three or more times. Among those who scored at the Advanced level on

the Algebra II CST, 22% had repeated Algebra I only once. Therefore, according to our data, it was possible for those who repeated Algebra I once to score Proficient or higher on later exams.

With regards to the CAHSEE, we observed that repeating Algebra I had little influence on whether or not students were successful on the math portion of the exam (i.e., scoring the requisite 350 they need to meet the CAHSEE requirement); those repeating the course three or more times, for instance, still had a 98% pass rate.

While repeating Algebra I multiple times had little influence on the students' pass rates on the CAHSEE, it did influence their course-taking sequence (Exhibit 12). We found that 51% of students who had to retake Algebra I three or more times ended up in the Off Track or remedial category, while half of the students who repeated the course twice ended up in the Basic pathway, and 57% of those who retook the course once ended up in an Intermediate course-taking sequence by the end of their senior year. Results suggest that even though these students had to repeat Algebra early in their high school career, it was still possible for some of them to wind up on an Advanced track and pursue rigorous courses.

EXHIBIT 12. Students' course-taking pathways as observed in the 12th grade, by Algebra I course frequency



Implications

In response to concerns of school leaders in the Garden Grove Unified School District, the present study closely examines students' enrollment patterns or trajectories in math using data from four cohorts of students who have graduated from the district in the past four years. The analyses reveal that an overwhelming majority of students are being placed in Algebra I in the 8th grade, which positions them to be On Track for meeting the minimum A-G requirements necessary for admission to the California State University and University of California systems. This decision to place most students in 8th grade Algebra is consistent with the view of many

educators and policymakers today, who see Algebra as the "gateway" course that will allow students to take on advanced mathematics that prepare them for the rigors of college-level work (Adelman, 1999; Horn & Nuñez, 2000; Riegle-Crumb, 2006). Educational reform policies throughout the country, including those led by the College Board (e.g., Equity 2000) have meant a significant increase in the number of 8th and 9th graders enrolled in Algebra I (National Center for Education Statistics, 2005). In fact, in California, the percentage of students in grade 8 taking Algebra I steadily increased from 32% in 2003 to 58% in 2008 (Rosin, Barondess, & Leichty, 2009).

The present analysis raises important policy and practice implications. Findings suggest that **educators must decide how to balance early access to advanced mathematics with students' preparation, particularly students from minority and disadvantaged backgrounds**. Similar to other studies (e.g., Loveless, 2008; Riegle-Crumb, 2006), we observed that placing all students in 8th grade Algebra does not necessarily lead to all students taking advanced mathematics in high school. Present findings show that racial/ethnic disparities exist, where Latino students, relative to their Caucasian peers, are more likely to diverge from the initial Basic pathway and move on to a general or less rigorous course-taking sequence. Economically disadvantaged students and English Language Learners are also more apt to fall short of a rigorous math course-taking pathway that improves their college prospects. In many respects, these results are not particular to math and reflect the broader educational disparities and opportunity gaps we observe today among low-income and ethnically and linguistically diverse students (Carter & Welner, 2013), particularly males.[6] Further, our analysis suggest that it is critical to start a rigorous course-taking sequence as early as possible, given that 66% of students who begin an Advanced track in grade 8 are likely to remain there until they graduate, thus securing their opportunities to take part in higher-level math. All of these findings are consistent with previous research on students' math course-taking (e.g., Finkelstein, Fong, Tiffany-Morales, Shields, & Huang, 2012; Riegle-Crumb, 2006). Educators in GGUSD may want to engage in further investigation on why these disparities exist (e.g., how is language playing a role in students' math performance; what kinds of language accommodations are necessary?), and brainstorm potential solutions to narrow such gaps.

This study also points to a need to **support students who fail Algebra I, especially those who have to retake the course multiple times to achieve a passing grade.** Current findings show that roughly two-thirds of students in the sample repeated Algebra I at least once, which may signal that some students may have been moved forward despite not being ready for the course; we suspect that this estimate may be higher since the data for this analysis were limited only to students who graduated. Trends seen in GGUSD are consistent with those of the state which demonstrate that in 2008, more than half of 10th and 11th graders who took the CST in Algebra I were repeaters. Taking Algebra again in the later grades is particularly concerning because it may prevent students from enrolling in college-preparatory science courses that have Algebra as a prerequisite (Rosin, Barondess, & Leichty, 2009). Moreover, having to repeat a

[6] http://www.allianceforbmoc.org/

course multiple times (i.e., two or more times) may convince some students that they are unable to succeed in math or in high school more broadly and, as a result, these students may fully disengage and drop out (Roderick & Camburn, 1999). As such, district leaders may want to examine the types and levels of support they provide to students in Algebra I, as well as their practices and policies surrounding students who have to repeat courses in math numerous times (e.g., how is instruction scaffolded for repeating students; do they take the same exact course again?). Leaders may also want to examine how students in need of academic support (in math and other subjects) are identified early and linked with appropriate services (e.g., supplemental instruction, extended learning opportunities).

Lastly, it is important to highlight that as students struggle to pass Algebra, they are also navigating the significant transition from middle school to high school. Past studies have demonstrated that youth during this period in their development experience notable changes in their classroom and school environments that can shape their social, psychological, and academic functioning (Barone, Aguirre-Deandreis, & Trickett, 1991; Barber & Olsen, 2004; Herlihy, 2007). As such, districts may want to implement supports that not only increase students' academic preparation in math but also ease their transition into high school. Intervention strategies may include creating small 9th grade academies, improving communication with students and families on what high school freshmen are expected to know and be able to do, and encouraging partnerships between middle schools and high schools to identify vulnerable students (Kennelly & Monrad, 2007).

In sum, this analysis helps shed light on differences in students' performance levels in specific math subject areas; disparities in students' access to higher-level courses; and differences among schools in the share of students enrolled in remedial-, general-, or advanced-level pathways. Results can also help inform the process by which schools assess students' mastery of math, advise students on their course taking, and make placement decisions. Indeed, with the onset of the Common Core State Standards, many districts, including GGUSD, will need to re-examine their course-taking sequences, teaching capacity, and ability to provide students with supports to ensure a clear path for students to meet the increased demand for advanced-level courses (Williams, Haertel, Kirst, Rosin, & Perry, 2011).

In the next phase of our partnership, we hope to engage with GGUSD leaders and educators in exploring other avenues of inquiry related to students' math course-taking that can enhance the structures, practices, and conditions that promote students' success. Among others, this may include expanding the analysis to include all students, including dropouts; an in-depth analysis of students' course grades in math in earlier grades (e.g., elementary school) and how these grades influence their course placements in middle and secondary school; a qualitative inquiry of why students—particularly Latinos, English Language Learners, and low-income students—are more likely than their peers to deviate from their course taking sequence; or an examination of district and school supports and interventions designed to help students succeed in math.

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John W. Gardner Center for Youth and Their Communities
Stanford Graduate School of Education
365 Lasuen Street, Third Floor
Stanford, CA 94305-2068

650.723.3099
gardnercenter@stanford.edu
www.gardnercenter.stanford.edu