



# HIGH SCHOOL AND COLLEGE READINESS DURING THE COMMON CORE ERA

By Manny Barbara and Deeana Ijaz



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# Introduction

The advent of the Common Core State Standards (CCSS) advanced an agenda for a deeper and more rigorous set of standards. Perhaps the most significant change in instructional expectations in a generation, the CCSS emergence in public education was seismic in its impact on districts, schools and classrooms. In his policy paper titled *The Common Core Meets State Policy: This Changes Almost Everything* (PACE), Dr. Michael Kirst, President of the California State Board of Education, states that *“The Common Core standards provide a great opportunity for improving student attainment, and a great challenge for California to implement. Common Core is much more than just a new array of standards. It provides a new vision for teaching and learning that builds upon what the state began in the 1990s”* (Kirst, 1).

With the adoption of the CCSS, districts found themselves in search of new curriculum materials to deliver the new standards. A new assessment and accountability model was developed to reflect the new standards resulting in the development of the Smarter Balanced Assessment Consortium (SBAC) assessments. The urgency for professional development for staff to deliver the new standards in the classroom was felt throughout the state.

California has made significant changes to its educational system to accommodate the Common Core curriculum. These have included new testing regimes that focus less on multiple choice questions and more on short-answer ones to better grasp a student’s conceptual understanding of the subject matter. Additionally, the state’s Academic Performance Index, a measure of school success designed to improve district and teacher accountability, has been retooled to better reflect the Common Core’s new expectations. The weight of standardized testing has been decreased while the importance of career readiness indices, high school graduation, and dropout rates has been increased. Lastly, California schools have made a renewed effort to better align what juniors and seniors learn in high school with the higher expectations placed upon them once they matriculate into college (Kirst, 5).

That final change is arguably one of the most essential of the attempts to revamp public education. To remain competitive on the global stage as we transition from a manufacturing to a service-based economy, the United States needs to bolster the number of citizens with college degrees. A post-secondary education has many auxiliary benefits ranging from higher rates of civic engagement to better health outcomes. Unfortunately, the changes have not been significant enough to boost the proportion of Californians receiving college degrees (Kobara, 1). Therein lies the crux of this paper: the California school system must better prepare its students for university. There is, however, already a set of instruments, namely A-G courses, that will allow California to succeed in this regard. In the pages that follow, we outline problems within the California public education system that have persisted beyond the implementation of the Common Core and give a set of policy recommendations intended to improve college readiness.

## Not Everything Has Changed...

While the CCSS did, in fact, create a seismic shift throughout the state in both the need for new instructional materials and professional development reflected in the new expected pedagogy, it did not change everything. Under CCSS, one aspect that did not change is the required instructional minutes, and another is the length of the school year. This is in stark contrast to the Hughes-Hart Educational Reform Act of 1983 which added five days to the school year. As recently as the 1990s, districts were able to use five to eight days of school time for professional development purposes. Under the current CCSS system, some schools are barely recovering financially from the most recent recession. Many districts had to reduce the work year in order to meet budgetary restrictions and often have as little as a single day set aside for professional development to address the significant expectations of the CCSS. Even with additional funds, some districts have the added burden of having to negotiate additional professional development time with bargaining units, rather than have them occur as part of the normal work year.

Due to the state's fiscal woes, many of the policies designed to improve teaching have had to rely upon online programs rather than full professional development. While this is obviously better than nothing, there is no true substitute for comprehensive, in-person programs (Kirst).

This paper will advance a position on high school readiness for college from an academic perspective. We will look beyond the focus of what it takes to just enroll in college to what it takes to actually *graduate* from college.

Another critical area not directly impacted by the CCSS was the academic course pathway to the University of California (UC) and California State University (CSU) systems.

The academic path for enrollment within the UC/CSU systems is still through the successful completion of the high school coursework usually referred to as the A-G requirements. These requirements outline 15 required courses that students must take in high school and pass with a minimum of a “C” grade in order to even apply for admission. The letters A-G refer to the corresponding course requirements (see **Figure 1**). Included within the A-G requirements is the math requirement of a minimum of three courses through Algebra II (Algebra, Geometry, Algebra II, or the Integrated Math course sequence I,II,III during the current common core era). The special importance of math will be addressed later in this paper.

**Fig. 1 A-G Course Requirements**

Area	Subject	Units
A	History/Social Science	2 years
B	English	4 years
C	Mathematics	3 years; 4 recommended
D	Lab Science	2 years; 3 recommended
E	Language other than English	2 years; 3 recommended
F	Visual and Performing Arts	1 year (must be consecutive semesters)
G	Elective	1 year

It should also be noted that the A-G requirements with the corresponding three-year math sequence reflect only the *minimum* expectations and allow the student to apply to the UC/ CSU with no guarantee and/or expectation of admission. Students who do not complete the minimum course requirements have the option of enrolling in the state community college system. Challenges faced by community college students who are unprepared have been previously addressed elsewhere, including the importance of math as a predictor of college success (Jaffe, 4). While there are other opportunities for improving college success and readiness downstream, the opportunity cost of later action is significantly higher. We don’t discount the importance of community college, but rather, believe that the most cost-efficient solutions with the highest chance of success are found earlier in a student’s

pathway inside of primary and secondary education classrooms.

There are, of course, other factors involved in determining college readiness. Both socioemotional and non-cognitive factors as well as fiscal variables directly impact student success in college.

The model presented by the Education Policy Improvement Center (EPIC) presents what a high school graduate ought to be able to demonstrate from a behavioral and socioemotional perspective. As developed by David Conley, EPIC identifies *The Four Keys to College Readiness: Think, Know, Act, Go*. Readiness and success are defined by “students’ engagement, adaptability, and what they can do with their knowledge...” (Conley, 1)



According to Conley, decent grades are only the preliminary step toward higher education. Additionally, they need to internalize behavioral and mental paradigms which promote success. Conley lists a number of paradigms, including: the readjustment of learning strategies upon initial failure, understanding of knowledge and success as a function of effort rather than innate talent, the ability to work and learn independently with few prior guidelines and healthy emotive coping mechanisms for stress. These mental frameworks are often found in successful students and professionals.

Teachers often focus on content, which is obviously essential, but they rarely focus on building these socioemotional skills. This is unfortunate since these skills will serve students not only as they apply to college, but also for the rest of their life. A new model of teaching in public schools would create ample room to promote these soft skills in order to guarantee success. Furthermore, social institutions and personal relationships also play an important role in promoting these skills. The earlier these values are instilled, the more likely they are to stick in students' minds and become foundational mindsets.

There are still other factors beyond academic and socioemotional success that determine high school outcomes. Social capital variables can impact college enrollment and subsequent graduation, especially for lower income students. For many, managing the complicated application process as well the high cost of attending college are barriers. Even students who qualify academically for college may still not end up enrolling and attending. A 2008 study of Chicago public high school students found that 73 percent of qualified students planned to attend a somewhat selective college, defined as a school to which a student with at least a 2.0 GPA and 18 ACT score could expect to be admitted. Of those students, only 61 percent had applied to a four-year college in the fall (Nagaoka et al. 15).

There are a variety of explanations for this discrepancy. Financial barriers coupled with our country's labyrinthine financial aid programs often make it incredibly difficult for students to find funding. Additionally, many of those students who are qualified to attend a four-year college instead opt to attend a two-year program or vocational school. While these are both fine choices, neither carries the wage-premium that a bachelor's degree would confer. The highest level of education a student's parents received as well as school culture, are both strong predictors of their attitudes towards degree seeking. These are all important barriers that need to be addressed, though, it's difficult to do so at the local level. There is, however, one blockade that can be addressed at this level: school culture.

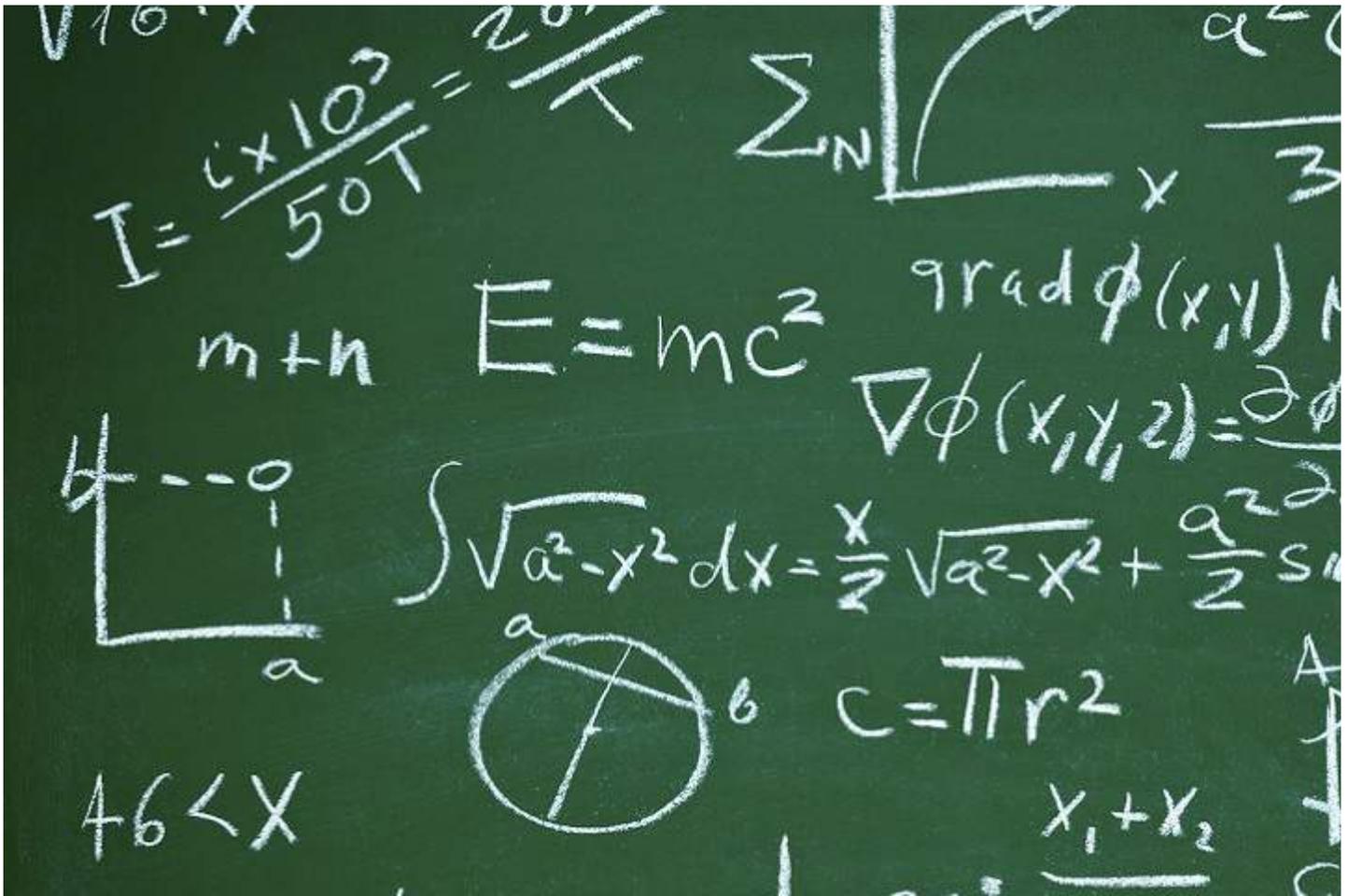
The 2008 Chicago study mentioned above also "asked... all high school teachers about the extent to which students in their school go to college, whether their school's curriculum is geared toward preparing students for college, and whether teachers in their school helped students plan for college outside of class time" (Nagaoka et al 17). The schools where teachers were most involved with their student's college planning, pushed their students the hardest and provided the most support were able to exceed previous models' expectations. This greater involvement made the largest difference for students who were on the bubble of attending a four-year college. Overall, the study found that a school's culture was the biggest predictor of whether a student would take the steps necessary to attend a four-year college.

This is all to say that there are a variety of roadblocks to going to college. Fortunately, there are a variety of policy and programmatic interventions that can be implemented at every stage in a student's career. We cannot understate the importance of the actual learning of content. While non-cognitive and fiscal factors are vital, if students do not meet the minimally necessary academic criteria, then the other variables become somewhat moot. In order to graduate, one must first enroll in college, and in order to enroll in the four-year California university system, there are specific academic criteria to be met.

## Completing A-G Coursework is Good But Not Enough...

Completing the A-G coursework will allow the student to apply to the UC/CSU but it will not automatically get them through the door, let alone ensure that they are actually prepared to do college level work. Common sense dictates that students who take higher level courses in high school are more likely to go on to college; this pans out in the data.

According to a 1999 Department of Education study, students who take Algebra II after completing Geometry were nearly twice as likely to receive a BA as those who stopped at Geometry. Furthermore, students who continue onto Trigonometry were 20 percent more likely to graduate college with a bachelor's in hand. However, this data comes with caveats. Of the students who complete Algebra II successfully, approximately 40 percent can be expected to actually graduate from college. Completing the coursework is no guarantee that the students mastered the content, which may explain the some of the variance of the other 60 percent who do not graduate from college (Adelman, 7). Doing well in a course doesn't necessarily portend mastery. The relationship between passing a course and understanding the subject matter is not absolute.



How do we know if students have mastered the math content of Algebra II (or Integrated Course III)? One aspect of evaluation that we can look to is letter grades in a course because they are reflective of the effort and motivation generated by the student. A 2006 University of Chicago study demonstrates the importance of grades as a predictor of future enrollment in college (Allensworth); grades can demonstrate a student's motivation and willingness to tackle the work.

Unfortunately, grades might not reflect the rigor of a course. Russlyn Ali addressed this in a prior study which showed that course rigor in English varied significantly from class to class. For example, in reviewing an assignment from the same textbook, a rigorous assignment might have included this:

*Describe the fundamental problems in the economy that helped cause the Great Depression.*

*Consider agriculture, consumer spending and debt, distribution of wealth, the stock market.*

We can compare that assignment to a lower level assignment from the same book:

*Role play (Meet the Press) & interview key people of the era*

*Draw a political cartoon highlighting a major event of the time*

*Share excerpts from noted literary authors-Lewis, Fitzgerald, Hemingway, Hughes*

*Listen to jazz artists of the 20's*

*Construct a collage depicting new inventions*

Variation in rigor is not limited to English classes and can vary from class to class in math as well. This variation in performance has been addressed in more detail elsewhere such as Bryk et al.'s *Learning to Improve*.

Variation in the rigor students are exposed to may result in uneven learning patterns across not only a district system but also within the school as a system.

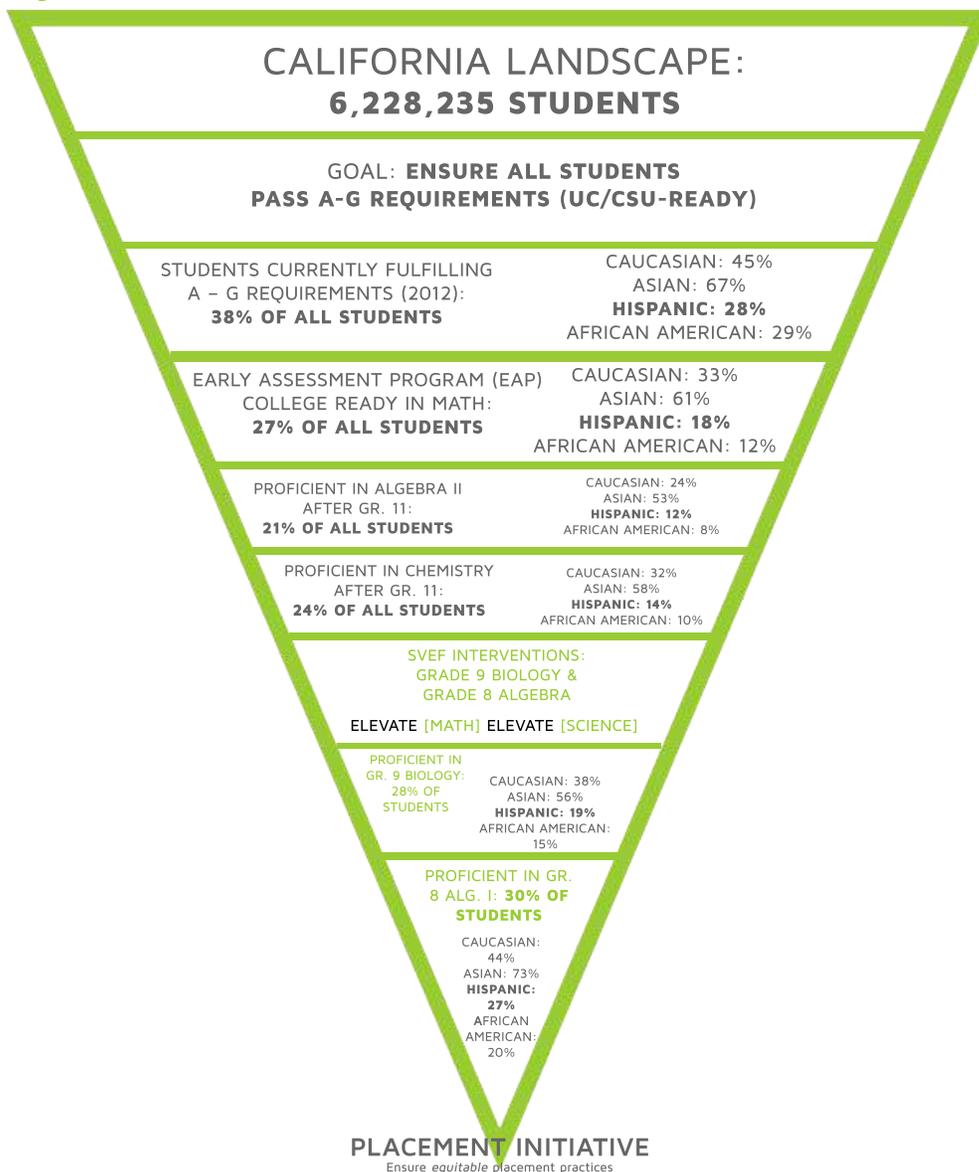
This begs the question: are students actually learning the material that they are expected to learn? A 2009 primer released by The Hechinger Institute sheds some light on that question:

*The ACT testing organization reported in 2008 that more than 75% of students who took and passed a core college-prep curriculum were nonetheless unprepared to do college level work. Nearly half of the 2005 tested high school graduates who earned a grade of A or B in high school Algebra were not ready for college math (Jacobs and Colvin 2).*

Under the prior state accountability system, the *Early Assessment Program* (EAP) provided an indicator as to a student’s readiness for college level math work. Students could choose to extend the Grade 11 state test with an additional 15 questions which assessed mastery of Algebra II. Students who met this criterion were deemed to meet the college math course placement requirement. They were allowed to take college level math in the CSU system. Many community colleges throughout the state who accepted the state test as their placement test.

The prior assessment system also included separate subject matter tests including Algebra II, that provided some indication as to whether the students mastered the Algebra II course content. Figure 2 provides a summary of the California results when the California STAR testing system was still in place in 2013.

Figure 2



Note that while 38 percent of the total student population completed the A-G requirement, only 27 percent passed the EAP grade 11 test. Only 21 percent of those students who chose to take the Algebra II test met criteria. Of this total, only 18 percent of the Latino and 12 percent of the African American student population met standards on this test.

Under the new SBAC testing, the EAP assessment levels have been replaced by meeting the "Exceed Standard" level on the grade 11 math test. Given that the grade 11 SBAC test is the only state assessment administered during high school, the test becomes even more significant because without interim assessments at grades 9 and 10, students may not have a clear indication as to whether they are on track to meet the grade 11 "Exceeding Standards" or minimally "Meeting Standards." Students do not learn if they are ready for the rigors of college until late in their high school experience. For those students especially, the senior year matters as a way to help make up what they might have missed. The importance of taking a fourth year of math has been made clear (Snipes, Jason, et al; Finkelstein et al, REL, West Ed.). A student who completes a fourth year of math almost doubles the probability that they will not just enroll, but graduate, from college (Adelman, 15). Students who complete that fourth year enter college with a better grasp of the skills necessary to complete college. This stronger grasp of the fundamentals will also allow them to take more difficult courses early on.

Remediation can be an important way to bring students up to the level of their peers, but students who enter college without the need for remediation graduate at higher rates than those who take remedial courses. Furthermore, there is significant variation in the effectiveness of remediation courses. A comprehensive study of public colleges in Ohio found that students who take remedial math boost their odds of graduating college by 15 percent compared to peers with similar scores on test assessments. A course in remedial English confers a nine percent boost.

However, due to the variation in the teaching methods and expectations of remedial courses, they are not effective on the aggregate. In fact, there is some evidence which suggests that remediation can have a negative effect on graduation rates. Often times remedial classes do not count towards degree prerequisites and force a student to attend college for a longer period of time (Bari).

The length of time it takes for a student to receive a degree has been negatively correlated with graduation rates. In part, this is due to academic attrition. The possibility of running out of financial aid is also a key factor in the lack of success of remedial courses. If students must take remedial courses which don't give them credits necessary to graduate, then they must spend a greater amount of time in college which puts a larger strain on their pocket books.

Clearly, colleges need to reexamine how they teach remedial courses. Bridget Terry Long, the dean of Harvard's School of Education, argues that increasing the accuracy of assessments and providing more support for students taking remedial courses are both remedies to the remedial dilemma. However, interventions in high school can avoid this problem altogether by better aligning their curriculum with that of a university setting and raising the standards placed on their student body.

In addition to changing the way courses are taught in high school and college, we need to reexamine the courses required for a degree. The chancellor of the California Community Colleges, Eloy Ortiz Oakley, recently argued that the biggest stumbling block for students entering California's community college system is the required completion of Algebra II. One way to sidestep Algebra II as a barrier for students to graduate at least from community college system is the current suggestion by Oakley to simply eliminate that requirement for non-STEM majors.

Perhaps another alternative is to focus on what we need to do so that students are better prepared to handle more rigorous coursework at the college level. There's value in both approaches and there may be ways to integrate them. A deeper understanding of math early on will open the door to a bachelor's degree while removing the requirement for an associate's degree may help build student confidence, so they're more likely to pursue a bachelor's later in life. Taking a multi-pronged approach to target the maximum number of students is essential for any serious education reform. These administrative changes are unfortunately outside the scope of this paper, but should be considered in-tandem with alterations to curriculum.

# Enrollment vs. Completion

College enrollment among low SES (socioeconomic status) students has declined since 2008 although more students have graduated from high school (Heller). Finances are a variable impacting college enrollment. Being able to enroll in college is not the same as being prepared to do college level work and eventually graduate from college. While overall college enrollment for all students has increased, college completion has not. As Michael Petrilli stated:

*What to make of all this? To our eyes, these pictures help explain why America's college matriculation rate is up but its college completion rate is not: We've succeeded at motivating more young people to enroll, but we haven't prepared more of them to succeed at it. All of the higher education reforms in the world—"fixing" remedial education, providing additional supports to students, easing the debt burden, making community colleges "free"—won't add up to a hill of beans unless our K-12 system gets a lot better at producing young people with the academic skills to succeed once they arrive on campus. (The alternative is to make college easier, which would only diminish the value of completing it.)*

As to why enrollment has declined, suggestions included:

1. A rapid increase in cost of college discouraging low income students in particular, including attendance at for-profit institutions.
2. A lack of appreciation of the economic value of a college education.
3. An increase in low income students entering the workforce because of job availability.
4. Incorrect data.

The data provided was unsettling as the author pointed out:

*These data are even more worrisome with this fact in mind: While the percentage of low-income students in elementary and secondary schools is increasing, the percentage of low-income students who go on to college is falling. Said a bit differently, at the same time that low-income individuals are enrolling in college at lower rates, the majority of young adults in the pre-college education pipeline are from those same low-income communities. A recent Southern Education Foundation report showed that for the first time in recent history, low-income students are a majority of the children attending the nation's public schools.*

*And as the Pew Research Center noted last year in its report, The Rising Cost of Not Going to College, "On virtually every measure of economic well-being and career attainment—from personal earnings to job satisfaction to the share employed full time—young college graduates are outperforming their peers with less education. And when today's young adults are compared with previous generations, the disparity in economic outcomes between college graduates and those with a high school diploma or less formal schooling has never been greater in the modern era.*

## Why College?

There are some who might resist this emphasis on going to college, stating that not everyone will attend and even fewer will graduate from college. This is, of course, a true statement, the real issue is who gets to make that decision. Whether to attend college or not should be dependent on the students themselves (with encouragement from their parents). The system, meaning the educational institutions, should break down the barriers that get in the way of providing students with that option. In an ideal society, if a student chooses to not attend college as a matter of total personal agency, then we should understand that choice and have systems in place to support them in other tracks. However, the nature of our school system means that few students make that decision independent of the dominant overarching cultural, political and financial institutions. Thus, we need to better understand why students choose to not attend college and work towards breaking down those barriers.

In recent years, there has been decreasing confidence in the value of a college education. A 2016 Public Agenda survey found that 14 percent more people said that “there are many ways to succeed in today’s work world without a college degree.” That’s a startling jump from 43 to 57 percent in just seven short years. Particularly when one considers this data within the context of a Bureau of Labor Statistics study, which projects that by 2018, 63 percent of all jobs will require a post-secondary education, whether that is a Bachelor’s or Associate’s degree (Carnevale, Smith and Strohl).

We shouldn’t expect either of these trends to reverse on their own. Automation and outsourcing mean that manufacturing jobs, which were the heart of the industrial American economy, are slowly going extinct. We fundamentally cannot change the macroeconomic trends that are shaping the world. However, policy makers can fight against the growing distrust of a college education. Combatting issues previously outlined in this paper (the increasing out of pocket cost of college, cultural perceptions of a college education, strict requirements for a degree and a lack of continuity between secondary and post-secondary education) will help bring college back to the forefront as the premier source of upward economic mobility and security.

We cannot understate the importance of a college education to our society. Our conclusion, as well as that of most education reformers, is backed by a wealth of data. The U.S. Census Bureau has reported that those with bachelor’s degrees earn nearly 2 million dollars, associate’s degrees nearly 1.5 million dollars, and high school diplomas nearly 1.2 million dollars during their careers (Day and Newburger). The average family pays just under \$24,000 each year for a college education. Extrapolated over four years, one could expect a family to pay approximately \$100,000 when other fees (travel, books, living expenses) are considered. Even with this staggering price, the return on investment for a college education is higher than any other investment, including traditional wealth building measures such as a mortgage and 401K. There’s no substitute for a college education in modern America, and policy makers concerned with inequality have a clear moral imperative to get more students graduating college.

Some have suggested that rather than focusing on college completion we ought to focus on college alternatives for students who do not graduate from high school academically prepared for college.

This perhaps might be marginally acceptable if it wasn't for the fact that as it stands now there is a significant racial achievement gap in the demographics of who is currently graduating academically prepared for college. While the number of white, black and Latino high school graduates and college students is at rough parity relative to population size, only 9 percent of African Americans and Latinos hold a bachelor's degree (Krogstad and Fry). The graduation rate for African Americans lags 20 points behind that of whites. Much of this discrepancy is the result of differential levels of college readiness. White students are four times more likely to meet the benchmarks for science and math than Black students. Only 14 percent of African Americans meet the math readiness benchmark set by the ACT. This is largely due to unequal local educational resources and not, as some commentators have claimed, the result of African Americans disdaining higher education. In fact, African American and Latino parents are significantly more likely to say that it's essential for their child to earn a college degree than white parents.

Exacerbating this problem of unequal education is the eternal question of paying for college. While different racial groups pay similar amounts of money for college – and African Americans and Latinos may pay slightly less than their white counterparts – minorities on the aggregate have lower incomes and less wealth, which means their ability to pay is significantly lessened (Wellman, 1).

Once we reach true equity in learning opportunities provided to students across all socioeconomic strata, then we can focus on those who are already prepared. In the meantime, to focus only on those prepared would result in a permanent underclass consisting of predominantly lower socioeconomic students and those of color.

There are other ways to be successful and college does not guarantee success in whatever way one chooses to define it. It does however increase the probability and options of careers and increased financial independence.



An increasing number of employers have raised the educational bar required for white-collar jobs. A 2017 CareerBuilder.com survey found that 41 percent of firms now hire college graduates for roles that were previously accessible to people with only high school degrees. This effect has rippled up the corporate hierarchy; 37 percent of those firms now seek applicants with master's degrees for positions that previously may have required a bachelor's degree.

While lacking a bachelor's doesn't lead to an instant rejection – there are still plenty of companies willing to hire qualified candidates with just a high school degree – it certainly increases the probability of increased options.

## College Attendance Vs. College Completion

According to a recent study by the Education Trust, nearly 600,000 students attend colleges that meet minimum standards and have dropout rates of over 85 percent. These dropouts who do not finish college usually have lower wages than college graduates of both four-year institutions and community colleges. Students at community colleges also improve or develop cognitive abilities at nearly the same rate as students at traditional colleges and universities. Tuition expense is a large differentiating factor between 4-year schools and community colleges, with students attending 4-year institutions paying more. Since cognitive skills development improves at nearly the same rate at both types of institutions, and community college is less expensive, individuals who are not committed to graduating should attend community college. Those who enter four-year colleges or universities should commit to obtaining a degree because of the time and financial commitment made any year during college.



# Benefits of Higher Education

Besides higher wages, there are numerous other benefits associated with graduating from college. Many college graduates enjoy the opportunity to work where they want to live, have more time for recreation, and have a higher standard of living. Some of the greatest benefits of a college education are experienced during school. Students have the opportunity to learn about different cultures and engage in activities and experiences that happen exclusively during those four years. They are also introduced to theories and unfamiliar ideas they might not learn about without attending college.

Research also indicates that many college graduates have healthier lifestyles and perceive themselves to be healthier than high school graduates at the same age. This “health premium” is more than 10 percent across all age ranges and is most pronounced among those with less income.

This isn’t just someone’s self-rated perception of health: college graduates have a higher life expectancy than their counterparts by seven years. College graduates are also significantly less likely to smoke and be incarcerated than those with just a high school degree (Baum, Ma and Paeya 39). It’s reasonable to expect that college graduates will pass this improved lifestyle down to their children, creating a ripple effect for generations to come.

We also can’t discount the quality financial benefits that a college education portends. While the wage premiums of a bachelor’s are well documented and known by the general public, there are other financial benefits. College graduates are able to save money for retirement and do so in more financially secure ways. Lastly, the government spends between \$800 and \$2,700 less per year in social services and programs for college graduates, even when controlling for race, income and geography. Although, college educated workers do not contribute as much to our tax base with their higher wages, they save us money in the long-term. Just like the aforementioned health benefits, we should expect this greater financial literacy to be passed down to the next generation and improve their financial security.

There are also a wide array of benefits to our civic society. College graduates are three times more likely to donate to charity, offer three times as many hours of community service and vote at a much higher rate. Perhaps most importantly, college graduates tend to be happier people. That’s often discounted in conversations about the role of a college education, but in a way, the goal of all social programs is to increase public welfare and happiness. There are no two ways about it: our society benefits in a variety of ways when more people go to college.

While the benefits of attending college are understood, whether or not a student attends college should be a matter of choice. Early decisions on courses in high school can have a direct impact on a student's options for college upon graduation. While there should exist multiple pathways that a student may follow, their choices should be informed with a clear understanding of the implications of decisions made early on in the educational timeline. In conjunction with students, parents also need to be more informed of the long-term impact of success in math, especially in middle school.

## College Begins in Middle School

According to WestEd, a San Francisco based non-profit, college readiness starts in middle school. There are plenty of reasons why this is the case. Math performance as early as seventh grade can predict what classes students go on to take throughout the remainder of high school. Furthermore, students who lag in Algebra I and retake the course are unlikely to pass it a second time. Only between 9 and 21 percent of students who retake Algebra 1 ultimately demonstrate mastery of the subject matter. This means that a single suboptimal performance when a student is only 12 years old can have long-lasting effects for the remainder of a student's academic career. Many families only begin thinking seriously about college when their student is in the 10<sup>th</sup> grade, but for many, the chance to reverse that trend has already passed. This is not acceptable; we need students and families to understand the importance of planning for college early on. That means ensuring success in math as early as the 7<sup>th</sup> grade.

# Competitive Admission and STEM Fields: How Can Students Keep Up?

There's also a growing trend of California universities. UCLA only accepted 16 percent of students in 2017 with the average score on the SAT math section over 700. If students want to attend one of California's flagship universities, which are among the top in the world, then they need to start early. This is particularly important for students interested in STEM fields. Nearly 50 percent of students who entered the STEM fields in 2004 had left by 2009. Of those, 24 percent of men and 14 percent of women who had left did so by dropping out (Megan, 1). This number should be alarming to any educator. The rigors of the STEM field are extremely intense and it's likely that even early success in Algebra II may not be enough to succeed.

## What is the Current data?

CALIFORNIA RATES OF STUDENT ENROLLMENT IN CALCULUS	
County	Enrollment
Santa Clara	7,509
San Mateo	1,655
Santa Cruz	544
Contra Costa	3,850
Alameda	4,695

Quantitative reasoning is one of the most important skills needed for success at the college level and beyond. According to the California State University system's Quantitative Reasoning Task Force "...the world is changing and mathematics is changing along with it. The National Academies Report *Mathematical Sciences in 2025* made it clear that mathematics is broader than arithmetic, algebra, and calculus at the service of research mathematics, engineering and science." (5) Mathematics is infused in every part of our daily lives, and students need to be able to perform at a high level. However, the gold standard of mathematic prowess, success in Calculus, is lagging incredibly. While pushing students to succeed in Algebra II is a start, we need to go further in the coming years and uplift each of our students to mastering Calculus, especially for traditional underrepresented students of color who might have ambitions for careers in STEM fields.

# Requiring Four Years of Math

Policy makers can't only focus on enrolling students in college; we need to make a concerted effort to get more students to commencement. Despite the fact that more students are attending college, the number graduating has remained stagnant. That's symptomatic of underprepared students entering college. Differences in course rigor between districts means that it's difficult to meaningfully compare the results of different students with just a letter grade. However, California already has an option to compare student mastery of math topics, Smarter Balanced Assessment Consortium. Since all students are taking the same exam, policy makers and educators can use the results of the test to better diagnose a student's true understanding of the subject matter.

Fundamentally, parents and students need to understand that four years of math is essential for succeeding in college and that in today's workforce, a college diploma just isn't enough. California schools need an effective information campaign that explains to parents that times have changed since they were students and that a college degree is a requirement for today's workforce.

Unpacking the wage premiums of a college degree as well as the shrinking opportunities for those with just a high school degree for parents and community members is one step of many needed to make the California school system more robust than ever before. Students who are seriously considering a college education need to understand the pathway to do so while students who are currently uninterested in that prospect need to understand just how important it is.

# Being College Ready Academically

This all begs the question: what does being academically college ready actually look like? The absolute baseline to apply is the completion of A-G courses. However, that isn't enough to receive admission into a competitive UC. Rather, students need to take the recommended number of A-G courses. Math and science are particularly important: taking four years of math courses and three years of science ones doubles the odds of a student being admitted to a UC campus. However, as we've previously discussed, just doing well in a class doesn't necessarily mean the student has mastered the content.

That's where SBAC scores come in. If a student meets the SBAC standards, that means that they have somewhat mastered the content. Greater exposure to math logically correlates with a stronger score on the exam hence we should create opportunities for all students to complete four years of math.

# Recommendations

## ***1. Districts adopt the A-G requirements as a default coursework.***

a. **Rationale:** The students who appear to have been helped the most by having A-G as a default are those students and families who do not understand the importance of successfully completing the A-G requirements as a precursor to just applying to the UC/CSU systems. As Erica, a young 25-year-old woman who was going back to school to finish a college degree said, “I would have taken different classes if I would have known about A-G sooner!” First year college students report that they would have taken more rigorous high school courses had they known. Students who are made aware of the A-G requirements make different choices as to what courses they take in high school (Finkelstein et al).

b. Furthermore, given that making the wrong choices about classes early can hamper future college options, placing students in recommended A-G coursework as a default reduces the chances of students taking the wrong classes early in their high school experience (Finkelstein et al).

## ***2. Communicate early and often to students and parents about the A-G requirements.***

a. **Rationale:** College really does begin in middle school (if not earlier). Instilling a college-going mindset is one dimension that can make a difference the earlier it begins (Child Trends, Data Bank Index). Lower expectations among lower SES and families of color can impact student future aspirations. While most high schools generally make it a priority to let students know of the high school graduation requirements and the college A-G requirements, for a lot of students waiting until high school to learn about the college pathway is too late. Parents and students need to be informed of college pathways early to influence student aspirations later on. The mindset of parents can also be a variable, especially in communicating to children. There is a difference in sending a message to children that it would be *nice* to go to college, and you *will* go to college.

b. College savings programs appear to make a difference in whether students actually graduating from college. Saving as little as \$500 per year has been shown to make a difference in a student eventually graduating and not just enrolling in college. Obviously, it is not just the money, as \$500 might only purchase a few textbooks. Rather, it is the expectation that a child can and will go to college that appears to make the difference. It is why districts like San Francisco Unified have invested in college savings programs that begin in kindergarten.

c. Communication to parents and students about the college-going pathways would ideally start in elementary school and certainly no later than the beginning of middle school (grades 6-8). Parents and students should be made aware of these pathways so they understand that the placement choices in math made at this level has impact on future college options. The achievement gap increases between the transitions from elementary to middle school and especially from middle school to high school (Grubb, 6). Performance in middle school, especially in math, is a strong indicator of future success in high school. Teachers and counselors alike within middle schools may not be aware themselves of the importance of middle school math on future success in high school and the importance of the A-G requirements. Decisions made before high school can have a strong impact on student choices later on in high school.

d. The communication to parents ought to include accelerated options in middle school and provide understanding on long term options in STEM fields. This is not to imply that students should be “pushed” beyond their skill level but to target students of color and lower socioeconomic families who do not know that decisions at the middle school level can impact future college options.

**3. Provide extended time options for students early — preferably no later than middle school — to assist them in catching up and be ready to not only take, but be successful in, grade level math courses in high school through four years of math.**

a. **Rationale:** Research has shown that grade 3 math performance (Duncan, 8) and grade 8 math performance (Finkelstein) predict future success. Accelerated extended intervention can make up for lost time and can help close the gap (Finkelstein).

**4. Provide extended time accelerated interventions for students to have options of taking advanced classes in middle school. If we are to increase the options for our students of color and lower socioeconomic students, opportunities to accelerate their math skills should be provided early on. Students would be able to take either Algebra or Geometry at grade 8 or Integrated Math Course 1.**

a. **Rationale:** There are some in the CCSS era that feel students should not take accelerated courses in middle school. The students most impacted by this thinking appear to be students in lower socioeconomic districts (Loveless, 6). As long as districts, especially in more affluent areas, continue to provide accelerated options, we see this as an equity issue. Students should not be held back from accelerated options because of their zip code. Districts, in turn, can offer extended time opportunities ( during summer, breaks, and after school) to help students learn a frontloaded curriculum to accelerate their performance. This does not mean pushing students who are not ready, but rather targeting students who can handle the additional opportunity. Students and parents alike need to see these extended time options as opportunities, not punishment, and that they are intended to help them achieve their college aspirations down the line.

**5. Placement in middle school math accelerated courses should be made through objective measures to reduce the possibility of placement bias.**

a. Racial bias can play a role in misplacing students (Waterman, 3). SB 359 was passed requiring that high schools use objective measures in placing students in critical math gateway classes. The same requirement should apply to placing students in accelerate students in middle school.

b. There are advantages to taking either Algebra 1 or Integrated Course 1 by the end of grade 8. Students would then be on track to take Calculus or AP Statistics their senior year. This is less important for non-STEM related subjects but important for students hoping to graduate in a STEM major. For non-STEM majors, taking Calculus or AP Statistics might be helpful for admission to more elite universities.

**6. Provide accelerated options for students in high school and focus on college readiness rather than just high school readiness.**

a. **Rationale:** High school exacerbates the achievement gap (Grubb, 2). Students below standards by the end of grade 8 are not likely to reach standards by the time they leave high school. Districts understandably tend to focus on improving high school graduation rates, which have increased over the past few years. Focusing on high school graduation rates includes providing summer remediation and credit recovery classes. This is different than focusing on college readiness which would involve preparing students to complete the A-G course requirements. However, without intensive, accelerated, extended time options, students will remain below standards. A frontloaded CCSS aligned curriculum taught during summer time, similar to that for middle school (WestEd), can help make a difference in having students catch up and meet standards by the time they take the grade 11 California SBAC exam. The objective would be to have students look beyond high school graduation after they leave middle school, even if they are below standards in math.

**7. Encourage, or better yet, implement 4 years of math as a default option for students.**

a. **Rationale:** The senior year matters (Finkelstein). Completing four years of math significantly increases the probability that a student will not just enroll in, but graduate from, college. The CSU is considering requiring four years of math as part of the new set of math requirements; given the strong connection between completing of four years of math (with the associated development of quantitative reasoning) and subsequent college completion. Long Beach Unified has passed a policy requiring four years of math as a default course sequence for students by 2019.

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