AN ANALYSIS OF COLLEGE READINESS INDICATORS TO INCORPORATE IN THE ACADEMIC PERFORMANCE INDEX

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by

Justin Daniel Lane

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Abstract

of

AN ANALYSIS OF COLLEGE READINESS INDICATORS TO INCORPORATE IN THE ACADEMIC PERFORMANCE INDEX

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Statement of Problem

A large proportion of high school graduates are not prepared for college-level coursework and require remediation courses once they start college. With the passage of Senate Bill 1458, California has the opportunity to incorporate new college readiness indicators into its accountability system, the Academic Performance Index (API).This thesis was written to help state policymakers determine which additional indicators to include. Potential college readiness indicators were identified based on what California and other states are doing to measure for college readiness, along with what research has found to predict college readiness. College readiness indicators up for consideration had to have a current data source in order to be implemented by the 2015-16 deadline. Overall, there were seven identified college readiness indicators. Those were: advanced coursework, the Early Assessment Program (EAP), Advanced Placement (AP), International Baccalaureate (IB), dual enrollment (DE), the SAT, and the ACT.

Conclusions Reached

A Criteria-Alternative Matrix (CAM) analysis was used to compare the seven identified college readiness indicators. Using the criteria of supported by research, technical feasibility, cost-efficiency, equity, and political feasibility, the college readiness indicators advanced coursework, the EAP, AP, and DE ranked the highest. An outline on how the identified college readiness indicators could be incorporated into the API is provided. Finally, this thesis concludes with a discussion on the policy implications of including the identified indicators into the API, limits of this thesis, and opportunities for future research.

_____, Committee Chair
Su Jin Jez, Ph.D.

_____
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"Hear, O Israel, Hashem is our God, Hashem alone" Deuteronomy 6:4

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CHAPTER 1: INTRODUCTION

OVERVIEW

Last September California's State Legislature passed a bill that would change the composition of California's accountability index for high schools. This change requires that 40 percent of a high school's Academic Performance Index (API) must come from non-assessment based indicators. The California Department of Education (CDE) is to make recommendations to the State Board of Education (SBE) on what those indicators should be. This thesis is a result of research on what college readiness indicators should be incorporated in California's new accountability system for high schools.

BACKGROUND

The Public Schools Accountability Act (PSAA) of 1999 established a state-level accountability system that would measure and report on the academic achievement of schools and districts across California (California Department of Education [CDE], 2012a). California's accountability system measures annual growth of schools and districts by using the API. The CDE assigns schools an API score, ranging from 200 to 1,000, based solely on school performance from three different assessments: 1) the California Standardized Test (CST) (mathematics, English-language arts (ELA), history, and science), 2) the California Alternate Performance Assessment and California Modified Assessment (for Special Education students), and 3) the California High School Exit Examination (CAHSEE) (CDE, 2012d). All schools have a target API score of 800, which indicates "proficiency". Schools and their subgroups (race/ethnicity,

special education, socioeconomically disadvantaged) are given growth targets each year to incrementally get their scores to the desired 800 (CDE, 2012d).

The requirement in California's Education Code is that at least 60 percent of the API has to come from California's state assessment tests (CDE, 2012d). Currently, as noted above, 100 percent of the API is based on California's state assessment tests. Two other indicators, graduation and attendance rates, are to be incorporated once the quality of the data can be firmly established (CDE, 2012d). Up until this last year, the graduation data have not been stable and reliable enough for it to be a part of the API. Now that they are, CDE and SBE will work to incorporate graduation data into the API in the coming years.

California's accountability system laid the foundation for meeting the accountability requirements in the No Child Left Behind (NCLB) Act in 2001. The NCLB accountability system depends on a measure called Adequate Yearly Progress (AYP). California has leveraged the API score and growth for schools to determine if schools and districts have met AYP. In order for schools and subgroups to make AYP, they must get a minimum API score of 740 or have a one point increase in their API from one year to the next (CDE, 2012b). The participation rate and percent proficient on the California's assessment tests and graduation rates for certain subgroups are factored in each school's AYP status (CDE, 2012f). The subgroups for AYP are the same as those used for the API. Under AYP, all students must be proficient by 2014. In other words, all students, in all subgroups must test at the "proficiency" level or above by 2014 (CDE, 2012f). Each state has its own proficiency levels. In California, students would

have to test at either the “proficient” or “above proficient” level.

Accountability in education is high-stakes. The API scores that are released each year have significant impact on students, parents, teachers, and administrators. Every year, the API scores are released to the public and are often reported in the media. Schools can earn awards, such as Distinguished School or Blue Ribbon awards, based on their API score. On the federal side of accountability, AYP, schools that fail to meet AYP for consecutive years become Program Improvement (PI) schools (CDE, 2012f). Failure to get out of PI can result in a complete change in curriculum taught at the school, removal of teachers and principals, and other corrective actions. For example, in 2010-11 in California, 164 schools implemented a new curriculum, 16 schools replaced staff members who are responsible for the schools’ low performance, and 94 schools restructured their internal organization (U.S. Department of Education [ED], 2011). API scores for schools have a significant impact on all who are involved. In fact, API even has an impact on home values because parents want to be located near a school with a high API score (Sturrock, 2007). As this discussion demonstrates, districts and schools are under a lot of pressure to increase their API scores and meet their growth targets.

PROBLEMS WITH THE CURRENT PSAA

The purpose of California’s accountability program is to measure the performance and growth of schools and student learning across the state. However, currently, California only measures a school’s performance by the results of assessment tests. The two main assessment tests with the most weight in the API are math and ELA (CDE, 2012d). For example, schools with grades 2-8 have 80 percent of their API score

from math and ELA test results. Science is only tested for in grades 5 and 8-11 and social science is tested only in grades 8-11. In a sense, the API score is one dimensional in its ability to report fully on what is going on in schools. The other indicators, graduation and attendance rates, were never incorporated into the API.

Using assessment test data only for accountability is problematic. There are other things that schools could be doing well that cannot be accounted for in assessment test results alone. For example, a school could be exceptional at getting English learners to graduate, but, under the current API, would receive no credit or acknowledgement for that success. Also different schools have different challenges. The API requires a certain point growth each year. However, a school that continues to earn the same score from one year to the next (as long as it is below 800) will be dinged. In reality, though, maintaining the same API score as the previous year could be a huge win for the school. For example, a school, that has a high number of English language learners or other students who require significant effort on the part of teachers and administrators, could be considered successful if the students do not regress in their proficiency.

The U.S. Department of Education (ED) has allowed states to apply for waivers for the accountability requirements in NCLB (also known as Elementary and Secondary Education Act (ESEA) flexibility waiver). In order for ED to approve a state's waiver, an alternate accountability system to AYP must be proposed. Out of the 44 states that have applied for the ESEA flexibility waiver, 34 states have already been approved (ED, 2013). As mentioned above, there are issues with the state-level and federal-level accountability systems' strong dependence, and, in California's case, full dependence,

on assessment test results.

SENATE BILL 1458

California Senator Darrell Steinberg believes that fully relying on assessment tests to measure a school's performance is not adequate and that there are other indicators that are needed to balance accountability reporting in California (Fensterwald, 2012). In September 2012, Senate Bill (SB) 1458, sponsored by Steinberg, was passed by the legislature and signed by Governor Brown. SB 1458 requires that only 60 percent of high schools' API can derived from the California state assessment tests. The remaining 40 percent of high schools' API will come from other indicators that are to be identified and approved by the SBE. SB 1458 only impacts the calculation of the API for high schools. Elementary and middle schools' API will still be fully based on California state assessment tests. SB 1458 requires that the State Superintendent of Public Instruction, with approval from the SBE, present to the legislature on the new indicators to be included in the API by October 1, 2013. The new indicators in the accountability system must be incorporated in to the 2015-16 API.

ISSUES WITH STUDENTS BEING READY FOR COLLEGE

Two- and four-year postsecondary institutions have noticed that there is a gap between the academic ability of high school graduates entering college and the requirements for college-level coursework. According the National Center for Education Statistics (2011), 42 percent of first-year students at two-year colleges and 36 percent of first-year students at 4-year colleges took at least one remedial course. Remedial courses are designed to get the students who require these courses up to the

academic level required of them in college. In California, Cox (2004) found that in 2003, on average, 36.7 percent of freshmen at a California State University required remedial course in math and 48.2 percent required remedial course in English. In addition, Murray (2008) found that these high rates of postsecondary remediation directly cost California's postsecondary institutions, both California State University (CSU) schools and community colleges, $274 million.

In addition, as will be discussed in chapter 2, there is more to college readiness than can be measured on a single assessment (Karp, 2012). Understanding if students are college ready requires being able to know not only if students are academically prepared, but if they can function successfully in a college environment—if they have the nonacademic knowledge and skills required for college (Conley, 2008). Expectations of students are different between high school and college.

The education students receive in high schools is partly responsible for students not being prepared for college-level coursework (Blackboard Institute, 2011). There is a disconnect between high school exit requirements and first-year college requirements. In California, graduating high school students are required to take the California High School Exit Exam (CAHSEE). However, the CAHSEE is based on curriculum from grades seven to ten, and not reflective of the requirements of college-level work.

Recently, many states have adopted the Common Core State Standards (CCSS) for college and career readiness. These standards are more rigorous and aligned to help prepare students to succeed at the postsecondary level. In addition, states are also implementing college indicators into their accountability systems (this will be discussed

in more detail in chapter 2).

California is also part of this movement and the Smarter Balanced Consortium. This consortium is a group of states that are developing assessment tests that align to the CCSS. The purpose of aligning these assessment tests are to prepare students for college and/or a career (Smarter Balanced Assessment Consortium, 2012). In addition, though SB 1458 does not specify which new indicators are to be used for the new accountability system, it does authorize the use of college and career indicators.

PURPOSE OF THESIS

It is clear California is moving toward improving high school graduates' ability to succeed in college-level coursework and is going to add college readiness indicators to the API. The purpose of this thesis is to provide the CDE with recommendations regarding which college readiness indicators should be included in its new accountability system. It should be noted that SB 1458 requires any new indicators must be incorporated into the 2015-16 API. This deadline creates a tight timeline to identify and incorporate new college readiness indicators. Therefore, data on any college readiness indicator that is not currently collected is outside the scope of this thesis. Building a new data collection or significantly changing a current one could not be adequately and appropriately done for inclusion by the legislature's deadline. Therefore, indicators that may prove valuable, such as high school grade point average (GPA), class rank, and college remediation rates, were not discussed in this thesis, because California does not currently collect these data.

In the next section, I will give an overview of what California is currently doing in the area of college readiness. Also, I will summarize what other states are doing in their accountability systems to measure for college readiness. Finally, I will review and summarize the literature of the common college readiness indicators used by the other states. In chapter 3, I will give an overview of the Criteria-Alternative Matrix (CAM) analysis and list the criteria used to evaluate each indicator. In chapter 4, I conduct the Criteria-Alternative Matrix (CAM) analysis to identify those college readiness indicators for inclusion into the API. In chapter 4, I outline how the college readiness indicators, identified for inclusion by the CAM analysis results, can be incorporated into the API. Finally, I will conclude this thesis by discussing the policy implications of my results, the limits to my research, and opportunities for further research.

CHAPTER 2: PROSPECTIVE COLLEGE READINESS INDICATORS

In order to identify potential college readiness indicators, I will first review what California is currently doing in the area of college readiness. From there, I will describe what the other states are doing to incorporate college readiness indicators in their statewide accountability systems. The states I reviewed have applied for flexibility waivers from the ESEA, with most of them being approved. States who have applied for this waiver are required to describe and implement an alternative accountability system. Finally, I will synthesize the literature available on the college readiness indicators used by these states. Reviewing what California and other states are doing and what the research says will identify college readiness indicators that should be incorporated in the API.

CALIFORNIA'S MEASUREMENTS FOR COLLEGE READINESS

I will begin this chapter by providing an overview of what California is doing in the area of college readiness and what the literature says about the state's approach. Both the Early Assessment Program (EAP) and A-G requirements are unique to California. It should be noted that CDE recently sponsored the Link Learning Alliance, which, among other things, is looking to measure for college readiness in high schools. However, this program is not discussed in this thesis because it is currently a pilot program and not readily available at high schools in California. This program may warrant consideration at a later date.

The purpose of the EAP is to help ensure high school students are ready for the college-level coursework required of them (CDE, 2011a). The University of California

(UC), California State University (CSU), and K-12 education collaborated to create the standards and assessments for the EAP. There are three parts to the EAP. First, schools administer this test in grade 11 to determine what is needed to get students ready for college. Second, grade 12 students can get additional college preparation before they graduate. Finally, high school math and English teachers can participate in professional development activities to improve their ability to prepare their students for college.

The EAP has four performance levels: Exempt, Conditionally Exempt, Nonexempt, and Incomplete (Venezia & Voloch, 2012). The Exempt performance level means that the student meets the requirements for college-level coursework and does not have to take a college placement exam. Next, the Conditionally Exempt performance level means that the student has meets the requirements for college-level coursework, but should participate in an appropriate math activity in grade 12 to be exempt from the college placement exam. The Nonexempt performance level means that the student is not ready for college-level coursework and should take courses in grade 12 to prepare for college. Lastly, the Incomplete performance level means that parts of the EAP were not completed by the student. Overall, there were a few research papers looking at the effectiveness of the EAP, which is discussed below.

California's A-G requirements, unlike the EAP, are not geared towards determining if students are prepared for college. Instead, it is a list of course requirements students must complete in order to be eligible to attend a UC or CSU school (CDE, 2012c). So, in other words, the A-G are eligibility requirements and not intended to measure for college readiness. There is significant amount of research that

has been done in the area of advanced coursework, which closely aligns with the A-G requirements, and its ability to measure for college readiness. The research on advanced coursework will be reviewed in the literature review section of this chapter.

In general, the research I found on the EAP was positive about its effectiveness in preparing high school students for college (Tierney & Garcia, 2008; Howell, Kurlaender, & Grodsky, 2010; Venezia & Voloch, 2012). Howell et al. (2010) found that the EAP had a significant positive impact on students taking remedial courses. They focused their research on CSU, Sacramento. They chose this campus because it has one of the largest student populations and it has a high percentage of students requiring remedial courses. In 2003, 66 percent of incoming freshmen required remedial courses in either math or English.

They used longitudinal, student-level data for students enrolled in grade 11 from school year (SY) 2001-02 to SY 2004-05 into their first year at CSU, Sacramento. This data set included two years of students before the EAP was implemented and the first two years of the EAP. They found that participation in the EAP reduced the percentage of students needing remediation. The probability that students needed remediation in math decreased by 4.1 percentage points and for English it decreased by 6.1 percentage points. Both math and English results were statistically significant. Overall, they found that the EAP was an effective program in preparing students for college, while costing the taxpayers less than college remediation courses.

Venezia and Voloch (2012) had similar findings for the effectiveness of the EAP. Their research looked at more of the strengths and weaknesses of the EAP and was not

as extensive as Howell et al (2010). A main strength for the EAP was the implementation of clear and understandable indications of students' college readiness to students, teachers, and parents. Also, the EAP helped develop college readiness benchmarks, so students, parents, and teachers could gauge how ready the students were for college. Lastly, the EAP helped change the college readiness environment in high schools across the state.

The main weakness they found in the EAP was that it is specifically tied to the grade 11 CSTs. They found that giving the test in grade 11 was too late. Because students who were not ready for college according to the EAP assessment had little time to get college ready before they graduated. Also, they pointed out that the EAP is limited because it only assesses for academic readiness. The EAP does not account for the cognitive abilities incoming college students need to be successful in college (Venezia & Voloch, 2012; Conley, 2008).

Tierney and Garcia (2008) also found weaknesses in the EAP. In their research, the weaknesses are not about its ability to assess college readiness in high school students, but the lack of access and quality of the program at lower income high schools. Similar to Venezia and Voloch (2012), they found that assessing students on the EAP in grade 11 was too late. By the time students found out whether or not they were college ready, they were entering grade 12. They concluded that preparing students for college, especially at lower-income high schools, needs to start before grade 11 in order to be truly effective.

STATE-BY-STATE COMPARISON

Now that I have reviewed what California does for college readiness at the state level, I will give an overview on how some of the states are measuring for college readiness and what specific indicators they are using. As of February 2013, 44 states have applied for ESEA flexibility and 34 have been approved. With this approved flexibility plan, these 34 states have to implement an alternative accountability system. Many of these states have incorporated some college readiness indicators into their approved new accountability systems. I have listed some of the states that have not had their ESEA flexibility plans approved and have noted that if it is the case. States are listed in alphabetical order.

Connecticut

Currently, Connecticut will immediately incorporate a college readiness measure using 4- and 5-year cohort graduation rates into its new accountability system. In future years, Connecticut will be adopting and implementing CCSS for college and career readiness (Connecticut State Department of Education, 2012). In addition to implementing the CCSS, Connecticut is expanding advanced course opportunity for low-income students. Connecticut will focus on increasing the number of students taking Advanced Placement (AP) courses (math, English, and science) and dual enrollment (DE) opportunities for low-income students.

Florida

In Florida, 50 percent of a high school's accountability score comes from three indicators: accelerated curricula, graduation rate, and college readiness (Florida

Department of Education, 2012). The accelerated curricula and college readiness indicators each measure for aspects of college readiness. For accelerated curricula, high schools earn points by the percentage of their enrollment that have taken at least one exam in AP, the International Baccalaureate (IB) program, the Advanced International Certificate of Education (AICE) program, or have completed at least one DE course.

In addition, high schools can receive bonus points if the percentage participating increases by five percent or more from the previous year (2012). Conversely, schools can lose points if the percentage participating decreases by ten percent or more from the previous year. High schools can also earn points for performance on an AP, IB, or AICE exam (receiving a score high enough to earn college credit), and in a DE course (receiving a grade of "C" or higher). For college readiness, students who are deemed college ready are those students who graduate on-time and have scored college ready on either the ACT, SAT, College Placement Test, or the Postsecondary Education Readiness Test.

Georgia

Georgia has indicators incorporated in its accountability system to measure for high school students who are ready for the next level (college or career). Georgia measures for college readiness in a variety of ways. First, it measures college readiness by percent of high school graduates that do not require college remediation courses (Georgia Department of Education, 2013). Second, Georgia awards high schools who have high percentages of students who pass the composite ACT (22 points or higher), SAT (1550 points or higher), two or more AP exams (3 points or higher) or IB exams (4

points or higher). Third, high schools are also awarded points for graduates who complete an advanced academic pathway or scores at the "exceeds" performance level for the End of Course Test. Finally, Georgia measures it by high school graduates who have earned high school credit by taking AP courses, IB courses, or other courses that are consider advanced coursework.

Illinois

Illinois measures for both college readiness and college mastery for elementary schools (grades 3-8) and high schools (grades 9-12). For elementary schools, college readiness is measured by percentage of students who are at the "meets" or "exceeds" performance level in reading, math, and science on the state assessment test, alternate assessment test, and EXPLORE (a college and career assessment test) in grade 8 (Illinois State Board of Education [ISBE], 2012). College mastery is measured by the percentage of students who are at the "exceeds" performance level for the same tests.

For high schools, college readiness is measured by percentage of students who are at the "meets" or "exceeds" performance level in reading, math, and science on the EXPLORE test (grade 9), PLAN (grade 10 college and career assessment test), alternate assessment (grade 11), or the PSAE (two-day standardized test taken in grade 11) (ISBE, 2012). College mastery is measured by the percentage of students who meet ACT college readiness benchmarks. It should be noted that Illinois' request for ESEA flexibility has not yet be approved by the ED, and, therefore, subject to change.

Iowa

In Iowa, college readiness is only measure in grades 6-8 and in grade 11. College readiness indicators are measured by students who perform above the cut points on its state assessment in reading and math (Iowa Department of Education [IDO], 2012). Cut scores to determine college readiness for grade 11 is based on Iowa Assessment National Scale Scores (NSSs). These determined cut scores are aligned to the college readiness scores found on the ACT (Furgol, 2011).

The cut scores for grades 6-8 are also based on Iowa Assessment NSSs and are aimed at determining college readiness (IDO, 2012). Middle and high schools earn points for the percentage of their students who perform at or above the assigned cut scores. Middle schools can earn up to 10 points, while high schools up to 5. As of February 2013, Iowa's ESEA flexibility waiver has not yet been approved and, therefore, the information in this section is subject to change.

Kentucky

Kentucky will measure for college readiness in both middle and high schools. For middle schools, college readiness is determined based on students' performance on EXPLORE. For high schools, Kentucky will determine college readiness from test results on the ACT, COMPASS (college placement test), and Kentucky Online Testing in English, math, and reading (Kentucky Department of Education, 2012). Currently, Kentucky's goal is to have 50 percent of the high school graduates be identified as college or career ready.

Michigan

Michigan has not directly incorporated college and career readiness indicators into its accountability system. However, Michigan has significantly raised its cutoff scores on the Michigan Educational Assessment Program (MEAP) and the Michigan Merit Examination (MME) that will have direct impacts on accountability (State of Michigan Department of Education, 2011). Under the new system, adopted by Michigan's State Board of Education in September 2011, there are three different cutoff scores. The first cutoff score represents students on track to succeed in postsecondary education for the MME and students on track to be successful in the next grade for MEAP. The second cut off score indicates students who are advanced on the track for next level success (either next grade or postsecondary education). The third cut off score indicates students' achievement is not on track for success in the next level (either next grade or postsecondary).

Oklahoma

Oklahoma measures college readiness in high schools by participation and performance. For participation, schools can receive credit for students who are in AP, IB, the AICE program, or DE in college courses (Oklahoma State Department of Education, 2012). For performance, schools can receive credit for students' performance on the AP exam (scoring a 3 or better), the IB exam (scoring a 4 or better), or college entrance exam. Also, bonus points are awarded to high schools that have 25 percent or less of their graduates enrolled in college remedial classes in reading, English, math, or science.

Tennessee

Though Tennessee does measure for college readiness, it is not incorporated into its formal accountability system. Instead, Tennessee has identified college readiness goals. It will include them in the department's annual report card and state board of education's annual performance report (Tennessee State Board of Education [TSBA], 2012). However, Tennessee has indirectly accounted for college and career readiness in its accountability system. Tennessee has begun raising the cut scores for its end of course exams and state assessment tests in the subject area of math, ELA, and science. The new cut scores are closely aligned to a "B" GPA. These raised cut scores is in hopes that students will be better prepared for postsecondary work.

Tennessee has set indicators and goals to measure college readiness. These indicators and targets are similar to the goals listed above, but expanded upon. For example, Tennessee's goal for grade 3 ELA on the state assessment is 60 percent proficient by 2014-15; however, as a college and career readiness indicator, Tennessee has added the goal for grade 4 students taking ELA on the National Assessment of Educational Progress (the goal is 39 percent proficient by 2014-15) (TSBA,2012). In addition, Tennessee has added goals for grade 8 students taking the ACT EXPLORE assessment test and grade 10 students taking ACT PLAN assessment test (English, reading, math and science) and high school graduates taking the ACT who meet the benchmark requirements on those tests. Lastly, Tennessee has added goals for the percentage of grade 9 students who graduate from high school on time with a 4-year diploma (goal is 90 percent by 2014-15).

Lastly, it has set vague goals for postsecondary access and success for high school graduates, but with no specific targets mentioned. The first goal is the percent of high school graduates who have either attained or are eligible for postsecondary credit (through DE, AP exams, etc.) (TSBA, 2012). Second, the percent of recent high school graduates enrolled in postsecondary education or who have successfully completed one year of postsecondary education. Lastly, the percent of postsecondary students who complete college within 150 percent of normal degree program time.

Texas

Texas will measure postsecondary readiness by students' performance on State of Texas Assessments of Academic Readiness for grades 3-8 and end of course assessments in 12 assessment tests (Texas Education Agency [TEA], 2012). These assessment tests are geared towards assessing the students' readiness for postsecondary work. Postsecondary readiness is defined as those students who score at the advanced performance level on any assessment test.

In addition to the assessment test, Texas will also measure postsecondary readiness using the 4 and 5-year cohort graduation rate (TEA, 2012). Schools are awarded points for the percent of students that graduate (the higher point total from the 4- and 5-year cohort graduation rate is used). An annual dropout rate is used if no 4- or 5-year cohort graduation rate is available.

Summary of States

After reviewing the different states, there are many commonalities among the states. In order to better organize and summarize the information from states, I put

together a table that provides an overview of what the different states are doing (see Appendix A). Overall, some of what the other states are doing is not in the scope of this thesis. This includes graduation rate, college remediation rates, and leveraging the state assessments by raising the cut scores. For graduation rates, as mentioned in chapter 1, this is set to be separate indicator in the near future. For college remediation rates, this requires a student longitudinal data system that spans into colleges and universities in California. Currently, there is no such data system in California and implementing one would be too costly. Lastly, for state assessments, SB 1458 requires the API to use non-assessment indicators and, therefore, cannot leverage California's state assessments to determine college readiness. There are, however, many college readiness indicators that have potential in being incorporated as college readiness indicators. These potential indicators are AP, IB, DE, the SAT and the ACT.

LITERATURE ON THE COMMONLY USED COLLEGE READINESS INDICATORS

Overview

After reviewing what college readiness indicators other states were building into their new accountability systems, there were many similar indicators. Those common indicators are AP, IB, DE, the SAT, and the ACT. I describe these common indicators, provide background information on each of them, and discuss what research the literature says about them. All articles cited are peer reviewed, unless otherwise noted.

Advanced Coursework

The courses high school students take play an important role for college readiness. Adelman (2006) has the most extensive and cited research paper in the area of college readiness in all the research I found. More than half of the papers cited in my literature have his research as a source. However, no state had incorporated his recommendations specifically into their new accountability systems.

He used a data set the consisted of a national sample of grade 8 students in 1998 and was schedule to graduate high school in 1992 (Adelman, 2006). This cohort was followed until 2000. He found that success in college begins in high school and the choices and availability of choices students make during those four years. The greatest predictor of college success was the intensity of the academic curriculum taken in high school. Adelman's (2006) research indicates the minimum number of Carnegie Units (CUs) needed in academic curriculum. A Carnegie Unit indicates that a high school student has studied a subject for 120 hours in a single school year. These minimums are 3.75 or more CUs of English and math at the highest level (i.e. calculus, pre-calculus, or trigonometry), 2.5 or more CUs in science or 2.0 CUs in a laboratory science (biology, chemistry, and physics), 2.0 or more CUs in foreign language, history, and social sciences, 1.0 or more CUs of computer science, and more than one AP course. Also, students could not have taken remedial English or math courses while in high school. He found that 95 percent of the students who met these minimum requirements earned a bachelor's degree by 2000. He also found that these students also helped close the achievement gap.

Specifically, he found that taking math courses greater than Algebra 2 and 3 or more CUs in laboratory science was more important for college success than taking foreign language and AP courses (Adelman, 2006). Lastly, he found that students who took remedial courses in college had a graduation rate of 48.7 percent. This is compared to students who did not take remedial courses in college had a graduation rate of 69.9 percent. The other two important indicators for college success were high school GPA and class rank.

McCormick and Lucas (2011) had similar findings. She found a positive correlation between high-level math courses (courses greater than Algebra 2) taken and initial postsecondary coursework. In other words, students taking high-level math courses were better prepared for college-level coursework. Also, she found that a rigorous course selection is more important for a student's college readiness than either income or parent education level. She recommended a high school curriculum that comprised of more rigorous coursework be implemented; especially in math because of its ability to prepare students for key cognitive abilities needed in college.

Researchers have also found the benefit of advanced coursework in preparing black, Hispanic, and lower-income students. According to Long, Lataroia, and Conger (2009), the majority of the college readiness gaps can be attributed to the different courses being taken. When black, Hispanic, and lower-income students take the same courses as white and higher-income students, the gaps are decreased by 28 percent for blacks, 35 percent for Hispanics, and 34 percent for lower-income. Placing students in more rigorous courses has had significant gains for low-achieving students (McCormick

& Lucas, 2011).

However, though several researchers have found the positive benefits of advanced coursework in preparing students for college-level work, there is some research that shows that there can be unintended consequences, such as offering courses with the appropriate course titles but not the appropriate content. As Venezia and Voloch (2012) discuss, approximately half of the 50,000 students entering the California State University (CSU) system required English and/or math remediation courses. That is the same percentage that required remediation before the CSU required students to complete advanced courses (A-G courses) in high school in order to be eligible for admission into the CSU. In other words, the inclusion of A-G — a proxy for advanced coursework — had little impact on CSUs' remediation rates.

Venezia, Kirst, and Antonio (2003) found that, when faced with pressure to provide college prep coursework, some high schools offered courses that appeared to be high-level (because of the title), but were not in terms of course content. Similarly, San Jose Unified School District became the first district in California to expect all students to complete A-G requirements for high school graduation (The Education Trust-West, 2010). To ensure the quality of the advanced courses required of students did not suffer, the district had to overhaul the structure of all of its high schools. It was successful, but it took extensive support from the community and district. Some researchers hypothesize that districts and schools are pressured offer rigorous courses, without the appropriate support, and without the appropriate safeguards in place, can create negative incentives (A. Venezia, personal communication, April 29, 2013).

In addition, according to Freedman, Friedman, Poter, and Schuessler (2011), in order to properly implement A-G courses, districts need to have local political support, consider the costs of A-G, professionally develop their teachers, oversee the rigor of the courses, and have a college-going culture. A-G is complex and its implementation is time-consuming, districts needs to adequately prepare for it if they decide they are going to implement it. Districts that fail to do this can put the quality and access of the A-G courses at risk. It should be noted that their research was not peer reviewed.

Advanced Placement (AP)

The College Board created AP in 1953 and still oversees its operation today (Lichten, 2000). AP offers college-level courses and exams that are aimed at preparing students to succeed at college and earn college credit while in high school (Lichten, 2000). The AP exams are scored on a 5-point scale (College Board, 2013b). Earning a score of 3 means you are qualified to receive college credit for that course (College Board, 2013b).

Across the country, 32.4 percent of high school students took at least one AP exam (College Board, 2013a). In addition, recently, California passed Senate Bill 532 that encourages high schools to expand the number of AP courses by offering at least five AP courses (College Board, 2011). Due to the prominence and popularity of the AP across the country, I have done an in depth review of the literature pertaining to AP.

Many of the researchers have found that an AP exam score of 3 should not warrant college credit (Casement, 2003; Hansen et al., 2006; Lichten, 2000; Sadler, 2007). Casement (2003) found that many colleges are moving to no longer accept AP

exam scores of 3. This is due to the AP exam score of 3 not adequately indicating to colleges the college credit should be awarded. Lichten (2000) has found that the College Board scale for AP exam scores does not accurately measure students' college readiness. In fact, in Table 1 Lichten (2000) proposes more accurate performance levels for determining what students are ready for college.

Table 1: AP Performance Levels

AP Exam Score	AP Performance Levels	Lichten's New Performance Levels
5	Extremely well qualified	Well qualified
4	Well qualified	Qualified
3	Qualified	Possibility qualified
2	Possibility qualified	No recommendation
1	No recommendation	No recommendation

The new scale would put half of the AP exams as not qualifying for college readiness. There is a gap between how the College Board and colleges interpret the AP exam scores. Students who score a 3 on an AP exam are not ready for college-level coursework (Casement, 2003; Sadler, 2007). Colleges are using a score of 4 on the AP exams to determine what students are qualified for college, with many pushing towards raising it to 5 (Casement, 2003). Colleges are concerned about the academic well-being of students that enroll at their colleges, their integrity, and the inadequacies of AP in earning college credit. Finally, students with an AP exam score of 3 do not warrant college credit over those students who take an AP course in high school but do not take the exam (Sadler, 2007).

In addition to the AP exam results, researchers have also found issues with the

graders of the AP exams. The researchers question the ability and qualifications of the people who are grading the AP exam (Casement, 2003; Lichten, 2000). Lichten (2000) found that of the 556 graders for the 1999 AP History exam, 57 percent of the graders were high school teachers. The majority of the AP exam graders are not college faculty who teach and are familiar with the requirements and expectations of college-level courses. Only a small minority of the AP graders comes from an accredited, 4-year university (Lichten, 2000; Casement, 2003).

Lastly, AP has been greatly expanded in recent years. In 2000, College Board estimated there were 100,000 teachers teaching AP courses and an additional 100,000 teachers will be needed by 2010 (Casement, 2003). The majority of this need will be met by high school teachers that may or may not be adequately prepared to teach AP courses. In addition to the concerns about the overall quality of AP as it expands, researchers have expressed specific concern about its quality in urban and low-income schools.

Hallett and Venegas (2011) have found that though access to AP has increased significantly in low-income urban schools, the quality of AP in these schools is not equal to higher-income schools. There is a huge disparity in low-income urban schools between students' AP course grades and AP exam scores. In other words, what was being taught in AP courses did not properly prepare these students for the AP exam. Hallett and Venegas (2011) found this was largely attributed to the quality of teachers, the material covered in AP courses did not match the exam, and the support system at schools does not properly assist their students. Just increasing access is not enough. The

quality of AP has to accompany increased access.

The researchers have found that half of the advantage attributed to AP experience can be accounted for in other variables (i.e. students' background, math and verbal skills) and not attributed to the AP program (Sadler, 2007). Overall, with the inappropriate grade scale of AP, the lack of qualified graders, and the decline in the quality of AP courses, researchers have found that *advanced placement* is becoming *placement* (Lichten, 2000).

On the other hand, there is a good amount of literature that has been done that has found benefits of AP in preparing high school students for college success. The literature falls into two different categories: performance on the AP exam and participation in AP.

Chajewski, Mattern, and Shaw (2011) researched the relationship between AP exam participation and 4-year college enrollment. To answer their research question, they used a 2007 cohort that consisted of over 1.5 million high school graduates. In order to be included in this data set, the graduates had to have participated in the Preliminary SAT (PSAT)/National Merit Scholarship Qualifying Test (NMSQT) or PSAT/NMSQT and AP. It should be noted that their data set began with over 2.5 million students. They removed about a million student records because they did not have all the variables needed in the study. This data set of 1.5 million students was randomly divided into two groups (N^1=761,740; N^2=761,806).

When controlling for race/ethnicity, gender, academic performance, SAT scores, and other variables, the researchers found students who participated in just one AP exam

had a 171 percent increase in the odds that they would attend a 4-year university over students who did not take the exam. It should be noted that the researchers did not control for students' aspirations and intent to attend a postsecondary institution. They also found that the more AP exams students took, the more likely they would enroll in a 4-year university. Specifically, the greatest increase was those students who took two to three AP exams. Their odds of attending a 4-year university saw an increase of 224 percent. Increases in the odds that students in race/ethnicity subgroup would attend a 4-year university were found. For example, Hispanic students who took the AP exam were 72 percent more likely to attend a 4-year university. Overall, the researchers found just participating in the AP exam had a significant positive impact on students attending college. Though their research did not explore how those students performed once they attended a 4-year university, they did set the foundation for the AP exam participants being motivated to move onto the next level in postsecondary education.

Dougherty, Mellor, and Jian (2006) looked at several questions using a data set that had 67,412 Texas grade 8 students in 1999. These same students graduated high school in Texas in 1998 and enrolled in a public college or university in the state. The researchers first question was do AP students graduate from college at higher rates than students not in AP? They found that students not in AP courses or not taking the AP exam only had a 5-year graduation rate of 17 percent. Students, who took an AP course, but no exam, had a graduation rate of 37 percent. Students who took an AP course and exam had a graduation rate of 42 percent. Finally, students who passed an AP exam had a graduation rate of 64 percent. Overall, the more students participated and were

successful in AP, the more likely they were to graduate from college within five years. These gains can be seen across race/ethnicity and income status.

Their second question was do AP students graduate from college at higher rates than students not in AP when controlling for race/ethnicity and income status? Again, they found that the more students participated and were successful in AP, the more likely they were to graduate from college. For example, low-income students who passed the AP exam were 26 percent more likely to graduate from college than students who did not take an AP course or exam.

Their final question was do high schools with a higher percentage of their enrollment participating in AP have higher graduation rates when controlling for school characteristics? Similar to their other findings, AP participation and success had a positive impact. They found, for example, that high schools with ten percent or more of their low-income students passing the AP exam were three percent more likely to graduate from college than high schools with less than ten percent. Though the positive impact for this question was not as significant as their previous two questions, a positive impact was still found. It should be noted that their research article was not peer reviewed.

Mattern, Shaw, and Xiong (2009) had similar findings in the benefits of AP participation and performance. Their data set consisted for student-level data for 196,364 students from 110 colleges and universities from across the country. They measured for students AP scores, SAT scores, first-year college grade point average (FYGPA), and retention (students who came back for the second year of college). After

controlling for students' academic ability, they found that students who passed the AP English exam with a score of 3 or higher averaged a FYGPA that was 0.6 points higher than student who did not participate in AP. Also, those students were almost three times as likely to return for the second year of college. They also found that students who only had scored one or two on the AP biology exam had the same FYGPA as non-AP students, but were more likely to return to college the second year. Their findings were similar on the AP English, biology, calculus, and U.S. history exams. Specifically, that performance on the AP exam (score of 3 or higher) had a significant and positive impact on college success and retention. This research paper was not peer reviewed.

International Baccalaureate (IB) Program

There are three separate programs for IB (International Baccalaureate [IBO], 2011). First, for elementary grades they have the Primary Years Program. Second, for middle school grades they have the Middle Years Program. Finally, and most pertinent to college readiness, they have the Diploma Program (DP) for high schools.

The high school IB program consists of advanced coursework to prepare high school students for success at the university level (IBO, 2013a). High school students in IB have to take five or six courses in different academic subject areas. Students take a final exam in each of the courses they take and can score up to seven points per exam. In order to receive an IB diploma, students must get at least a combined 24 points on their final exams.

There were several states that used IB participation and performance to measure for college readiness. In the last ten years, IB has grown significantly and has also

expanded to schools with high percentages of socioeconomic disadvantage students (Stillisano, Hostrup, Waxman, Rollins, 2011). IB is focused on academic programs using an intercultural perspective.

In Caspary (2011) research, she tracked 24,487 IB students as they exited high school. She found that 67 percent of these students enrolled directly into a 4-year university. At the University of Florida, 72 percent of IB students graduated in four years, whereas only 53 percent non-IB students graduated in the same period.

In similar research, Caspary and Bland (2011) used a data set that had 4,845 IB students that graduated from a Florida high school from 2000-2005. They found that students with an IB exam score of a 6 or higher were more likely to earn an "A" grade in the same subject year in their first year of college than those IB students with a lower exam score. However, this research does not explore how IB students did in comparison to non-IB students.

The IBO (2010) had a data set of 1,547 IB students and 5,253 non-IB students who enrolled in a University of California school between 2000 and 2002. In its regression, it controlled for socio-economic status, high school GPA and SAT/ACT scores. The IBO found that performance in the IB program was the best predictor of college performance, GPA, and college graduation. Overall, The IBO found that IB students performed better than non-IB students in the UC system. However, it should be noted that only a research summary was available on this research and, therefore, the quality and accuracy of the research method and design used cannot be determined. Also, all the research cited for IB was not peer reviewed.

The Benefits of Dual Enrollment (DE) for College Readiness

Dual Enrollment (DE) is a program where students who are enrolled in high schools can also be enrolled in college courses and receive both high school and college credits. These college courses can either be on the high school campus where the student is enrolled or at a local college facility. Students who receive a grade of "C" or higher can earn college units for that course. In the past, DE was aimed at students who were headed to a postsecondary institution, but, recently, the program has expanded to include students who traditionally been underserved (Hughes, 2012).

Researchers have found that there is more to college readiness than can be measured on a single assessment (Karp, 2012). College readiness also includes new ways of behaving, thinking, and interacting with others. Also, college professors expect greater cognitive abilities from their students than is required of them in high school (Conley, 2008).

Karp (2012) and Sullivan-Ham (2010) both found that DE helps students adjust to the social and academic expectations of college and live up to these expectations. College courses are different from high school courses and DE exposed high school students to the higher lever required of them in college (Karp, 2012). Also, it gives high schools students a chance to "rehearse" for college. Researchers have also found that DE courses offered at high school were of less quality that those offered at a college campus (Klopfenstein & Lively, 2012; Hughes; 2012).

Klopfenstein and Lively(2012) found that students in DE (not taught at a high school campus) were more likely to attend 4-year universities than similar AP students.

In addition, she found that DE students graduated with baccalaureate degrees much faster than AP students. Similarly, Kim and Bragg (2008) found that dual credit (synonymous with DE) plays a significant role in getting high school students ready for college math. Kim and Bragg's research involved three states: Texas, Florida, and Oregon. In Florida, she found dual credit hours had a positive impact on college readiness.

Sullivan-Ham (2010) had similar findings. Her data set consisted of both DE students and non-DE students. There were approximately 1,000 high school students in her research. She found that DE students had an average FYGPA of 3.11 compared to non-dual enrollments students who had an average of 2.39. She also found that the more DE courses students took, the higher their FYGPA. Overall, she found that students in DE courses had significantly better FYGPA than non-DE students.

ACT and SAT and College Readiness

The SAT is a college-ready assessment test and is administered by the College Board (SAT, 2013b). The main areas of the SAT are critical reading, math, and writing. Each of these areas is scored on a scale of 200 – 800. The maximum amount of points students can score in these main areas is 2,400. Much like the SAT, the ACT is also a college-readiness assessment test. The ACT consists of four main tests: English, math, science, and reading. Each test is scored on a scale 1-36. An ACT composite score is an average of the four tests.

Overall, researchers have found that the SAT and ACT are poor predictors for college readiness and success. Maruyama (2012) compares the threshold scores for the

ACT in the four subject areas to the national average. Table 1 compares the national average score on the ACT and the corresponding ACT threshold score.

Table 2: ACT Threshold Scores

Subject Area	ACT Threshold Scores	National Average
English	18	20.6
Math	22	21.1
Science	24	20.9
Reading	21	21.3

Students who meet all four thresholds are considered college ready by ACT. However, he found that the threshold ACT (and SAT scores because they are similar) scores were insufficient in determining college readiness.

In a similar vein, Perez (2002) found that the SAT (both I and II) and ACT have serious flaws because they lack the ability to measure students' performance in college. In fact, the SAT and ACT were the weakest predictor for college success compared to other indicators (courses taken in high school and high school grades). She also notes that the SAT (I and II) and ACT are highly coachable tests and students who can afford to spend money preparing for the tests have a distinct advantage (Perez, 2002).

In addition, Maruyama (2012) found that the single assessment (ACT or other such tests), especially using the threshold scores, is not an adequate indicator for college readiness by itself. He recommends the use of multiple measures if college readiness is to be accurately measured (such as the courses students take and course assessment performance levels).

On the other hand, there has been research that found has the validity of the SAT and ACT as predictors for college performance. Shaw, Kobrin, Patterson, and Mattern (2012) found that the SAT was valid in predicting GPA in college. In their research, they gathered and used data from 39 four-year postsecondary institutions and data from the College Board. In order to be included, each student record had to have data on her SAT results, high school GPA (as indicated on the SAT questionnaire), two-year cumulative college GPA, and a college major. Overall, their research included 39,440 students from these 39 postsecondary institutions.

They found that the SAT is more inclined to predict, most often over predict, the two-year college GPAs for majors in the area of science, technology, engineering, and math (Shaw et al., 2012). However, the SAT slightly under predicted the two-year college GPAs in other majors, including education, humanities, and liberal arts. It should be noted that this research was not peer reviewed and was sponsored by the College Board, which administers the SAT.

In regards to the ACT, Bettinger, Evans, Pope, and Devin (2011) found that out of the four ACT test areas (English, math, science, and reading), the English and math test predicted college performance, while the science and reading test did not. Their data set consisted of all students who matriculated to a 4-year, public postsecondary institution in Ohio. In their data set, they had the students' race, age, gender, ACT performance, high school GPA, and information on the college they attended. Overall, they had 25,465 students in their analysis.

When controlling for the ACT composite score, they found with every one point

increase in the English and math composite score is associated with a 0.066 increase in FYGPA and 0.060 increase in the second-year college GPA (Evans et al., 2011). Also, they found that a one point increase in the English and math composite score is associated with a 1.3 point decrease in the probability of being a first-year college dropout and 2.6 decrease in the probability of being a third-year college dropout. On the other hand, they found the science and reading portion of the ACT did not predict college success for students. Ultimately, their recommendation was to have the science and reading areas of the ACT dropped, and the composite ACT score based solely on English and math tests. It should be noted that their research was not peer reviewed.

Conclusion

The literature reviewed had a great amount of information on the different ways to measure students who are ready for postsecondary coursework. Adelman's well cited and respected research on advanced coursework warrants advanced coursework to be considered as a college readiness indicator. After reviewing what other states are doing and the literature, there are a lot of similarities on the proper way in determining if students are ready for college-level coursework, such as advanced coursework, AP, IB, DE, the SAT, and the ACT. Much of the literature and many states agree that determining students' ability to succeed in postsecondary cannot be measured with a single indicator. Multiple college indicators are required if an accountability system is to be balanced and accurate.

CONCLUSION

Overall, I have identified seven potential college readiness indicators. Those indicators are the EAP, advanced coursework, AP, IB, DE, the SAT, and the ACT. It should be noted that the A-G requirements are covered by the advanced coursework laid out by Adelman (2006). Therefore, A-G is not one of the indicators because its inclusion would cause redundancy. In order to identify which of these college readiness indicators should be incorporated into the API, I will evaluate each indicator. In the next chapter, I give an overview of the methodological approach I will use to evaluate these indicators.

CHAPTER 3: METHODOLOGY

In this chapter, I will give an overview of the approach used to analyze the different college readiness indicators, select and define the rating for the criteria, and, finally, weigh the criteria. Based on use in California, use in other states, and the literature, seven unique college readiness indicators are identified. The college readiness indicators identified are:

- already in use in California: the EAP
- used in other states: Advanced Placement (AP), International Baccalaureate (IB), Dual Enrollment (DE), the SAT, and the ACT.
- from the literature: advanced coursework

These identified college readiness indicators will be evaluated and analyzed to determine which ones should be used in California's new API.

CRITERIA-ALTERNATIVE MATRIX ANALYSIS

I use the Criteria-Alternative Matrix (CAM) analysis to conduct this evaluation of the college readiness indicators. The CAM analysis is a method to provide a simple and transparent way for comparing different policy options to the identify the preferred option to address the stated problem (Munger, 2000). The first step in the CAM analysis is to identify the criteria that will be used to evaluate the college readiness indicators. Certain criteria will have more importance than others, and, therefore, each criterion will receive a weight that is relative to its importance.

Next, in order to determine how each college readiness indicator stacks up to the criteria, each indicator will be measured on a scale from one to five on how well it rates

on each criterion. This measurement will reflect a rating on a Likert-scale. The measurements and ratings are in listed in Table 3.

Table 3: Measurement and Rating Scale

Measurement	Rating
1	Weak
2	Somewhat Weak
3	Neither Weak nor Strong
4	Somewhat Strong
5	Strong

Finally, the criteria and their weights are used to evaluate and score the college readiness indicators. Each indicator will receive a score based on the sum of the ratings for each criterion and that criterion's associated weight. In the end, the CAM analysis provides a ranking for all the college readiness indicators to determine those indicators that rank the highest.

CRITERIA SELECTION AND RATIONALE

In this section, I discuss five criteria and provide rationale for the use of each criterion. Also, I define the five rating levels for each criterion.

Criterion 1: Supported by Research

This criterion evaluates how much research support exists showing how well the indicator predicts college readiness. It is important and valuable for the college readiness indicators used in the API to be supported by research. The definitions of the ratings for this criterion are in Table 4.

Table 4: Supported by Research Rating

Measurement	Rating	Definition
1	Weak	No research available in support of use or research actively does not support use
2	Somewhat Weak	Little research exists to support use
3	Neither Weak nor Strong	Most of the research supports use, but with restrictions
4	Somewhat Strong	Most of the research supports use
5	Strong	All research supports use

Criterion 2: Technical Feasibility

The API and its indicators must be accurate. As discussed in chapter 1, API is high-stakes. Therefore, the quality of the data that supports any college readiness indicators should be established and verified. If just one indicator is incorporated with inaccurate or incorrect data, then it would compromise the accuracy of schools' API score. The definitions of the ratings for technical feasibility are in Table 5.

Table 5: Technical Feasibility Rating

Measurement	Rating	Definition
1	Weak	Data are known to be unreliable and inaccurate or the data do not exist
2	Somewhat Weak	Quality of data cannot be verified
3	Neither Weak nor Strong	Majority of the data are accurate and reliable, but some of the data lack quality and accuracy
4	Somewhat Strong	Vast majority of the data are accurate and reliable
5	Strong	Data quality are proven and reliable

Criterion 3: Cost-Efficiency

The next criterion is cost-efficiency. This criterion accounts for the cost-efficiency of implementing a new indicator into the API. The districts' budgets are already stretched thin because of the hard economic times. Any additional costs to the districts would be a major issue. Therefore, an ideal indicator would minimize costs districts and their schools. The definitions of the ratings for cost-efficiency are in Table 6.

Table 6: Cost-Efficiency Rating

Measurement	Rating	Definition
1	Weak	Costs to be a significant burden to the district to implement
2	Somewhat Weak	Costs to be a burden to the district to implement
3	Neither Weak nor Strong	Moderate costs to the district to implement
4	Somewhat Strong	Small costs required to the district to implement
5	Strong	No cost to the district to implement

Criterion 4: Equity

The equity criterion is defined as equal access to education programs for all students regardless of income level, race/ethnicity, disability status, and gender. Any new indicator should include as many students and schools as possible. Indicators should not be used if they exclude large numbers of students, student subgroups, or schools in California. Careful consideration should be taken to ensure any college readiness indicators be widely available to students, student subgroups, and schools. The definitions of the ratings for equity are in Table 7.

Table 7: Equity Rating

Measurement	Rating	Definition
1	Weak	Little to no availability to students and schools
2	Somewhat Weak	Available only to a minority of students or schools
3	Neither Weak nor Strong	Available to the majority of students or schools
4	Somewhat Strong	Available to the vast majority of students or schools
5	Strong	Available to all students and schools

Criterion 5: Political Feasibility

It is important to garner support from the different stakeholders when making changes to the API. The political feasibility criterion evaluates the level of support or opposition an indicator would face. If the incorporation of a specific college readiness indicator would garner strong opposition to its use in the API, then the indicator is not politically feasible. The definitions of the ratings for political feasibility are in Table 8.

Table 8: Political Feasibility Rating

Measurement	Rating	Definition
1	Weak	Broad disapproval from stakeholders
2	Somewhat Weak	Majority of stakeholders disapprove
3	Neither Weak nor Strong	Neither strong approval or disapproval
4	Somewhat Strong	Majority of stakeholders support
5	Strong	Broad support from stakeholders

WEIGHT OF CRITERIA

In this section, I assign a weight to each criterion for use when evaluating the different criteria. Some criteria are more important and valuable than others. Weights are assigned to ensure that the value of each criterion is accurately and appropriately accounted for. Justification for the assigned weights is provided for each criterion.

The supported by research criterion is weighted at 0.30 (30% of the total weight), the highest weight given to any of the criterion. Using an indicator that has shown to be an accurate predictor is of the utmost importance in selecting a college readiness indicator. Technical Feasibility is weighted at 0.15 (15% of the total weight) to recognize the importance of the quality of data for all the college readiness indicators. Without quality data, the API score is useless. Cost-efficiency is weighted at 0.25 (25% of the total weight). The districts are still suffering from the poor economy, and, therefore, cost-effectiveness plays a prominent role when looking to incorporate any college readiness indicators. Equity is also weighted at 0.25, recognizing the high importance of offering equal education opportunities and programs to all students. Finally, political feasibility is weighted at 0.05 (5% of the total weight) to acknowledge the importance of support from the different stakeholders. An overview of each criterion and its assigned weight are in Table 9.

Table 9: Criteria Weights

Criteria	Weight
Supported by Research	0.30
Technical Feasibility	0.15
Cost-Efficiency	0.25
Equity	0.25
Political Feasibility	0.05
Total	1.0

Overall, I determined the weights of each criterion based on the individual value of each criterion. Using the information and justification on each criterion, I assigned the weights of the criteria to best of my ability. However, other weighting systems may be preferred. Therefore, in addition to my CAM analysis in chapter 4, I also conduct a sensitivity analysis. I use a sensitivity analysis to examine the different effects when the weights are slightly adjusted for the criteria.

CONCLUSION

In this chapter, I discussed the CAM analysis and listed each criterion I will use in the CAM analysis. In addition, I provided justification for each criterion and defined each of the five rating levels. Lastly, each criterion has varying value and importance and was assigned a weight accordingly. In the next chapter, I provide the results of evaluating the proposed college readiness indicators by the set criteria.

CHAPTER 4: ANALYSIS OF COLLEGE READINESS INDICATORS

In this chapter, I analyze each of the seven alternatives: the Early Assessment Program (EAP), advanced coursework, Advanced Placement (AP), International Baccalaureate (IB), dual enrollment (DE), the SAT, and the ACT.

THE EAP COLLEGE READINESS INDICATOR

The EAP is administered as an addition to the grade 11 CSTs to measure for students' ability to handle college-level work.

Criterion 1: Supported by Research

The research on the EAP was generally very positive about its effectiveness in preparing high school students for college (Tierney & Garcia, 2008; Howell et al., 2010; Venezia & Voloch, 2012). Researchers found that the EAP had a significant positive impact on reducing the need for students to take remedial courses (Howell et al., 2010). Also, researchers found that the EAP helped develop clear college readiness benchmarks (Venezia & Voloch, 2012). The main weakness the researchers found on the EAP was its administration in grade eleven was too late. Students who were found not ready for college had little time to get college-ready before they graduated. However, since the research on the EAP shows that it helps improve students' readiness for college, it is rated somewhat strong (4) in the supported by research criterion.

Criterion 2: Technical Feasibility

Since the EAP is a part of the CSTs for grade 11, the data for it are collected by the CDE on the student-level. These data are vetted by the CDE to ensure accuracy, validity, and reliability (CDE, 2004). The EAP is rated strong (5) for this criterion.

Criterion 3: Cost-Efficiency

In order to implement the EAP as a college readiness program, no new resources are needed. The EAP is already a part of the grade 11 CSTs, and, therefore, there are no additional costs to the districts. The EAP is rated strong (5) for this criterion.

Criterion 4: Equity

Though the EAP is available to all students who take the grade 11 CSTs, there are equity concerns with access to other EAP programs to prepare students for college. Those other parts of the EAP are professional development for teachers and curricular opportunities for students (Venezia & Voloch, 2012). Students at lower-income high schools do not have the same access to a quality EAP program (Tierney and Garcia, 2008). Therefore, the EAP is rated somewhat weak (2) for the equity criterion.

Criterion 5: Political Feasibility

The EAP was a result of a collaborative effort among the CDE, the State Board of Education, and the CSU (California State University, 2012). The EAP is still well supported by the various stakeholders. The EAP is rated strong (5) for this criterion.

Overall Score for the EAP

Table 10 provides the total CAM analysis score after all the ratings for each criterion have been assigned. The total score for the EAP is 3.95.

Table 10: The EAP CAM Analysis Results

	Criteria					
	Supported by Research	Technical Feasibility	Cost-Efficiency	Equity	Political Feasibility	Total
EAP	Rating: 4 Weight: 0.30 Total: 1.20	Rating: 5 Weight: 0.15 Total: 0.75	Rating: 5 Weight: 0.25 Total: 1.25	Rating: 2 Weight: 0.25 Total: 0.50	Rating: 5 Weight: 0.05 Total: 0.25	3.95

ADVANCED COURSEWORK COLLEGE READINESS INDICATOR

The advanced coursework college readiness indicator was derived by the extensive work by Adelman and consists of taking rigorous courses in high school.

Criterion 1: Supported by Research

Research consistently indicates that advanced course-taking in high school is a strong predictor of college readiness (Adelman, 2006). Other research supported his findings and found that students taking high math courses were better prepared for the level of coursework in college (McCormick, 2011). Also, the researchers found a rigorous course selection is more important for a student's college readiness than either income or parent education level. However, researchers have found that the use of A-G requirements, a proxy for advanced coursework, had little impact on CSU's remediation rate. Also, other research found, that though advanced coursework is crucial, the problem is with the "advanced" courses being watered down. Overall, the research supports the use of advanced coursework for college readiness, and, therefore, it is rated somewhat strong (4) for this criterion.

Criterion 2: Technical Feasibility

The data on advanced coursework would rely on student-level course data. These data are currently collected and submitted through the California Longitudinal Student Achievement Data System (CALPADS) (CDE, 2013). The data that are submitted to the CALPADS system is checked for quality and accuracy. Advanced coursework is rated strong (5) for the technical feasibility criterion.

Criterion 3: Cost-Efficiency

Adelman (2006) provides a minimum list of courses required for high school graduates to be adequately prepared to succeed at the postsecondary level. There would be costs to implement advanced courses at high schools that do not currently offer any or not enough of these courses. Districts that have implemented advanced coursework districtwide had to cut or change other programs in order to fund it (Freedman et al., 2011). Significant resources may be required to implement this college readiness indicator, and, therefore, it is rated somewhat weak (2) for this criterion.

Criterion 4: Equity

There are significant issues of access of all students to quality advanced courses. As described above, some high schools offered courses that appeared to be high-level (because of the title), but were not in terms of course content. The CCSS will implement strict and consistent standards for all students that will address this issue. However, since they have not yet been implemented, its effectiveness is yet to be determined. In addition, disadvantaged students (English learners, socioeconomically disadvantaged, and special education) have unequal access to take these advanced courses

(McCormick, 2011). Since, there are significant equity issues, it is rated somewhat weak (2) for this criterion.

Criterion 5: Political Feasibility

Advanced coursework is popular and strongly supported by the stakeholders. There have been 45 states that have adopted the CCSS, which incorporate more rigorous course taking for high school students (Common Core State Standards Initiative, 2012). Also, there is a movement to increase high school graduation requirements to look like A-G requirements (Freedman et al., 2011). It is rated strong (5) for this criterion.

Overall Score for Advanced Coursework

Table 11 provides the total CAM analysis score for advanced coursework after all the ratings for each criterion have been assigned. The total score for advanced coursework is 3.20.

Table 11: Advanced Coursework CAM Analysis Results

	Criteria					
	Supported by Research	Technical Feasibility	Cost-Efficiency	Equity	Political Feasibility	Total
Advanced Course-work	Rating: 4 Weight: 0.30 Total: 1.20	Rating: 5 Weight: 0.15 Total: 0.75	Rating: 2 Weight: 0.25 Total: 0.50	Rating: 2 Weight: 0.25 Total: 0.50	Rating: 5 Weight: 0.05 Total: 0.25	3.20

AP COLLEGE READINESS INDICATOR

AP offers college-level courses and exams that are aimed at preparing students to succeed at college and earn college credit while in high school (Lichten, 2000).

Criterion 1: Supported by Research

Research has mix things to say in regards to the effectiveness of AP in preparing students for college. Many researchers have found that an AP exam score of 3 should not warrant college credit because it does not predict college success (Casement, 2003; Hansen, 2006; Lichten, 2000; Sadler, 2007). Also, researchers have also found issues with the graders of the AP exams. The researchers question the ability and qualifications of the people who are grading the AP exam. Other studies found that students who participated in the AP exam have higher levels of college success (Chajewski et al., 2011; Dougherty et al., 2006). In addition, researchers have found that AP is a good predictor of college success (Dougherty et al., 2006). Based on the mixed research regarding AP, it is rated neither weak nor strong (3) for this criterion.

Criterion 2: Technical Feasibility

Currently, CDE only collects data on students who take AP courses through the CALPADS system (CDE, 2013). The data that are submitted to the CALPADS system are checked for quality and accuracy. However, CDE does not collect students' performance on the AP exam. In order to obtain the exam data, CDE will have to match its records with the AP records. Matching two data sets can weaken the quality and accuracy of the data, because it is highly unlikely that there will be 100 percent match of all records. Therefore, some records are bound to not be included because they could

not be matched. Since there may be issues with the quality and accuracy of AP data, it is rated neither weak nor strong (3) for this criterion.

Criterion 3: Cost-Efficiency

There are some costs associated with AP, both in the courses and exams. In order for a district to implement just one AP course, it costs between $1,900 to $10,000, depending on the resources needed and the specific course (AP, 2013). However, many districts are able to leverage existing resources to help decrease these startup costs. Also, California has set aside funds to pay for eligible high schools' implementation of AP courses (California AP Expansion Program [CAPE], 2011). In regards to the AP exam, students' taking the various AP exams can fall to the districts to cover. Though districts can be reimbursed for the costs of the AP exams, there are eligibility requirements and limited funding availability (CDE, 2012e). Since, it is not as cost-efficient, it is rated neither weak nor strong (3) for the cost-efficiency criterion.

Criterion 4: Equity

AP has grown significantly in the last decade and has become widely available. California passed Senate Bill 532, which encourages and funds high schools in the state to offer at least five AP courses (CAPE, 2011). Though access to AP programs has increased significantly in low-income urban schools, many low-income and urban schools are still without AP courses and the quality of AP in these schools is not equal to higher-income schools (Hallett & Venegas, 2011). There are some equity concerns with access of AP to all students, and, therefore, it is rated neither weak nor strong (3) for the equity criterion.

Criterion 5: Political Feasibility

AP continues to be a well-supported, respected, and popular program across the state (and nation). In the last ten years, AP has approximately doubled in size (Casement, 2003). It is rated strong (5) for this criterion.

Overall Score for AP

Table 12 provides the total CAM analysis score for AP after all the ratings for each criterion have been assigned. The total score for AP is 3.10.

Table 12: AP CAM Analysis Results

	Criteria					
	Supported by Research	Technical Feasibility	Cost-Efficiency	Equity	Political Feasibility	Total
AP	Rating: 3 Weight: 0.30 Total: 0.90	Rating: 3 Weight: 0.15 Total: 0.45	Rating: 3 Weight: 0.25 Total: 0.75	Rating: 3 Weight: 0.25 Total: 0.75	Rating: 5 Weight: 0.05 Total: 0.25	3.10

IB COLLEGE READINESS INDICATOR

The high school IB program consists of advanced coursework to prepare high school students for success at the university level (IBO, 2013b).

Criterion 1: Supported by Research

The majority of research found benefits of IB. Researchers found that students with an IB exam score of a 6 or higher were more likely to earn an “A” grade in the same subject year in their first year of college than those IB students with a lower exam score (Caspary & Bland, 2011). The only downside to the research is that a majority of

it was not from peer reviewed articles or journals, and, therefore, IB is rated somewhat strong (4) for this criterion.

Criterion 2: Technical Feasibility

Like AP, CDE collects data on IB courses but not on the IB exams. In order to use the IB exam data, CDE would have to match its data with IB data and data issues can surface. As such, it is rated neither weak nor strong (3) for this criterion.

Criterion 3: Cost-Efficiency

There are significant costs to the districts and their schools to have IB. First, schools are assessed an application fee of up to $23,000 when applying to have the IB program (Truth About IB, 2013). Second, schools have an annual fee of $10,400 per IB program (IBO, 2013). So, if a school has multiple diploma programs, it has multiple annual fees to pay. All of these costs to the schools are rolled up and paid by the districts, and, therefore, IB is rated somewhat weak (2) for the cost-efficiency criterion.

Criterion 4: Equity

The high costs of IB do cause equity concerns. High costs can limit access to IB for districts in low-income neighborhoods. Also, IB is not as widely available as AP in California high schools. Currently, there are only 120 schools with IB programs in the state (IBO, 2011). Overall, it is rated somewhat weak (2) for this criterion.

Criterion 5: Political Feasibility

Recently, IB has been gaining in popularity and support from stakeholders. In the last ten years, IB program has grown significantly throughout the nation (Stillisano et al., 2011). It is rated somewhat strong (4) for this criterion.

Overall Score for IB

Table 13 provides the total CAM analysis score for IB after all the ratings for each criterion have been assigned. The total score for IB is 2.85.

Table 13: IB CAM Analysis Results

	Criteria					
	Supported by Research	Technical Feasibility	Cost-Efficiency	Equity	Political Feasibility	Total
IB	Rating: 4 Weight: 0.30 Total: 1.20	Rating: 3 Weight: 0.15 Total: 0.45	Rating: 2 Weight: 0.25 Total: 0.50	Rating: 2 Weight: 0.25 Total: 0.50	Rating: 4 Weight: 0.05 Total: 0.20	2.85

DE COLLEGE READINESS INDICATOR

DE is a program where high school students can receive both high school and college credits for a dual enrollment course. DE courses typically are taught either on high school campuses or at off-campus, college facilities.

Criterion 1: Supported by Research

Research strongly supported the positive impact of DE programs in preparing students to handle college-level coursework. Researchers have found that DE offers college readiness benefits that include new ways of behaving, thinking, and interacting, because high school students are exposed to life on a college campus (Karp, 2012). Also, researchers found DE plays a significant role in getting high school students ready for college math (Kim & Bragg, 2008). It is rated strong (5) for this criterion.

Criterion 2: Technical Feasibility

The data for DE are collected by CDE, but it is not a mandatory collection (CDE, 2013). Because it is not mandatory, the quality and accuracy of the data are not checked as thoroughly as mandatory data collected through the CALPADS system. Also, in order to meet the needs for incorporation into the API, a slight change in the way that DE is currently collected in the CALPADS system would have to be made. Currently, the CALPADS system only collects those students enrolled in a DE course, regardless of whether the DE course is taught on the high school campus or at the local college. It is rated neither weak nor strong (3) for this criterion.

Criterion 3: Cost-Efficiency

As the data required for the DE indicator would require a minor change in CDE's current data collection, this will have a financial impact on districts. They would have to expend some resources to ensure these data are properly collected on the student-level in the CALPADS system. It is rated neither weak nor strong (3) for the cost-efficiency criterion.

Criterion 4: Equity

DE has significantly expanded in recent years (Hughes, 2012). This expansion has seen an increase in access for disadvantaged students to DE in California. It is rated neither weak nor strong (3) for this criterion.

Criterion 5: Political Feasibility

The expansion of DE in schools in California shows its growing support and popularity. Also, stakeholders are becoming more aware of the robustness of college

readiness and the ability of DE to help prepare students for the many aspects of college life (Karp, 2012). It is rated somewhat strong (4) for this criterion.

Overall Score for DE

Table 14 provides the total CAM analysis score for DE after all the ratings for each criterion have been assigned. The total score for DE is 3.65.

Table 14: DE CAM Analysis Results

	Criteria					
	Supported by Research	Technical Feasibility	Cost-Efficiency	Equity	Political Feasibility	Total
DE	Rating: 5 Weight: 0.30 Total: 1.50	Rating: 3 Weight: 0.15 Total: 0.45	Rating: 3 Weight: 0.25 Total: 0.75	Rating: 3 Weight: 0.25 Total: 0.75	Rating: 4 Weight: 0.05 Total: 0.20	3.65

THE SAT AND ACT COLLEGE READINESS INDICATORS

Both the SAT and ACT are college readiness assessment tests. Though separate indicators, the exact issues and criticism exist for both the SAT and ACT equally. Therefore, the discussion of these exams is combined.

Criterion 1: Supported by Research

Overall, the research did not find that the use of the SAT and ACT was predictive of college success. Some researchers found that the SAT and the English and math test for the ACT predicted college performance (Shaw et al., 2012; Bettinger et al., 2011). Other researchers have found that the ACT and SAT are poor predictors for college readiness and success (Maruyama, 2012; Perez, 2002). Also, researchers found

that a single assessment test, like the SAT and ACT, is not an adequate indicator for college readiness by itself (Maruyama, 2012). It is rated somewhat weak (2) for this criterion.

Criterion 2: Technical Feasibility

CDE does not currently collect data on the SAT or ACT. In order to use SAT or ACT data, CDE would have to match its student-level records in the CALPADS system with the SAT and ACT data. These types of matches can weaken the quality and accuracy of the data. Most likely there will not be 100 percent match, leading to some students records dropping off. Therefore, they are each rated neither weak nor strong (3) for this criterion.

Criterion 3: Cost-Efficiency

The SAT and ACT both allow the fee for the test to be waived if students meet eligibility requirements (SAT, 2013a; ACT, 2013). Students who do not meet the eligibility requirements have to pay for the test themselves, unless districts choose to fund their high school students to take the SAT and/or ACT (College Board, 2012). Districts that do fund their students to take either exam can take on a significant financial burden. For example, just administering the SAT once would cost a district with 200 test takers approximately $10,000 (SAT, 2013a). The SAT and ACT are neither weak nor strong (3) for the cost-efficiency criterion.

Criterion 4: Equity

The cost of the SAT and ACT, if not covered by the school district can be prohibitive for low-income students. Students who meet eligibility requirements can

also have the fee to take the SAT and/or ACT waved (SAT, 2013a; ACT, 2013). However, there are limits to how many times students that receive a fee waiver can take either test. Also, the fee waiver does not cover the costs for the SAT and/or ACT preparation. Due to the costs of the SAT and ACT preparation, economically disadvantaged students do not have equal access to the SAT and ACT. They are rated neither weak nor strong (3) for the equity criterion.

Criterion 5: Political Feasibility

Both the SAT and the ACT have support among the various stakeholders. However, both tests have taken some heat in the research for not being adequate predictors for college success (Maruyama, 2012; Perez, 2002). They are each rated somewhat strong (4) for this criterion.

Overall Score for the SAT and ACT

Table 15 provides the total CAM analysis scores for the SAT and ACT after all the ratings for each criterion have been assigned. The total scores for the SAT and ACT is 2.75.

Table 15: The SAT and ACT CAM Analysis Results

	Criteria					
	Supported by Research	Technical Feasibility	Cost-Efficiency	Equity	Political Feasibility	Total
SAT	Rating: 2 Weight: 0.30 Total: 0.60	Rating: 3 Weight: 0.15 Total: 0.45	Rating: 3 Weight: 0.25 Total: 0.75	Rating: 3 Weight: 0.25 Total: 0.75	Rating: 4 Weight: 0.05 Total: 0.20	2.75
ACT	Rating: 2 Weight: 0.30 Total: 0.60	Rating: 3 Weight: 0.15 Total: 0.45	Rating: 3 Weight: 0.25 Total: 0.75	Rating: 3 Weight: 0.25 Total: 0.75	Rating: 4 Weight: 0.05 Total: 0.20	2.75

OVERVIEW OF THE CAM ANALYSIS RESULTS

Table 16 provides an overview of all the college readiness indicators and results for each indicator when evaluated by the criteria.

Table 16: CAM Analysis Results for the College Readiness Indicators

	Criteria					
	Supported by Research	Technical Feasibility	Cost-Efficiency	Equity	Political Feasibility	Total
EAP	Rating: 4 Weight: 0.30 Total: 1.20	Rating: 5 Weight: 0.15 Total: 0.75	Rating: 5 Weight: 0.25 Total: 1.25	Rating: 2 Weight: 0.25 Total: 0.50	Rating: 5 Weight: 0.05 Total: 0.25	3.95
Advanced Course-work	Rating: 4 Weight: 0.30 Total: 1.20	Rating: 5 Weight: 0.15 Total: 0.75	Rating: 2 Weight: 0.25 Total: 0.50	Rating: 2 Weight: 0.25 Total: 0.50	Rating: 5 Weight: 0.05 Total: 0.25	3.20
AP	Rating: 3 Weight: 0.30 Total: 0.90	Rating: 3 Weight: 0.15 Total: 0.45	Rating: 3 Weight: 0.25 Total: 0.75	Rating: 3 Weight: 0.25 Total: 0.75	Rating: 5 Weight: 0.05 Total: 0.25	3.10
IB	Rating: 4 Weight: 0.30 Total: 1.20	Rating: 3 Weight: 0.15 Total: 0.45	Rating: 2 Weight: 0.25 Total: 0.50	Rating: 2 Weight: 0.25 Total: 0.50	Rating: 4 Weight: 0.05 Total: 0.20	2.85
DE	Rating: 5 Weight: 0.30 Total: 1.50	Rating: 3 Weight: 0.15 Total: 0.45	Rating: 3 Weight: 0.25 Total: 0.75	Rating: 3 Weight: 0.25 Total: 0.75	Rating: 4 Weight: 0.05 Total: 0.20	3.65
SAT	Rating: 2 Weight: 0.30 Total: 0.60	Rating: 3 Weight: 0.15 Total: 0.45	Rating: 3 Weight: 0.25 Total: 0.75	Rating: 3 Weight: 0.25 Total: 0.75	Rating: 4 Weight: 0.05 Total: 0.20	2.75
ACT	Rating: 2 Weight: 0.30 Total: 0.60	Rating: 3 Weight: 0.15 Total: 0.45	Rating: 3 Weight: 0.25 Total: 0.75	Rating: 3 Weight: 0.25 Total: 0.75	Rating: 4 Weight: 0.05 Total: 0.20	2.75

Based on the results of the CAM analysis, I have listed the college readiness indicators from the highest score to the lowest score and assigned them a corresponding rank.

Table 17: Rank Order of Indicators

Indicator	Score	Ranking
EAP	3.95	1
DE	3.65	2
Advanced coursework	3.20	3
AP	3.10	4
IB	2.85	5
SAT	2.75	6 (tied)
ACT	2.75	6 (tied)

After performing the CAM analysis, there is a break at those indicators greater than 3.00 and those that are below. The score of 3.00 indicates that, overall, the indicator is on the stronger side of the scale. Other cutoffs may be used or preferred. Ultimately, these scores provide the policymaker with the information to weigh the pros and cons of each indicator and make his or her decision. Using the cutoff score of 3.00, I propose the use of the advanced coursework, the EAP, DE and AP indicators. The SAT, the ACT and IB, therefore, have been excluded. However, before I continue, I perform a sensitivity analysis to ensure my results are accurate.

SENSITIVITY ANALYSIS

The results of the CAM analysis are based on ratings and weights I assigned. I assigned the ratings and weights to best of my ability, using the information available. However, other weighting systems may be preferred. Therefore, I use a sensitivity analysis to examine the different outcomes when different criteria weights are used. This gives transparency and accuracy to the CAM analysis process. Overall, changing the weights of the criteria changes the totals for the different college readiness indicators and possibly changes the preferred alternatives.

I conduct three different sensitivity analyses focusing on the three criteria with the highest weights: supported by research, cost-efficiency, and equity. Each sensitivity analysis has three tests to it. In the first sensitivity analysis, for test one, I increase the research criterion by 0.05 and decrease the cost-efficiency and equity criteria each by 0.025. Each subsequent test I increase the research criterion again by 0.05 and decrease the other two criteria by 0.025. The results of the first sensitivity analysis are in Table 18.

Table 18: Sensitivity Analysis 1 – Increasing the Supported by Research Weight

Criteria	Baseline Weight	Test 1	Test 2	Test 3
Supported by Research	0.30	0.35	0.40	0.45
Cost-Efficiency	0.25	0.225	0.20	0.175
Equity	0.25	0.225	0.20	0.175
Technical Feasibility	0.15	0.15	0.15	0.15
Political Feasibility	0.05	0.05	0.05	0.05
Total	1.00	1.00	1.00	1.00

Table 19: Sensitivity Analysis 1 – Changes in Rank Order

Indicators	Baseline Rank Order	Test 1 New Rank Order	Test 2 New Rank Order	Test 3 New Rank Order
EAP	1	1	1	1
DE	2	2	2	2
Advanced coursework	3	3	3	3
AP	4	4	4	5
IB	5	5	5	4
SAT	6 (tied)	6 (tied)	6 (tied)	6 (tied)
ACT	6 (tied)	6 (tied)	6 (tied)	6 (tied)

In the first sensitivity analysis, there was one result I found interesting. In test three, IB moved ahead of AP in rank order. However, overall, the rank order was not impacted significantly.

In the second sensitivity analysis, for test one, I increase the cost-efficiency criterion by 0.05 and decrease the supported by research and equity criteria each by 0.025. Each subsequent test I will increase the cost-efficiency criterion again by 0.05 and decrease the other two criteria by 0.025. The results of the second sensitivity analysis are in Table 20.

Table 20: Sensitivity Analysis 2 – Increasing the Cost-Efficiency Weight

Criteria	Baseline Weight	Test 1	Test 2	Test 3
Supported by Research	0.30	0.275	0.25	0.225
Cost-Efficiency	0.25	0.30	0.35	0.40
Equity	0.25	0.225	0.20	0.175
Technical Feasibility	0.15	0.15	0.15	0.15
Political Feasibility	0.05	0.05	0.05	0.05
Total	1.00	1.00	1.00	1.00

Table 21: Sensitivity Analysis 2 – Changes in Rank Order

Indicators	Baseline Rank Order	Test 1 New Rank Order	Test 2 New Rank Order	Test 3 New Rank Order
EAP	1	1	1	1
DE	2	2	2	2
Advanced coursework	3	3	3 (tied)	4
AP	4	4	3 (tied)	3
IB	5	5	5	6
SAT	6 (tied)	6 (tied)	4 (tied)	5 (tied)
ACT	6 (tied)	6 (tied)	4 (tied)	5 (tied)

In the second sensitivity analysis, I had two results I found interesting in test two and three. First, the SAT and ACT jumped IB in the rank order. Second, in test two advanced coursework and AP tied for third place and in test three AP jumped ahead of advanced coursework.

In the last sensitivity analysis, for test one, I increase the equity criterion by 0.05 and decrease the supported by the research and cost-efficiency criteria each by 0.025. Each subsequent test I increase the equity criterion again by 0.05 and decrease the other two criteria by 0.025. The results of the third sensitivity analysis are in Table 22.

Table 22: Sensitivity Analysis 3 – Increasing the Equity Weight

Criteria	Baseline Weight	Test 1	Test 2	Test 3
Supported by Research	0.30	0.275	0.25	0.225
Cost-Efficiency	0.25	0.225	0.20	0.175
Equity	0.25	0.30	0.35	0.40
Technical Feasibility	0.15	0.15	0.15	0.15
Political Feasibility	0.05	0.05	0.05	0.05
Total	1.00	1.00	1.00	1.00

Table 23: Sensitivity Analysis 3 - Changes in Rank Order

Indicators	Baseline Rank Order	Test 1 New Rank Order	Test 2 New Rank Order	Test 3 New Rank Order
EAP	1	1	1	1
DE	2	2	2	2
Advanced coursework	3	3	3 (tied)	4
AP	4	4	3 (tied)	3
IB	5	5	5	6
SAT	6 (tied)	6 (tied)	4 (tied)	5 (tied)
ACT	6 (tied)	6 (tied)	4 (tied)	5 (tied)

In this last sensitivity analysis, again, I had the exact same results as I had for the second sensitivity analysis. Namely, the SAT and ACT jumped IB in the rank order in test two and three. And, in test two advanced coursework and AP tied for third place and in test three AP jumped ahead of advanced coursework. Overall, after conducting the three different sensitivity analyses, my original CAM analysis findings were supported.

CONCLUSION

The CAM analysis divided the alternatives into two distinct groups by making a clear cut score of 3.00. As such, college readiness indicators scoring 3.00 or greater are recommended for incorporation into the API. Those indicators are advanced coursework, the EAP, DE, and AP. The indicators scoring less than 3.00 were removed from consideration. Those indicators are IB, the SAT, and the ACT.

In order to test the robustness of my results, I performed three sensitivity analyses. After conducting these analyses, the selected alternatives remained the same; thus, lending support to my original results. In the next chapter, I discuss how the recommended college readiness indicators can be incorporated into the API.

CHAPTER 5: CONSTRUCTING THE API WITH COLLEGE READINESS INDICATORS

In the last chapter, I compared college readiness indicators identified in chapter 2 using the CAM analysis. The results of the CAM analysis pointed to four college readiness indicators to be incorporated into the API. Those indicators are advanced coursework, the Early Assessment Program (EAP), Advanced Placement (AP), and dual enrollment (DE). In this chapter, I outline how those college readiness indicators could be incorporated into the API.

PERFORMANCE LEVELS AND API SCORES FOR THE INDICATORS

Performance levels are used for assessment tests to determine the level of proficiency for each student. Likewise, the college readiness indicators should have performance levels to determine the level of college readiness. In order to keep the API easy to understand by the different stakeholders and consistent, the college readiness performance levels should be the same as they are for assessment tests in California.

Table 24: Performance Levels and API Score for the Indicators

California's Current Assessment Performance Levels	Performance Levels for College Readiness	API Score
Advanced	Advanced	1,000
Proficient	Proficient	875
Basic	Basic	700
Below Basic	Below Basic	500
Far Below Basic	Far Below Basic	200

Each college readiness indicator [advanced coursework (see table 25), the EAP (see table 26), AP (see table 27), and DE (see table 28)] would have five performance levels.

In other words, the AP college readiness indicator will have Advanced, Proficient, Basic, Below Basic, and Far Below Basic performance levels.

The Advanced performance level represents students who have demonstrated comprehensive knowledge and skills required for college (CDE, 2011b). Next, the Proficient level represents students who have adequate and competent knowledge and skills required for college. The Basic performance level represents students who have limited knowledge and skills required for college. The Below Basic performance level represents students who have a deficient amount of knowledge and skills required for college. Finally, the Far Below Basic performance level represents students who have no knowledge and skills required for college.

Advanced Coursework College Readiness Indicators

The most extensive and cited research done in the area of college readiness revealed that the greatest predictor of college success is the intensity of the academic curriculum students took in high school (Adelman, 2006). Though no state had incorporated specifically Adelman's advanced coursework into their new accountability systems, the weight and significance of Adelman's research warrant incorporating it into California's API. Much of what is considered "advanced coursework" can be found in programs such as AP and IB; however, it can act independently of such programs. Although there are similarities between A-G and Adelman's requirements, his are more stringent than A-G. In other words, if a student meets the requirements set forth by Adelman, A-G requirements, by default are met. Therefore, Adelman's requirements subsume those of A-G. The performance levels for advanced coursework are assigned

solely based on Adelman's extensive research.

Table 25: Advanced Coursework Performance Levels

Performance Levels for College Readiness	Advanced Coursework Performance Levels	API Score
Advanced	3.75 CUs in English and math (either pre-calculus, calculus, or trigonometry); 3.0 CUs in a laboratory science (biology, chemistry, or physics); 4.0 CUs in foreign language or social science; 2.0 CU of computer science	1,000
Proficient	3.75 CUs in English and math (either pre-calculus, calculus, or trigonometry); 2.5 CUs in a laboratory science (biology, chemistry, or physics); 3.0 CUs in foreign language or social science; 1.0 CU of computer science	875
Basic	3.75 CUs in English and math (either pre-calculus, calculus, or trigonometry); 2.0 CUs in a laboratory science (biology, chemistry, or physics); 2.0 CUs in foreign language or social science; 1.0 CU of computer science	700
Below Basic	2.75 CUs in English and math (either pre-calculus, calculus, or trigonometry); 1.0 CUs in a laboratory science (biology, chemistry, or physics); 1.0 CUs in foreign language or social science; 1.0 CU of computer science	500
Far Below Basic	Did not take any advanced courses.	200

According to Adelman (2006), the requirements at the Basic level are the minimum requirements for advanced coursework, which is the reason why I placed them at this performance level. However, I did not include his minimal requirement of one AP course, because that is counted in the AP college readiness indicator. For the Advanced and Proficient performance levels, I made slight increases to the number of CUs required in the different subject areas. The Advanced level reflects achieving at the

highest level in advanced coursework in high school and the Proficient level just below those standards. For the Below Basic performance level, I made a 1.0 CU reduction in the different subject areas. Overall, the college readiness performance levels reflect Adelman's research findings.

The EAP

As mentioned in chapter 2, the EAP is unique to California and, therefore, no other state is using this exact college readiness indicator in their accountability systems. The literature available on the EAP described its effectiveness and usefulness in determining students who are college ready. Table 26 maps the EAP to the performance levels and the corresponding API score.

Table 26: The EAP Performance Levels

Performance Levels for College Readiness	The EAP Performance Levels	API Score
Advanced	Exempt	1,000
Proficient	Conditionally Exempt with completion of required math courses	875
Basic	Conditionally Exempt without completion of required math courses	700
Below Basic	Nonexempt	500
Far Below Basic	Incomplete	200

The Exempt level means that those students meet the requirements for college-level coursework and have been exempted from the college placement exam. Therefore, students who test at Exempt level on the EAP are awarded 1,000 points on the API.

Students who test at the Conditionally Exempt level are recommended to take an appropriate math course to prepare for college and be exempted from the placement. Therefore, those students who test at the Conditionally Exempt level on the EAP and take the recommended math course in grade 12 earn 875 towards the API. Those students who place at the Conditionally Exempt level, but have not taken the recommended math course are awarded 700. Students who test at the Nonexempt level on the EAP have limited knowledge and skills required for college and, therefore, are awarded 500 points on the API. Finally, students who did not participate or did not complete the EAP test are awarded 200 points for the API.

AP College Readiness Indicator

AP was used by several states as a college readiness indicator in their new accountability systems. Also, there were states that measured both participation and performance in AP. The literature confirmed the importance of participation and performance and helped determine how performance in AP should be measured.

Table 27: AP Performance Levels

Performance Levels for College Readiness	AP Performance Levels	API Score
Advanced	AP Exam score of 5 on at least two AP exams	1,000
Proficient	AP Exam score of 4 on at least two AP exams	875
Basic	AP Exam score of 3 on at least two AP exams	700
Below Basic	Participated in two or more AP courses	500
Far Below Basic	Did not participate in AP	200

The assignment of the different AP courses is based on a balance of what states were doing and what the literature revealed. Georgia measures college readiness by those students who perform at the college ready levels on at least two AP exams (Georgia Department of Education, 2013). Students who have a high score on two or more AP exams demonstrate their readiness for college in two or more subject areas. This is important because being college ready requires students to be ready in more than just one subject. The research also revealed that an AP score of 4 is considered qualified for college and a score of 5 is considered well qualified (Casement, 2003; Hansen et al., 2006; Lichten, 2000; Sadler, 2007). Students who score a five or higher in two or more AP exams have demonstrated that they are at the Advanced performance level and are awarded 1,000 API points. Likewise, students who score four or higher on two or more AP exams have demonstrated that they are at the Proficient performance level.

According to the research, students scoring a three on an AP exam may mean that they are possibly ready for college (Casement, 2003). Therefore, I placed students who score three on two or more AP exams at the Basic level because they demonstrated that they may be ready for college. Lastly, students who participate in (i.e. enrolled in) two or more AP courses are at the Below Basic level, because the research did indicate that there is value in students who are exposed to AP.

DE College Readiness Indicators

DE courses offer students a chance to rehearse for college and be familiar with what is required to succeed at the college level. DE gives high school students a glimpse of college life and the academic requirements of college-level work. For the Advanced, Proficient, Basic, and Below Basic performances levels, students can take their DE courses at either a high school campus or an off-campus, college facility.

Table 28: DE Performance Levels

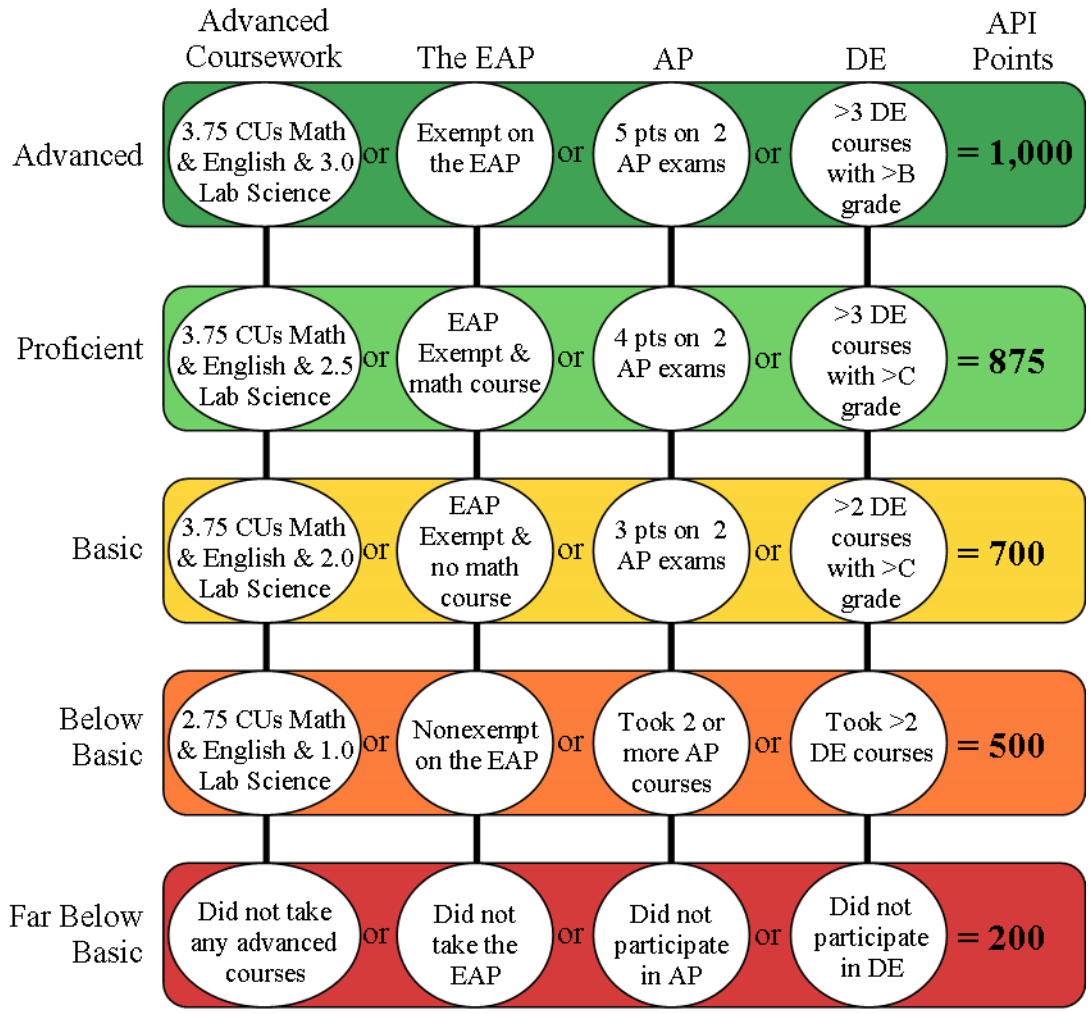
Performance Levels for College Readiness	The Dual Enrollment Performance Levels	API Score
Advanced	Three or more DE courses completed with a grade “B” or better	1,000
Proficient	Three or more DE courses completed with a grade “C” or better	875
Basic	Two or more DE courses completed with a grade “C” or better	700
Below Basic	Participated in two or more DE courses	500
Far Below Basic	Did not participate in DE	200

Students who have taken three or more DE courses with a grade of “B” or better are placed at the Advanced level. These students have proven to be able to handle college-level coursework in a college environment and exceed at a high level. Students who have taken three or more DE courses with a grade of “C” (which is needed for college credit) or better are placed at the Proficient level. These students have proven to be able to hand college-level coursework. The same logic is applied to students who are placed in the Basic performance level. Students are placed at the Below Basic level if students have participated two or more DE courses, regardless of grade, because there is value in students who are exposed to the expectations of college.

Summary of the College Readiness Indicators

I have summarized my results on how to incorporate the college readiness standards in a chart. This chart allows for the incorporation of the college readiness indicators into the API to be clearly understood.

Figure 1: Incorporation of the College Readiness Indicators into the API



CONCLUSION

In this chapter, I listed each college readiness indicator and assigned college readiness performance levels. The performance levels were assigned based on a combination and balance of what other states were doing and what the research said. In the next chapter, I provide the policy implications of my recommendations, the limits of my research, and opportunities for further research.

CHAPTER 6: CONCLUSION

In the upcoming months and years, changes will be made to the API with the passing of Senate Bill (SB) 1458. There is a need and a desire to incorporate college readiness indicators into the API to keep districts and high schools accountable for ensuring their graduates are ready to succeed at the postsecondary level. Also, college readiness indicators would incentivize the kinds of opportunities research and practice indicates students should have to become ready for college. The purpose of this thesis is to provide the CDE with recommendations regarding which college readiness indicators should be included in its new accountability system.

I first looked at what California was doing in the area of college readiness and found that the two main indicators were the administration of the Early Assessment Program (EAP) to assess the college readiness of high school students and the use of A-G requirements for college eligibility. I reviewed what other states were doing in this area and found several common college readiness indicators in use: Advanced Placement (AP), International Baccalaureate (IB), dual enrollment (DE), the SAT, and the ACT. Also the research identified advanced coursework as another potential college readiness indicator. I took these indicators, along with the EAP, to find what the research said about their use as college readiness indicators.

These college readiness indicators were evaluated by a list of criteria. The five criteria selected were: 1) supported by research; 2) technical feasibility; 3) cost-efficiency; 4) equity; and 5) political feasibility. After analyzing these indicators, I found that advanced coursework, the EAP, DE, and AP were best suited for the state to

incorporate into the API. I established performance levels for college readiness that aligned to the performance levels for California's assessment tests and the API point scale. These performance levels were Advanced (1,000 API points), Proficient (875 API points), Basic (700 API points), Below Basic (500 API points), and Far Below Basic (200 API points). Each college readiness indicator was mapped to these performance levels based on a combination and balance of what other states were doing and what the research said. The four college readiness indicators used (advanced coursework, the EAP, DE, and AP) were combined to create a single indicator. This allowed for multiple ways for students to demonstrate college readiness. I provided a chart that gave a visual overview of the recommended college readiness indicators and their incorporation into the API (see Figure 1).

POLICY IMPLICATIONS

The API is high-stakes and changes made to it will have significant policy implications across the state. Therefore, it is important to project possible policy implications and unintended consequences before making changes.

Incorporating advanced coursework as a college readiness indicator could have significant unintended consequences. As noted in the literature review, researchers found when schools are pressured (or forced) to offer advanced courses, the content of the "advanced" courses may not match the title (Venezia, Kirst, & Antonio, 2003). If advanced coursework is implemented as part of the API, then districts will be heavily pressured to have students enroll in and complete advanced courses in their high schools. This may force districts to offer courses that are labeled "advanced" but, in

reality, the content of the courses may be watered down. Steps will need to be taken by California to ensure the courses are rigorous. The Common Core State Standards (CCSS) may be able to address this, as one of the main purposes of the CCSS is to create rigorous and consistent standards for courses to prepare students for college. However, since the CCSS have not yet been fully implemented, their ability to adequately address this issue is still unknown.

A well-known consequence of high-stakes accountability is that schools will tailor their practices to respond to what they are being held accountable to in the API. For example, up until now the API has been solely based on assessments, so schools have had a heavy focus on the assessment tests (Fensterwald, 2012). If California was to implement the college readiness API that I recommend, I would expect schools to focus more on advanced coursework, the EAP, DE, and AP. This would have positive outcomes, such as greater availability of advanced coursework, DE, and AP courses – and the supports that promote student success in these courses. However, this could also have unintended consequences. For example, schools may neglect or remove other valuable programs, such as music and performing arts. If valuable and important programs were to fall by the wayside, it would do a disservice to the students and their parents.

In that same vein, IB, the SAT, and the ACT were not recommended for inclusion into the API based on their lower scores from the analysis. However, since they would not be part of the API, an unintended consequence would be that districts and schools would be less likely to encourage their students to engage in such

programs. As discussed in the literature review, these three excluded indicators do have value in preparing students for college, but were not included in the index because of their shortcomings on other criteria of importance, like cost-efficiency.

In addition, these college readiness indicators have two main aspects: advanced courses students take (advanced coursework, AP, and DE) and students' achievement on a college ready assessment (the EAP). These aspects heavily rely on students who are high-achievers, and, traditionally, those students tend to be advantaged students. A possible unintended consequence may be those advantaged students receive a majority of the focus, leaving the disadvantaged students behind. A policy solution to this potential consequence is to require schools to both meet API growth targets school-wide and by subgroups (race/ethnicity, socioeconomically disadvantaged, students with disabilities, and English learners). Currently, this is a part of the API and AYP, and it would just need to be implemented for the college readiness indicators to ensure disadvantaged students receive the same focus.

LIMITATIONS

There are limitations with my methodology. First, I limited in the number of college readiness indicators I analyzed to what was currently being done in California, what other states were doing, and what is prominent in the research. There may be important and significant college readiness indicators that were not used by California, other states, or in the literature.

Second, the CAM analysis results are based on the criteria I used to evaluate the potential college readiness indicators. I was limited by the number of criteria and which

criteria I selected. Using a different set of criteria would likely yield different results.

FURTHER RESEARCH

The college readiness indicators recommended in this thesis were based on the results of the CAM analysis. Further research will be needed if these indicators are incorporated into API. Specifically, future research is needed to analyze and evaluate the effectiveness of each college readiness indicator. For example, for the AP college readiness indicator, college readiness was measured for participation and performance in any AP course; however, after analyzing the data certain courses may prove to be of more value than others. It is possible that future research can reveal adjustments that need to be made to each indicator to better measure for college readiness.

There were college readiness indicators that were used by other states and/or supported by research, but were not considered in this thesis. This is because the data are not collected for them, and, therefore, could not be implemented by the 2015-16 legislative deadline. These indicators, include, but not limited to, high school GPA, college remediation rates, and class rank. Also, collecting data for these indicators can prove to be costly. However, research has found that these indicators are strong predictors for college success (Adelman, 2006; North Carolina Community Colleges, 2013). California should commission a research report to determine if these, and possibly others, indicators' benefits outweigh the costs to implement them after 2015-16.

CONCLUSION

The purpose of this thesis is to provide the CDE with recommendations regarding which college readiness indicators should be included in its new accountability system. The four recommended indicators are advanced coursework, the EAP, AP, and dual enrollment. These indicators were chosen based on the evidence of their success in predicting college readiness, the minimal costs to the state, equal access to the programs, and the support they receive from the stakeholders. These college readiness indicators will go a long way in keeping high schools accountable for ensuring their students are being prepared for the rigors and requirements of college.

Appendix A – Summary of States' College Readiness Indicators

	College Readiness Indicators						
State	**Graduation Rate**	**College Remediation Rate**	**AP/IB Participation**	**Dual Enrollment**	**Performance on State Assessment**	**ACT/SAT Scores**	**Other**
Connecticut	✓		✓	✓			
Florida	✓		✓	✓		✓	✓
Georgia		✓	✓		✓	✓	✓
Illinois					✓	✓	✓
Iowa					✓		
Kentucky					✓	✓	✓
Michigan					✓		
Oklahoma		✓	✓	✓			✓
Tennessee	✓		✓	✓	✓	✓	✓
Texas	✓				✓		

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