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Separate and Unequal: Latinx Access, Enrollment and Completion of AP coursework in the State of Virginia

Virginia Elizabeth Palencia
mckenzieve@mymail.vcu.edu

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Virginia Palencia

Virginia Commonwealth University

Director: Charol Shakeshaft, Ph.D., Professor, School of Education

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Abstract

In response to the national problem of overrepresentation of Latinx students in general education classes, this study addresses Latinx access to Advanced Placement (AP) coursework, enrollment, and completion patterns in Virginia, a growing destination state for many Latinx families and students. Through a secondary data analysis of both the Civil Rights Data Collection (2015-6) and College Board data (2016), this quantitative study mapped patterns of disproportionality in AP access, enrollment, and completion for Latinx students, who comprise 13% of enrollment in Virginia public high schools. In addition, a case study of two diverse school districts provides evidence of segregation and unequal access to AP, as well as disproportionality in Latinx enrollment and completion. Although greater AP course availability was found in suburban schools, where most Latinx students in Virginia were enrolled, findings document disproportionality in AP enrollment for STEM and nonSTEM coursework for Latinx students, and disproportionality in AP completion in terms of passing the exam.

Finally, the case study of two Virginia school districts revealed disparate experiences for Latinx students. Within the school districts, there were varied levels of segregation and disproportionality in AP access, enrollment, and completion for Latinx students, despite being in diverse, well-resourced school districts. Latinx students experienced the greatest degree of underenrollment in AP compared to Asian, Black, and White students in both school districts. Such findings demonstrate the need for more research in regard to AP access, enrollment and completion for underserved students, especially in regard to school setting and segregation.

Keywords: access, advanced coursework, Advanced Placement, enrollment, completion, disproportionality, Latinx achievement, segregation, tracking

Dedication

I would like to dedicate this dissertation to my students for showing me the importance of opportunity and access in order to create a better future. Thank you for teaching me the value of advocacy, the dangers of complacency, and the need for systemic change. I hope to do right by you.

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I would like to dedicate this dissertation to my family, past and present, who sacrificed and created opportunities for me that they did not always have for themselves. This dissertation belongs to all of us, and to the children of our family, in order to show them that with hard work and persistence, anything is possible.

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Chapter 1: Overview of the Study

Introduction

The response to *Brown v. Board* (1954) demonstrated that segregated public schools cannot be made equal; despite the significance of this ruling decades ago and the wisdom of its intent, our schools continue to be segregated (Carnoy & Garcia, 2017; Ladson-Billings 2013; Orfield & Lee, 2005; Orfield, Kucsera, and Siegel-Hawley 2012; Pew Research Center, 2017). Underresourced schools and segregation negatively impact minority students, particularly in access to opportunity and college preparation. Latinx[1] and Black students are more likely than White and Asian students to attend segregated schools and comprise over 75% of the student body in extreme poverty schools, overcrowded, and under-funded schools (Carnoy & Garcia, 2017; Ladson-Billings, 2013; National Center for Education Statistics [NCES], 2019; Orfield & Lee, 2005; Pew Research Center, 2014).

Sixty-six years later, segregation remains, even within schools that are, on paper, diverse. Tracking, or the practice of sorting students into classes that differ in rigor and ability, often results in disparate experiences within the same school: White and Asian children disproportionately enroll in honors (college preparatory), dual enrollment, and

[1] **Latinx as a designation**. The term "Latinx" is becoming more common in the United States as a designation for a person who identifies as Hispanic or Latina/o. The "x" is a designation intended to be more gender-inclusive, with respect to Spanish using the gendered terms Latina/o. however, it remains a construction that dominates in English-speaking countries like the United States. I adopt Latinx because my primary audience is scholars within the United States where this usage is now commonplace; my ultimate goal is to communicate clearly the needs and issues surrounding the community in regard to education in the United States.

Advanced Placement classes, while Black and Latinx students disproportionately enroll in regular, general education classes (Crabtree, Richardson, & Lewis, 2019; Gándara & Contreras, 2009; Oakes, 2005). Considering that Latinx students comprise 25.4% of the national school population and Black students 15.5%, over 40% of students run the risk of being underserved (Pew Research Center, 2014).

Sorting students into different tracks may appear to be a middle or high school practice, but such decisions are made before a child even reaches the fourth grade (Burris, Wiley, Welner & Murphy, 2008; Ford, 2015; Kettler & Hurst, 2017). Unfortunately, once students become tracked into a level, it becomes exceedingly difficult to change trajectories, as structural barriers prevent the freedom and choice to do so. In short, creating barriers to advanced work creates opportunity gaps that are systematically difficult to dismantle; this is especially detrimental as Latinx and Black students could arguably benefit the most from greater access to educational opportunity as they are the most likely groups to need greater access. Even though Virginia does not have the largest Latinx population compared to other states, the Latinx population is growing; ensuring equitable access to advanced coursework is a pressing concern as such courses are tied directly to economic and educational opportunity. Regardless, the issue of Latinx access to AP and STEM coursework remains underexplored.

Background

The equity conversation surrounding the access to Advanced Placement (AP) programs is far from new. Established in the 1950s, AP credit is granted by almost all universities (85%) for the successful completion of exams (College Board, 2016). Thus, a beneficial relationship exists between high schools and universities, as AP courses signal

a competitive candidate for university admission and students can potentially save money and time through the completion of exams for college credit.

The research of Solorzano and Ornelas (2004) into AP access and minorities affirm that Latinx and Black students are underrepresented in AP courses in California and that low-income urban and minority schools have lower AP enrollment and fewer offerings. Even when Latinx and Black students attend higher income schools, they are still disproportionately underenrolled in AP classes.

The literature that does discuss the AP gap and Latinx students converges around one theme: it's complicated. In truth, multiple financial, social, and structural barriers exist that may impede Latinx students from enrolling and successfully completing AP coursework and college preparatory classes. Kanno & Kangas (2014) note that higher track course enrollment corresponds with higher socioeconomic status; AP course offerings and enrollment also correspond with schools with higher overall socioeconomic status. Thus, socioeconomic status of individuals and schools both are a factor in access to Advanced Placement courses. Further, the AP exam itself costs $94, although students may apply for a fee reduction on an application basis (College Board, 2019a).

Several structural barriers may also provide an explanation for the Latinx AP gap. Flores & Gomez (2011) note that many schools lack the infrastructure to develop and expand a rigorous curriculum. Fiscal restraints are also an impediment as implementing classes and training teachers cost school districts resources and money. Parents and students alike may be unaware of the benefits of the AP program and its potential to save college tuition money in the long run and bolster university admissions. Thus, lack of articulation can lend itself to an elitist school culture: the perception that only certain

types of students belong in an AP class. Other factors may also be at play, such as deficit thinking, maintaining the status quo, and bias (D'Errico & Castruita, 2018).

Statement of the Problem

Denying educational access to a growing population has sweeping ramifications that impact not only Latinx students specifically, but society as a whole. Lack of access to advanced coursework impacts educational attainment and future opportunity, which translates into achievement gaps, graduation gaps, and lower college completion rates. In turn, lower educational attainment leads to lower economic attainment, thus, potentially perpetuating a cycle of lower educational fulfillment for subsequent generations. One could argue that such practices are contrary to our national commitment to a free and fair public education, upholding the ideal that we all benefit socially and economically from an equitably educated society.

Purpose of the Study and Significance

In response to the national problem of overrepresentation of Latinx students in general education classes, I addressed Latinx access to advanced coursework, enrollment, and completion patterns in Virginia. What little scholarship exists that specifically addresses Latinx students is generally qualitative in nature or applies to areas with large concentrations of Latinx populations such as California, Texas, or New York City. Quantitatively exploring patterns in a new destination state that is currently experiencing a demographic shift will provide insights for other communities in similar contexts, especially in light of recent population trends. Further, while many Black and Latinx students experience similarly negative outcomes in regard to segregation and lack of access to advanced coursework, there is a gap in quantitative research focusing

specifically on the Latinx experience. For these reasons, this research focused on Latinx access to AP and STEM in Virginia, a growing destination state for many Latinx families and students.

Research Design

This study is a secondary analysis of data from the Office of Civil Rights and the College Board to examine patterns in AP course taking and completion of Latinx students in Virginia. Collected by the United States Office for Civil Rights, and part of the Civil Rights Data Collection (CRDC), the data used in this sample were collected for the 2015-16[2] school year from nearly every local educational agencies (LEA) and public school, in addition to alternative schools, charter schools and juvenile justice facilities (CRDC, 2019b). In addition, I supplemented the CRDC set with information from the Virginia Department of Education (VDOE, 2020b) for classification of alternative and special education schools in the state. Finally, in order to be able to answer questions regarding racial/ethnic groups and the specific scores and completion of the exams with greater depth, I used the College Board archival data for AP Program and Participation, 2016.

Research Questions

The questions guiding this study are:

1. AP Availability/Offerings - How does the number of advanced placement course offerings vary by urbanicity (rural, suburban, urban) in the state of Virginia? To what extent do the amount of AP course offerings affect AP enrollment for Latinx students?

[2] This is the most recent data available through the Civil Rights Data Collection.

2. AP Enrollment - To what extent does racial disproportionality for Latinx students in AP enrollment exist? Are Latinx students disproportionately enrolled in AP STEM coursework?

3. AP Completion - To what extent does racial disproportionality for Latinx AP completion exist? Are there differences by type of exam in passing the course for Latinx students?

4. School District Analysis - To what extent does racial disproportionality for Latinx AP access, enrollment, and completion exist within diverse school districts? How is AP access and participation impacted by racial segregation?

Assumptions and Limitations

The following assumptions were made concerning the collection of data. The first assumption was that the data collected by the local LEAs, CRDC and the College Board were reliable and valid. The second assumption was that the data reported by local LEAs, the CRDC, and the College Board were accurate.

This study has the following limitations. One limitation is that data collected by local LEAs, the CRDC, and the College Board are subject to recording errors. Additional variables, not part of this study, may impact enrollment and completion trends, which can in turn impact achievement. In regard to measurement, because the CRDC only accounts for enrollment in at least one AP course, this makes it difficult to gauge for students who are enrolled in multiple AP courses. Finally, another limitation centers on decisions of who or what to measure. Not all schools offered AP science, AP Math and AP nonSTEM. In addition, not all schools have Asian, Black, Latinx or White school enrollment or AP enrollment. This means that deciding which courses and

students to measure potentially left groups out or could potentially distort numbers. This dilemma will be explored more thoroughly in Chapters 3.

Definition of Terms

The following terms will be utilized in this study:

Ability grouping (or sorting)*:* The practice of grouping students by ability or talent. This often occurs within the classroom at the elementary level.

Advanced Coursework: Courses including Advanced Placement, Dual Enrollment, International Baccalaureate (IB) or honors classes that are designed and intended to prepare students for university.

Advanced Placement (AP): Courses that both prepare students for university and can replace introductory university courses with the successful completion of the course and scoring a three or higher on an exam.

AP completion: The completion of an AP course and the successful passing (three or above) of the AP exam.

AP Math*:* In the CRDC, all AP courses in mathematics (i.e. Calculus, Physics) are collapsed into one category.

AP NonSTEM: In the CRDC, all AP courses that are neither mathematics or science (i.e. Government, English Language and Literature)

AP Science: In the CRDC, all AP courses in the sciences (i.e. Biology, Chemistry, Environmental Science) are collapsed into one category.

Higher-level coursework: Courses including Advanced Placement, Dual enrollment or honors classes that are designed and intended to prepare students for university.

LEA: Local educational agencies. They are responsible for reporting data to the U.S. Department of Education.

Regular-level coursework: Courses that are intended to provide a general education, not necessarily college preparation.

Second-Generation segregation*:* Racial disproportionality that results from the practice of tracking or curricular differentiation (Mickelson, 2002). Latinx and Black students are disproportionately sorted into general coursework by these structures, resulting in a separation from their White and Asian peers.

School setting: the type of school a student may attend: traditional, alternative, special education, regional, magnet.

Tracking: the practice of sorting students into classes that differ in rigor and ability.

Urbanicity: whether an area or school district is located in a rural, suburban or urban school district.

Chapter 2: Theoretical Orientation and Review of Literature

In order to accurately set the context for such a study, the following literature review explores the emergence of Latinx students, segregation, tracking, and access to advanced placement and STEM courses to frame this important (and much needed) conversation about Latinx students and opportunity.

Theoretical Orientation

Several theories provide useful explanations for the forces that support and reinforce barriers to access within education, specifically in regard to Latinx populations.

Latino Critical Theory (LatCrit)

Critical race theory (CRT) is a framework grounded in the following concepts: racism and inequality are ubiquitous and are integrated and present in all aspects of our society (Delgado & Stefancic, 2017). Those who employ CRT examine the relationships of power, race and society and often re-evaluate and deconstruct systems that maintain the status quo. Latinx critical theory (LatCrit) is a complementary extension of CRT and maintains that epistemologies are essentially "systems of knowing;" much of education is dominated by a Euro-centric epistemology (Delgado Bernal, 2002; Ladson Billings, 2000). Latcrit is an appropriate framework for this study as it provides more dimension than CRT for Latinx populations, because it also considers language, immigration status, phenotype, culture and identity in its analysis (Delgado Bernal, 2002). Latcrit is a useful guide for considering Latinx students and education, as these aforementioned factors are very much present in the process of selecting certain students for higher level-

coursework, whether it is teacher bias, the racial/cultural mismatch of teacher to student, perceptions of a student or family's value of education, and standardized testing.

Capital Theory

Bourdieu's (1986) cultural capital theory refers to assets that facilitate social mobility, power, and access to opportunity. Education is a powerful form of capital, as well as having the knowledge of how to navigate educational systems. Thus, cultural capital in terms of socioeconomic status, race, language, immigration status and parental education relate to Latinx education through a variety of lenses. For example, social class in terms of both economics and parental education may impact the achievement of a Latinx student in terms of cultural capital. Latinx students who have immigrant parents with no prior experience of the U.S. education system face additional barriers Thus, many Latinx students and parents contend with a deficit in terms of "what to know" and how to successfully prepare for and negotiate higher-level coursework.

While the terminology for social capital predates Bourdieu, his work specifically illuminates how social capital reinforces inequity. Social capital refers to the ability of people to use networks and knowledge to enhance their own standing (Bourdieu, 1986). In a school setting, this may enhance the ability to access additional information, hidden rules, or use networks to leverage "funds of knowledge" – information about strategies and behaviors that assist achievement (Núñez, 2014). Thus, access to cultural and social capital impacts students in terms of what to know and how to negotiate for higher-level coursework.

A criticism of Bourdieu's conceptualization of cultural capital is that it is grounded in deficit thinking (Yosso, 2005). White, middle-class capital is privileged over

the other types of capital a Latinx family may have, such as aspirational or navigational capital. Thus, rather than regarding all forms of capital on equal status, Latinx capital may not be seen as an asset, but as a deficit. There is great merit to this critique, as Latinx families may have a wealth of capital (aspirational capital, strong family networks, bilingualism) that is not valued in our current school system. CRT helps develop this view, when research is centered on the comprehensive assets and resources that exist within communities of color. While it is important to acknowledge and move away from deficit explanations of capital, schools still often operate from a White, middle-class cultural perspective. Thus, those norms inform teacher perceptions of capital and subsequently, their behavior towards students and families. Further, cultural capital is a useful model to discuss teacher bias, as well as the hidden curriculum in regard to underserved students.

Intersectionality

While intersectionality was initially conceived of in terms of feminist critical theory, it provides a useful model for Latinx students. Intersectionality examines power dynamics, specifically in terms of privilege and marginalization (Núñez, 2014). People can simultaneously hold positions of marginalization and privilege in terms of race, class, gender, education, language, citizenship, and identity. Thus, intersectionality is a useful model for Latinx students, who are part of a diverse group of people with diverse experiences. Coupled with this examination of marginalization versus privilege, intersectionality also provides a powerful opportunity to examine systems that maintain and perpetuate inequity and favoritism. Núñez (2014) asserts that there are several modes of intersectionality at play with Latinx students: social categories, arenas of influence,

and historicity. In essence, Latinx students contend with stereotypes, teacher perception, internalization and misrepresentation that impact academic performance (Núñez, 2014).

Review of the Literature

This review was organized around three emergent themes: benefits of advanced and STEM coursework; barriers (segregation, tracking, bias and capital); and outcomes (gifted gap, AP gap, STEM gap, and lack of access to AP and STEM courses).

Before discussing relevant literature, I will justify the rationale for investigating opportunities for Latinx students and then expand on the benefits of access to advanced and STEM coursework. Doing so will set the foundation for a robust examination of barriers to access and potential outcomes for Latinx students and advanced coursework. External barriers refer to barriers that exist outside of the school building, such as residential segregation. Internal barriers (tracking, implicit bias, lack of capital) refer to challenges that occur inside of the school building or classroom. Lack of capital pertains specifically to students, and Latinx student may additionally contend with language and cultural barriers. External and internal barriers ultimately lead to the gaps and lack of access for underserved students. Because of the breadth and depth of such a topic, I found it helpful to conceptualize the literature in the following way (Figure 1):

Figure 1:
Barriers to Outcomes Model

Barriers → Outcomes

External Barriers[3] →	**Internal Barriers**[4] =	**Outcomes**
Segregation	Tracking	AP enrollment gap
Systemic Bias	Implicit Bias (Teacher)	AP completion gap
	Lack of Capital	STEM gap
		Gifted gap
		Achievement gap
		Lack of access to AP/STEM

The Emergence of Latinx Students

While many Black and Latinx students experience similarly negative outcomes in regard to segregation, there are experiences that are unique to Latinx students that warrant individualized attention. The practice of tracking and segregation creates barriers to opportunity and access for Latinx students; it follows that such practices lead to lower outcomes in terms of educational achievement (college matriculation, preparation, and attainment) and future earnings.

Although one must hesitate before assigning generalities to an incredibly diverse group of students, the common experience of low expectations and underachievement persists for Latinx students, regardless of region, country of origin, or gender (Gándara & Contreras, 2009). The issue of access is becoming increasingly pertinent for Latinx students for a multitude of reasons; however, the most relevant one is that this particular group is the fastest growing minority in the United States. By 2016, the Latinx population reached 17.9% of the United States population, making them the largest minority; school enrollment for Latinx students also doubled from 8.8 million in 1996 to 17.9 million in

[3]External barriers refer to obstacles that often exist outside a school building, such as residential segregation.
[4]Internal barriers refer to obstacles that exist within a school building

2016 (NCES, 2019, United States [U.S.] Census, 2017). As of 2016, over 25% of public school students were Latinx (NCES, 2019). Further, demographic patterns are shifting so that many states are now becoming new destinations for Latinx communities, such as Virginia or South Carolina; as a result, school systems that did not historically have a large Latinx population are now adapting to an influx of students from this demographic (Ackert, 2018). When we consider shifting demographics in both cities and suburbs and the fact that the population in the United States is evolving into a majority-minority paradigm, the matter of educational access and opportunity has both economic and moral consequences. While it is important not to conflate race with low socioeconomic status, it is relevant that many Latinx students are concentrated in school systems where students and schools often have a lack of resources and access to advanced coursework (Carnoy & Garcia, 2017; Crabtree et al., 2019). With such a large demographic shift, there should be an equally proportional shift in honors class participation and bachelor degree attainment for Latinx students; however, these numbers do not align, suggesting other factors are at play.

As it stands, Latinx students demonstrate significant achievement gaps in comparison to their White and Asian peers in the following areas: standardized testing, college preparation, high school graduation, and college completion (Crabtree et al., 2019; Gándara & Contreras, 2009; Pew Research Center, 2013). Nationally, only 79% of Latinx students hold a high school diploma compared to 88% of White students (NCES, 2019; Gándara & Contreras, 2009). As of 2019, Virginia echoed a similar pattern for its cohort report: 80.1% of Latinx students graduated compared to 94.7% of White students in 2018 (VDOE, 2020c).

In Richmond City Public schools, a city whose Latinx population has quadrupled in the past ten years, the graduation rates for Latinx students are especially troubling: compared with an 78.9% graduation rate for White students, 40.1% of Latinx students graduate, a number inexplicably lower than Richmond's 50.6% graduation rate for English learners (VDOE, 2020c). Richmond's 57.3% Latinx dropout rate is equally concerning (VDOE, 2020c). This disparity in graduation rates suggests the need for reevaluating the education of Latinx students (VDOE, 2020c). Further, the demographic shifts vary geographically, disproportionately impacting schools that are historically segregated, furthering the racial and access divide.

While college attendance rates for Latinx students have nationally made humble gains, the college completion rate for this group continues to lag (Gándara & Contreras, 2009; Pew Research Center, 2013). Many Latinx students are more likely to work and attend community colleges than to attend four-year universities without working; often, they cite financial barriers for the completion of a four-year degree (Gándara & Contreras, 2009; Pew Research Center, 2013, 2017). If the largest minority in the United States is not completing college, this will create economic consequences that will affect society as a whole.

Benefits of Advanced and STEM Coursework

Determining what qualifies as access to AP is debatable. How many courses are available vary widely between and within school districts. Does having access to both AP STEM and nonSTEM courses meet the definition of access? How many courses should be available to present a robust amount of offerings? The CRDC relies upon the metric of *at least one course available*. Many studies rely upon correlations between the number of

AP courses and other variables, whereas others rely upon merely the presence of coursework.

Regardless, being prepared for college matters: financially, academically, and in terms of opportunity (Moller & Stearns, 2012). Students engaged in higher-level coursework have better academic outcomes, especially for historically marginalized students attending underresourced schools (Long, Conger, & Iatarola, 2012; Oakes, 2005; Raudenbush et al., 1993; Schneider, Swanson, & Riegle-Crumb, 1998). They also have higher graduation rates (Long et al., 2012; Scafidi, Clark & Swinton, 2015) and better college attendance and completion (Cabrera & La Nasa, 2001; Crabtree et al., 2019; Long et al., 2012; Scafidi et al., 2015). Higher-level coursework is also tied to student efficacy and self-perception (Hurt, 2018; Lewis & Diamond, 2015). And perhaps, most importantly, students in higher-level coursework have a richer educational experience, one with greater depth, rigor, and challenge (Lewis & Diamond, 2015), as advanced classes are associated with higher quality teachers (Scafidi et al., 2015). For a student attending an underresourced school, which many minority students do, this access to richer educational experiences is even more critical. Finally, education is tied to economic opportunity and ultimately, income equality; thus, education can leverage future social and racial inequalities (Moller & Stearns, 2012; Tyson 2013).

In other words, the value of equitable access to higher-level coursework cannot be understated. Engaging in a rigorous curriculum is tied to better overall academic outcomes (Crabtree et al.,2019; Long et al., 2012; Oakes, 2005; Raudenbush et al., 1993; Richardson & Lewis, 2019; Scafidi et al., 2015; Schneider et al., 1998). Higher-level classes also tend to have a greater amount of instructional time, as classes are more likely

to be taught bell-to-bell (Oakes, 2005). Further, greater instructional time also results in deeper academic engagement, as well as higher performance expectations (Lewis & Diamond, 2015). Greater time, engagement, and high expectations culminate in greater student efficacy - a self-fulfilling prophecy (Lewis & Diamond, 2015; Tyson, 2013). Finally, considering the very real economic benefits associated with education, students who engage in higher level coursework are more likely to have greater economic opportunities in their future job market (Tyson, 2013).

The connection between AP courses and college performance is also strong. Taggart & Crisp (2011) found a correlation between AP courses and four-year college attendance; in their study, half (48%) of the Latinx college students in a four-year institution had enrolled in at least one AP course in high school, compared to those in community college (9%).

In many respects, the benefits of access to STEM coursework parallel those of advanced coursework. Indeed, the importance of access to 7th and 8th grade Algebra has recently received national attention, as it illuminated gaps in school offerings and resources and highlighted school inequity (GAO, 2018; NCES, 2019). Using the Educational Longitudinal Study of 2002–2006, Byun, Irvin & Bell (2015) investigated the effects of advanced math coursework on educational outcomes; they found that STEM coursework had positive effects on college enrollment and math achievement, especially for low SES students. In essence, access to higher-level coursework and STEM provide multiple academic benefits and positive student outcomes; yet, many students do not have the opportunity to experience those benefits due to barriers, such as segregation.

Barriers to Access to Advanced and STEM coursework

Multiple barriers to advanced coursework and STEM exist for underrepresented students. Some barriers are systemic and the result of structures that have been in place for decades, such as segregation. Many barriers exist within the school building as well, including tracking, bias and lack of capital. All of these barriers serve as possible explanations for gaps in advanced and STEM enrollment.

Segregation

Many of us know that educational segregation *de jure* (by law) was struck down by *Brown v. Board 1954*. Fewer of us are aware of the different incarnations of segregation *de facto* (by fact), which still persist to this day. Segregation can occur regionally or locally, as well as *between-districts* or *within-districts* for school systems. *Between-district* segregation can be especially prominent if there are significant extremes or gaps in the socioeconomic status within a school district; this can lead to an unequal distribution of resources and opportunity (Reardon, 2016). *Within-district* segregation reflects a lack of equity within a school district. Segregation can also occur within a school through tracking (second-generation segregation). Beyond race, students can also experience segregation socioeconomically, as well as linguistically (Palardy, Rumberger & Butler, 2015). For Latinx students, the intersection of segregation by race, language and socioeconomics is especially daunting (Palardy et al., 2015), especially considering that Latinx students are becoming the most segregated minority group in the United States (Kucsera, Siegel-Hawley & Orfield, 2015; NCES, 2019; Orfield & Lee, 2007; Orfield & Yun, 1999). In 2017, sixty percent of Latinx students attended school with at least 75 percent minority enrollment (NCES, 2019).

Much scholarship has been devoted to the harmful effects of segregation; segregated schools are more likely to have fewer resources, per-pupil funding, and opportunity (Brunn-Bevel & Byrd, 2015; GAO 2018; Logan & Burdick-Will, 2017). The relationship between segregation and achievement is especially relevant, considering that Black and Latinx students are more likely to attend highly segregated, underresourced schools than White students (GAO 2016; Logan & Burdick-Will 2017; Palardy et al., 2015; Welsh, 2018). Even within districts, Billingham (2019) concluded that Black-White segregation and Latinx-White segregation persists within many inner cities. Thus, urban education is doubly impacted by segregation and poverty. Palardy et al. (2015) found the effects on achievement and outcomes were further compounded for Black and Latinx students because they more frequently attend underresourced segregated schools. Their study concluded that the socioeconomic status of segregated schools impacted student outcomes more than family socioeconomic status (Palardy et al., 2015). Further, segregation is an issue for "new destination" states. Clotfelter et al. (2020) study of school districts in North Carolina (n=108) found that middle and high schools experience a significant amount of within-school segregation and that segregation was more profound between Latinx and White students than Black and White students, particularly within schools. In addition, White students were more likely to be enrolled in advanced coursework.

GAO's (2016) report analyzed education data from the school years 2000-01 to 2014-15 and concluded that many Black and Latinx students in minority-dominant schools have far less access to advanced coursework. In addition, high-poverty and minority schools offer fewer math and science classes, impacting access to STEM. For

the school year 2011-12, 79% of low-poverty/low-minority schools offered 7th or 8th grade Algebra, in comparison to 49% of high-poverty/high-minority schools (GAO, 2016). In addition, 80% of low-poverty/low-minority schools offered Physics, in comparison to 55% of high-poverty/minority schools. Disproportionality and disparities were also present for AP access. For example, 72% of low-poverty/minority schools offered AP classes in comparison to 48% of high-poverty/minority schools (GAO, 2016).

Reardon & Kalogrides (2019) also found that segregation was a significant predictor of achievement gaps. This builds upon the work of Reardon (2016) who determined which feature of segregation most strongly correlated with achievement gaps; he concluded that school poverty rates between segregated schools were the strongest predictor of academic achievement gaps. Building on this research, Gagnon & Mattingly (2018) examined Black-White test gaps and Latinx-White test gaps and found that those gaps persist regardless of region. However, the Latinx-White gap was especially marked comparing areas of affluence and disadvantage. Logan & Burdick-Will (2017) expanded segregation research by examining its impact on rural communities. They found that in rural areas, Native Americans were most impacted by segregation and also found inequality between Black and Latinx students in comparison to White students. Giersch, Bottia, Mickelson, Arlin & Stearns (2016) explored how segregation impacted college freshman grade point averages and found that high school segregation negatively impacted minority students in college. Hanselman & Fiel (2017) concluded that White and Asian students experienced higher quality schools than their Black and Latinx peers.

Segregation creates barriers for Latinx students and advanced coursework, and many Latinx students attend underresourced, high-poverty schools. Given this

relationship among segregation, resources, and achievement, many Latinx students have lower levels of college readiness (Gandara & Contreras, 2009; Kouyoumdjian, Guzmán, Garcia & Talavera-Bustillos, 2017; Moller & Stearns, 2012), as well as financial barriers to college completion. Thus, the importance of access to advanced coursework is especially important for this group of students in terms of achievement, access, and opportunity.

Tracking (Second-Generation Segregation)

Tracking, or the practice of sorting students into classes that differ in rigor and ability, can potentially lead to second-generation segregation; tracking reflects our choice-oriented culture and also our conflicting perception around the main purpose of education. Is the purpose of education to prepare students for a trade or university? To promote citizenship, higher order thinking, or a devotion to the classics? While perhaps ideally, education should embody all of these aims, tracking has become a compromise of these intentions and goals (Oakes, 2005), often in an attempt to consider the diverse needs of a diverse group of learners. Tracking at the secondary level often results in two streams of learning: a generalized curriculum and an advanced curriculum. On the surface, the presentation of two options is innocuous, if it is purely grounded in choice. Yet, who makes the choices and who benefits from them? Who are the gatekeepers to access?

While philosophically many conceive public education as a means to provide a multitude of opportunities in a free and fair manner, in truth, our educational system is far from fair. Indeed, the lure of "choice" between tracks affirms our belief in a meritocratic system; however, in an educational system that begins with ability grouping (the process

of sorting according to talents and proficiencies) in elementary school, we must question how much actual "choice" is actually involved in our children's education. And if such choice is based upon teacher recommendations (and perceptions), parental cultural capital (leveraging knowledge of the educational system to benefit one's child), and financial resources (the presence of Advanced Placement (AP) classes), we must consider that choice is not actually meritocratic or fair (Lewis & Diamond, 2015). While on the surface, the typical criteria used for tracking (standardized tests, teacher recommendation, parental choice) seem objective, in practice, they are vulnerable to implicit bias (Oakes, 2005). When you consider that many Latinx and Black students are disproportionately sorted into general coursework by these structures, tracking then engenders a racially correlated "second-generation segregation" (Mickelson, 2015). In sum, a multitude of structures actually dictate the placement of a student far beyond superficial choices.

While the practice of tracking is common (Card & Giuliano, 2016), the benefits of such a practice remain controversial. Beyond the merits of aligning students within their ability and with their intended career trajectory, the practice creates potential barriers to access for Black and Latinx students. Indeed, the benefits of access to higher-level coursework are well supported for both minorities and White students (Long, Conger, & Iatarola, 2012; Oakes, 2005; Raudenbush, Rowan, & Cheong, 1993; Schneider, Swanson, & Riegle-Crumb, 1998). However, tracking creates negative effects when minority students are disproportionately represented in general education classes (Crabtree et al., 2019; Mickelson, 2015; Oakes, 2005).

As with segregation, tracking is negatively correlated with achievement for some students; in particular, segregation and tracking combined may "trigger a cycle of

cumulative disadvantage...for educational outcomes" (Mickelson, 2015). Tracking negatively impacts minority students, especially those with low socioeconomic status, regardless of school composition (Finkelstein & Fong, 2008; Mickelson, 2015; Oakes, 2005). Even within a diverse school, Black and Latinx students are more likely to enroll in general education classes than their White and Asian peers (Kolluri, 2018; Oakes, 2005; Scafidi et al., 2015). Those who attend racially homogeneous schools (majority Black and Latinx) will find that the overall course load is also disproportionately lower-level; there are fewer advanced course offerings available (CRDC, 2020). As a result, tracking results in an educational pipeline that inhibits minority students' access to higher order thinking and rigor and results in less overall instructional time (National Education Policy Center, 2013, U.S. Department of Education, 2013). Ability grouping has the potential to exacerbate segregation, which is especially problematic for Latinx students, who can be the most isolated students within a school (Conger, 2005). Thus, tracking or second-generation segregation can potentially undermine desegregation efforts (Oluwale & Green, 2020).

Further, the process of steering minority students into general education classes results in negative school perceptions, relationships with teachers, self-efficacy, and beliefs (Oakes, 2005). Because tracking results in racial segregation and isolation, the systems that allow for sorting and hierarchies ultimately reinforce and affirm status beliefs about race (Hurt, 2018; Lewis & Diamond, 2015; Oakes, 2005; Tyson, 2013). The systematic sorting of races into different tracks tied to intelligence allows educators and students to perceive some groups as more intelligent than others (Hurt, 2018; Lewis and Diamond, 2015). In addition to affecting high school achievement and reinforcing

harmful stereotypes, tracking impacts post-secondary education, as well, in terms of college access and completion (Tyson, 2013). Tracking directly impacts opportunity, and opportunity has a real cost in terms of future earnings, high school graduation, and college attendance and completion (Lewis & Diamond, 2015).

Despite harmful consequences to certain groups of students, there is some evidence to suggest that tracking can incur benefits beyond matching students to their intended potential. Card & Giuliano (2016) explored the efficacy of selective tracking for high-achieving students (n=4,144) and found that tracking resulted in higher reading and math scores, especially for Black and Latinx students. This supports the concept that access to higher-level coursework is beneficial. Thus, tracking students into rigorous coursework leads to higher academic gains, whereas the practice of disproportionately sorting students into lower-level courses results in achievement gaps and a negative educational pipeline.

Latinx students, like their Black peers, are particularly vulnerable to implicit bias and their families often lack the capital to navigate the educational system and work it in their favor. Segregation and tracking create multiple negative consequences for Latinx and Black students; however, Latinx students can also potentially experience segregation and discrimination in a way that distinguishes them from other marginalized groups. Language is an aspect of segregation that is relevant to Latinx students. While many Latinx students are English learners (and often segregated within a school due to language ability), language can also be used to justify tracking. Citing evidence of underachievement, many justify tracking Latinx students because they believe that language is a barrier for this group of students, yet the majority of Latinx students (69%)

speak English at home or demonstrate a high proficiency with the English language. This number is higher for U.S. born Latinx (89.7%) (Gándara & Contreras, 2009; Pew Research Center, 2017). For the group of Latinx students who are classified as English learners, 3.7 million or 7.6% of the total school population, many reach English proficiency by high school (U.S. Department of Education, 2018). Despite this reality, the majority of non-Latinx Americans cite language as the primary reason for Latinx underachievement (Gándara & Contreras, 2009; Kanno & Kangas, 2014). In reality, Latinx students experience disproportionate tracking, regardless of language proficiency, suggesting language is not the explanation for tracking (Gándara & Contreras, 2009; Kanno & Kangas, 2014).

Bias

Systemic and implicit bias are important factors in determining which types of students are perceived to be suited for advanced placement and STEM coursework. Often, these two forms of bias work in tandem when considering the gifted, STEM and AP gap, standardized tests and teacher recommendations.

Gifted identification and access to advanced courses often rely on teacher recommendations and standardized scores. Standardized tests are historically problematic for underrepresented groups, both in their construction and in the subjectivity of cut-off scores (Oakes, 2005). Teacher recommendations are also problematic as the teacher workforce (82%) and school administrators (80%) are predominantly White, yet White students only make up 51% of the public school population (U.S. Department of Education, 2018). Racial disproportionality between teacher and student can lead to bias, lowered expectations, and misperception of ability (Lewis & Diamond, 2015; Oakes,

2005). A teacher's perception of generalized academic behavior can be impacted by racial bias (Irizarry & Cohen, 2019), and students are often aware of their teacher's perceptions and expectations (Liou, Tyson, Marsh & Antrop Gonzalez, 2017), lending weight to the presence of racialized tracking perpetuating stereotypes and misperceptions. Thus, objective measures, such as testing, and subjective measures, such as teacher recommendation, are both problematic gatekeepers for identifying giftedness.

Systemic Bias. In terms of systemic bias, or prejudice on an institutionalized basis, prominent scholars argue that in the past, achievement gaps were often believed to be the result of racial and intellectual inferiority; now, such attitudes result have evolved into a "deficit" mindset where students of color or their families are blamed for their underachievement (Ladson-Billings, 2006; Solorzano & Ornelas, 2004; Valencia, 2012). As a result this hyper-focus on achievement gaps and subsequent blame on individuals allow for systems and stakeholders to escape accountability or to even be considered as a possible source for student underachievement.

Beyond the greater educational system, systemic bias can also impact school climate, which in turn relates to academic motivation for students of color. Perriera, Fulgini & Potochnick (2010) compared two groups of Latinx students (n=459) in North Carolina and Los Angeles to explore the role of environment and context on Latinx students' sense of belonging and achievement. They found that positive school climate, adult encouragement and positive ethnic treatment incurred higher academic motivation. School climate mediated the relationship between perceived discrimination and academic motivation.

Keels, Durkee & Hope (2017) explored the link between educational outcomes and racial microaggressions against Black and Latinx students (n=426). Despite a common misperception that microaggressions only incur psychological harm, Keels et al. found that microaggressions negatively impacted Black and Latinx student achievement.

Taggart and Crisp (2011) connected the impact of systemic bias and racist experiences to Latinx students' postsecondary decisions. In their study, Latinx students (n=2,210) were less likely to enroll in a four-year university if they experienced or witnessed discriminatory experiences. Thus, students essentially "tracked" themselves based on the presence of bias and discrimination (Taggart and Crisp, 2011).

Implicit Bias. Implicit bias, the presence of prejudice (conscious or unconscious) from a privileged group towards a marginalized group, also plays a profound role in student selection for higher-level coursework, as teachers are often the gatekeepers either through recommendations, identification or grouping students into certain levels of courses. In truth, such observations are highly subjective. In a qualitative study, Duncheon & Muñoz (2019) found that teachers (n=108) often rely on personal and subjective experiences to determine college readiness, which resulted in a large variation in what skills are considered "college ready."

Fox (2015) investigated the effects of same-race teachers and students (n=3,224) on two outcomes: teacher recommendations for higher-level courses and teacher expectations for post-secondary attainment. There were statistically significant effects for both Black and Latinx students in terms of teacher expectations. Relative to White teachers, Black teachers are 11.1 percentage points more likely to believe that a Black student will graduate high school and 13.5 points more likely to have expectations that

Black students will graduate college. Latinx teachers were 11.3 percentage points more likely to believe that Latinx students would graduate college than White teachers (Fox, 2015).

Implicit bias is not just limited to teacher and student, as bias may compound perceptions about whether or not certain groups value education, despite evidence that Latinx parents are more likely than other groups to cite education as a key to success (Katz, 1999; Pew Research Center, 2013). Ho & Cherng (2018) examined teacher perceptions (n=6,100) regarding minority and immigrant parents and found that teachers were more likely to perceive that minority immigrant parents were less involved in their child's education despite parents reporting active involvement; this led to ability grouping for English and Math along racial stereotypes and impacted teacher recommendations. Math teachers, in particular, were less likely to perceive Latinx parents as involved in their child's education; the largest gap was with Latinx immigrant families. Another finding confirmed that the students of parents considered highly involved by teachers had higher GPAs and were more likely to be recommended for honors courses, despite gaps in actual parental involvement vs. teachers' beliefs of parental involvement (Ho & Cherng, 2018). In reality, parental involvement is a subjective perception that often occurs at home in regards to helping with homework, preparation and planning: tasks a teacher would not easily be able to discern.

Such perceptions matter as teacher perceptions regarding parents may lead to poorer expectations of student performance and ability (Suarez-Orozco et al., 2008). Thus, negative perceptions about parents' value of education and parenting ability may lead to negative perceptions about student ability and potential, which translate into a

teacher/parent mismatch on involvement and less recommendations for higher coursework.

Irizarry & Cohen (2018) investigated (n=12,610) how race, ethnicity and immigration status intersect to influence teacher perceptions on academic behavior and ability. Reading ability was significantly lower for Black American and immigrant students, as well as for Latinx students. Receiving high literacy ratings for non-white Latinx students was 19% lower and 23% lower for Black American students than White and Asian peers.

The perception of effort is also subject to bias. Kozlowski (2015) investigated (n=7,135) three theories of racial achievement gaps: cultural mismatch, oppositional culture and teacher bias using the Educational Longitudinal Study (2002). She found that Black and Latinx students were more likely to believe that they were working hard, yet their teachers held different beliefs. Latinx students were 72% more likely to believe they were working hard than their teachers. Socioeconomic status also correlated with Black and Latinx student effort, suggesting that cultural capital may be a factor. In addition, those students were less likely than their White and Asian peers to receive positive teacher effort assessment. Thus, White and Asian students benefited from positive perceptions and Black and Latinx students experienced marginalization.

Lack of Recognized Capital

Another pathway to advanced coursework is parental choice, yet privilege and social-cultural capital all impact the ability of a parent to negotiate for a child's educational choices (Lewis & Diamond, 2015; Oakes, 2005). In reality, some students are essentially rewarded for their parent's access to capital and privilege at the expense of

their Black and Latinx peers (Horvat, Weininger & Lareau, 2015). In addition, transactions between schools, teachers, and parents may benefit some groups over others, as some parents may be more familiar and comfortable with school and cultural norms than others (Horvat, et al., 2015; Valadez, 2002).

Liu & White (2017) contend that parental involvement and engagement can be one form of capital; this belief aligns with earlier evidence that parental involvement (or the perception of involvement) can impact educational outcomes for students. Engagement may be an especially important leverage for immigrant families, in particular. Although the literature on parental involvement is vast, it is evident that communication, involvement and participation can vary among different groups. In their study, Liu and White (2017) used both the HSLS (2009-2012) and NCES (2013) data sets (n=13,000) and found that greater parental engagement and involvement leads to higher math scores and educational trajectory for students. Essentially, if parents have access and are engaged, then student outcomes improve.

Ryan (2017) investigated the role of social capital and parental engagement in Latinx and White youth choosing to attend college. Among Latinx students (n=1,020), parents having bachelor degrees or an advanced degree had a significant impact on college enrollment. Thus, a parent having the capital (knowledge) regarding the college process was a significant predictor; as a result, Latinx parents who have attended college provide a transfer of capital and knowledge to their children. However, many Latinx students have parents who have not attended college, thus suggesting a potential lack of capital in college preparation and preparatory coursework (Lewis & Diamond, 2015; Oakes, 2005).

Valadez (2002) investigated the role of social capital and math course selection for Latinx students (n=2,107). He found evidence that social capital leads to more informed educational decisions, and that social capital was a more powerful determinant for Latinx students with high socioeconomic status. Using the NELS (1988) data set, he found that parental discussion had a positive association with Latinx enrollment in higher-level math coursework.

Essentially, a multitude of factors converge that direct students into certain paths that have little to do with student ability including: teacher expectations, school perceptions, access to capital, parental demand, segregation and bias. Other factors such as socioeconomic status, parental education, immigrant status, and access to social capital also compound the divide for many Latinx students. The cumulative effects of bias and lack of capital lend support to the idea that tracking is not meritocratic and never has been (Horvat et al., 2015; Lewis & Diamond, 2015; Kanno & Kangas, 2014).

Outcomes

The inevitable result of systemic barriers and segregation is academic and opportunity gaps between privileged and nonprivileged groups of students. These gaps can be in the form of the gifted gap, the AP gap, and the STEM gap.

The Gifted Gap

No universally accepted definition of gifted exists and such definitions (and assessments) vary from school district to school district. However, for this argument, on the elementary level, “gifted” refers to students who have access to and are identified for a school district’s gifted program. For middle and high school, “gifted” coursework refers to access to honors, Advanced Placement and International Baccalaureate classes. An

important connection is that often students identified as gifted are more likely to enroll in AP classes in high school (Crabtree et al., 2019). Thus, a gifted gap can potentially lead to an AP gap.

While definitions may vary, it is clear that there is a racial gap in identification, enrollment, and access to gifted programs and advanced courses. The gifted gap refers to the gap between Latinx and Black students in gifted identification and advanced course enrollment (Crabtree et al., 2019). At the elementary level, Black and Latinx students are less likely to be identified as gifted, while White and Asians students are disproportionately represented in gifted programs (Ford, 2015; Kettler & Hurst, 2017). In McFadden *v. Board of Educ. for Illinois School Dist. U-46* (2013), Latinx students constituted 40% of the district, but only 2% of the school district's gifted program; in contrast, White students constituted 40% of the district, but 98% of the gifted program (Ford, 2015). Identification for gifted programs matters, because gifted programming often becomes a pipeline for advanced coursework in middle and high school; disproportionality exacerbates inequity, impedes opportunity and represents "a failure to invest in the intellectual development of American children" (Crabtree et al., 2019). Another dimension of disproportionality is found between and within schools and districts: low poverty schools are twice as likely to have gifted programs than high poverty schools (Yaluma & Tyner, 2018)

The gifted gap manifests itself in two ways at the high school: disproportionality in AP and STEM enrollment and lack of course offerings between and within schools and districts. Such courses are considered to be college and career preparatory classes; in a sense, they become gatekeeper courses to future opportunity and education. Latinx and

Black students are less likely than their White peers to attend schools where advanced courses are present, and even schools that have those courses under-enroll Latinx and Black students (New York Equity Coalition, 2018). For example, urban schools that were predominantly Black offered an average of 11.75 AP classes in comparison to majority White high schools offering an average of 20.6 (Crabtree et al., 2019). Further disproportionately exists between types of AP courses taken.

The AP Gap

Why does access to advanced placement and STEM coursework matter, specifically for Latinx students? When we consider that many future career opportunities center around STEM-related fields, being shut out of such fields merits attention. Several researchers have investigated reasons for lack of enrollment, as well as potential outcomes. Young (2005) identified several factors of underrepresentation for Black and Latinx adolescents in STEM coursework including: lack of teacher quality, resources, and access to coursework.

Despite the College Board's recent push to serve more students from marginalized backgrounds and their claims that Latinx students are fairly represented, in reality, disproportionality still remains. The College Board created an "All in" campaign in response to the disproportionality of Latinx enrollment in AP courses (College Board, 2014; Gilroy, 2016). However, while enrollment rose for Latinx and Black students, enrollment also increased for White students (College Board, 2014; Scafidi et al., 2015). While some evidence exists suggesting that Latinx AP participation is proportional to Latinx school enrollment, this may be attributable in part, to overrepresentation in AP Spanish Language. When disaggregating enrollment and results for AP Spanish

Language, Literature and Italian Language and Culture, Latinx students are underrepresented in other AP courses, especially in STEM subjects (Cannon, 2011; College Board, 2014; Kolluri, 2018; Scafidi et al., 2015). The largest gaps for Latinx AP enrollment were in math and science courses. According to Gilroy (2015), less than half of Latinx students who showed potential for such work actually enrolled in their respective AP classes. Arguably, access to STEM-related coursework and AP exams impact Latinx students in terms of college preparation and future scholastic and financial opportunity. Thus, disproportionality exists not only in terms of access, but also in the types of courses that are taken. Numerous studies demonstrate that there is a marked gap for Black and Latinx students in enrollment (Cha, 2015; Cisneros, Holloway-Libell, Gomez, Corley, & Powers, 2014; Garland & Rappaport, 2018; Handwerk et al., 2008), as well as passing exam scores for Latinx students (Cannon, 2011; Judson & Hobson, 2015).

One potential explanation for Latinx underenrollment in AP is language bias. While the majority of Latinx high school students are proficient in English, there is evidence of the perception that the reason for Latinx underachievement or lack of ability is language (Gándara & Contreras, 2009; Kanno & Kangas, 2014). Further, there is an even greater gap for gifted identification and AP enrollment for English Learners; only 2% of English learners took courses that were college preparatory (Callahan, 2005). Considering that the majority of gifted testing is language-based, this becomes an additional barrier that perpetuates school districts' reluctance to dually identify students as English learner and gifted.

Cannon's (2011) analysis of students in two Texas high schools (n=4,648) found that disproportionality in enrollment: White students were enrolled in AP classes at twice

their proportion to the school district and Latinx students were under-enrolled (81.4% district population, 65.7 % enrollment in AP). Further, exam-qualifying scores were related to socioeconomic status.

Kettler & Hurst (2017) also analyzed schools in Texas (n =117) and found that over the span of ten years (2001-2011), ethnicity gaps persisted between Black and Latinx AP enrollment and White AP enrollment. College readiness and minority faculty were associated with changes in AP enrollment gaps, but not overall demographic enrollment or teacher experience in suburban schools.

Cisneros et al. (2014) explored the Advanced Placement gap in Arizona schools (n=172) and found that schools with higher percentages of minority students were less likely to have a wide variety of AP courses and that offerings varied widely across the state. Only one third of Latinx students enrolled in AP courses took the exam (Cisneros, et al., 2014). In contrast, Garland & Rapaport (2018) found that high schools (n=1,529) in Texas with higher percentages of Latinx and Black students offered STEM courses; however, an enrollment gap persisted for Latinx and Black students in comparison to other students.

Socioeconomic status seems to be an important piece of the underenrollment puzzle. Cha (2015) found Black and Latinx students (n=5,049) from low-income families were less likely to enroll in higher-level mathematics courses. Socioeconomic status also impacted the school level, as schools with high incidences of Free and Reduced Lunch programs also had fewer enrollments in high-level mathematics courses and Advanced Placement. This echoes Klopfenstein's (2004) findings that low income was the most significant predictor of an AP gap for minority students.

Regionality may be another factor to consider with the AP gap. Cha (2015) investigated region as a variable and found suburban students were the most likely to engage in higher-level coursework, overall. Garland & Rapaport (2018) also found that urban and suburban schools had a greater amount of offerings, in comparison to rural schools.

Despite higher overall enrollment and participation in AP, the elusive score of three or higher remains out of reach for many Latinx students (Cannon, 2011; Judson & Hobson, 2015). This score matters because it is the generalized score that colleges accept for credit; passing with a three or higher could potentially spare students having to pay for the college course or take it again.

In regards to completion, Jara's (2013) dissertation conducted a secondary analysis of Latinx AP exam completion rates in comparison to White students from 2000-2012 using College Board data. Jara (2013) concluded that despite an increase in overall enrollment in AP, Latinx students completed exams at a far lesser rate than White students. Two STEM exams (Physics and Chemistry) were among the most difficult exams for Latinx students to pass. Spanish Language and Literature were among the most commonly passed exams.

Judson & Hobson (2015) also analyzed College Board data over a 15-year period and found that overall pass rates have fallen over the last fifteen years. This is in contrast to the growth in test-taking rates; Latinx ratio of AP exams to graduates in AP grew 232% from 1997 to 2012. However, Latinx students' pass scores declined at a striking rate: Latinx students passed at a 61% rate in 1997 and 42.8% in 2012 (Judson & Hobson, 2015).

The STEM Gap

Multiple longitudinal studies have been conducted to explore the STEM gap, especially in mathematics. In 1988, Stiff & Harvey asserted that mathematics classes were "one of the most segregated places in American society" (p. 190). Scholars also found that course-taking and tracking directly relate to the mathematics achievement gap. Decades later, longitudinal studies suggest that although humble improvements have been noted in achievement scores, in truth, great divides still persist between Black and Latinx students and their White and Asian peers. Berends & Peñaloza (2010) assert that progress has, indeed, stalled in regard to mathematics scores. Utilizing the National Educational Longitudinal Study, they concluded that from 1972 to 2004 increased segregation led to an increase in mathematics test-score gaps between Latinx and white students (Berends & Peñaloza, 2010). Drawing on earlier literature that contends that segregation is increasing for Latinx students (Fuller et al., 2019; Gandara & Mordecay, 2017) this conclusion demonstrates that STEM gaps may also increase. Further, gaps in science achievement begin as early as the third grade (Curran & Kellogg, 2006; Morgan, Farkas, Hillemeier & Maczuga, 2016).

Kotok (2017) drew on the HSLS (2002) in order to examine factors (school and individual) that relate to gaps between racial groups in high school mathematics (n=4,600). They concluded that Latinx students had the lowest educational efficacy (not expecting to earn a bachelor's degree) and with Black students, were the least likely to enroll in advanced math courses (Kotok, 2017). They also noted that multiple factors contributed to the widening achievement gap including SES and tracking.

Riegel-Crumb & Grodsky (2010) also noted that gap (n=7,975), despite gains in overall enrollment for Black and Latinx students. They found the largest math achievement gap was in the "most demanding" mathematics classes, such as Pre-Calculus and Calculus. Latinx students from low SES and Black students from segregated schools exhibited the largest math achievement gaps (Riegel-Crumb & Grodsky, 2010).

Dondero & Muller (2012) compared segregation and outcomes in both established Latinx spaces and new destination states (n=2,300 schools). Even though Latinx populations have been moving to more rural and suburban spaces, gaps in advanced mathematics course taking persist. Even Latinx students in new destination states attended better resourced schools overall, Latinx students only had a .46 probability of taking advanced math coursework (Algebra II or above), compared to White students (.58 probability).

Means et al. (2017) investigated the impact of attending inclusive STEM high schools (ISHSs) in North Carolina and Texas and underrepresented students enrollment (n=5,113) in STEM coursework and work in STEM-related fields. Latinx students in Texas and females were more likely to express interest in STEM careers after taking such coursework. There was a positive relationship between test scores in mathematics and science, as well, suggesting that exposure to STEM courses relates to positive test score gains and interest in STEM-related fields.

Kolluri (2018) conducted a literature review on whether or not the AP program has achieved its goal of increased access and effectiveness. Latinx students remain underrepresented when disaggregating for Spanish Language, where they represent

(65.6%) of exam takers. Kolluri (2018) notes the greatest gap with STEM exams, specifically Computer Science (9%), Calculus BC (8.3%) and Physics C (8.7%).

In regard to future education, only 8% of bachelor's degrees in STEM were awarded to Latinx students, despite a 33% increase from 1996 to 2004 in interest in STEM-related majors (U.S. Department of Education, 2015). Thus, while a greater proportion of Latinx students begin university with a STEM major (16%); half actually complete a STEM-related bachelor's degree. Currently, less than 2% of the STEM workforce is Latinx and the field is projected to increase dramatically, specifically in biomedical engineering (U.S. Department of Education, 2015). When you consider the percentage of the overall population that is Latinx, this enrollment gap presents significant opportunity gaps in the future.

Synthesis of Findings

In practice, segregation and tracking result in an unfair and an unlevel playing field that determines who gets the opportunity to learn and who doesn't. Ultimately, these practices coupled with bias and lack of capital allows barriers to access to persist, creating a lasting effect on educational achievement and future economic opportunity. Allowing such barriers to advanced coursework to continue creates opportunity gaps that are systematically difficult to dismantle and allow systemic inequity to fester. Essentially, denying access to advanced coursework for Latinx students creates lasting effects beyond this specific group of students. In a sense, lack of access creates not only an AP gap, gifted gap and STEM gap, it also engenders an opportunity gap. Such decisions have economic consequences not only for a growing, underserved population (Latinx), but our society, as a whole. Allowing such practices to continue denies educational equity to

Latinx students, and it also fosters a racialized school culture that perpetuates stereotypes and impedes commitments to diversity. Further, denying opportunity to our fastest growing minority impacts our entire economy; the need for STEM-related careers that require a college degree is well documented. Thus, there is an established need to explore quantitatively the schools where Latinx students are experiencing lack of access, underenrollment, lack of completion and segregation, in regard to advanced coursework.

Chapter 3: Methods and Procedures

Introduction

This research explored disproportionality in AP access, enrollment, and completion patterns for Latinx students by examining the information provided by LEA's in the State of Virginia for the Civil Rights Data Collection (CRDC) and 2016 scores from the College Board. The intent of this study was to ascertain whether or not AP access and opportunity are equitably available for Latinx students in Virginia. I examined variation in Advanced Placement (AP) offerings, enrollment, type of enrollment (STEM v. nonSTEM) and completion for Latinx students using an urbanicity lens. In addition, I conducted the same analysis for two diverse school districts in order to examine patterns within school districts at the school level. Such evidence will contribute to the growing body of knowledge on access, enrollment and completion to Advanced Placement coursework, and its impacts on educational and economic opportunity.

Virginia Schools and the AP

As of 2020, there were 133 school districts and 322 public high schools in Virginia. Virginia also has 28 alternative education programs, eight charter schools and 19 Governor's schools (Virginia Department of Education [VDOE], 2020b). The CRDC lists 438 public schools for the state of Virginia, including traditional, alternative, Department of Justice (DOE/DOJ), regional, and special education schools. Of these public high schools, 301 offered Advanced Placement courses in the 2015-2016 school year (CRDC, 2020). For the case study, Fairfax county schools had 39 high schools, of which 25 offered AP courses: 24 were traditional public schools, and one was a magnet

school. Prince William County had 13 high schools, of which 12 offered AP: 11 traditional schools and one alternative school.

Established in the 1950s, AP credit is granted by almost all universities (85%) for the successful completion of exams (College Board, 2019). Thus, a beneficial relationship exists between high schools and universities, as AP courses signal a competitive candidate for university admission and students can potentially save money through the completion of exams for college credit. Advanced Placement classes have a positive relationship with student achievement and opportunity. The State of Virginia does not require that all public high schools offer AP courses; additionally, the process of self-selection or recommendations for AP enrollment varies by school district. Although schools in the State of Virginia offer International Baccalaureate and dual enrollment, an overwhelming majority of schools offer Advanced Placement (VDOE, 2020a). Dual enrollment is emerging as an alternate advanced course pathway; however, the majority of students in Virginia have greater access and enrollment in Advanced Placement (VDOE, 2020a). In regard to measuring completion, the College Board dataset was instrumental and readily accessible for analysis. As a result, I chose to use Advanced Placement, instead of IB or dual enrollment data, as a measure of advanced course taking.

Research Design

This study was a secondary analysis of data from two data sources: the Office of Civil Rights and the College Board to examine patterns in AP course taking and completion of Latinx students in Virginia. Because the research questions center on public high school advanced placement offerings and patterns, utilizing a secondary data set was appropriate. The data used in this study were collected for the 2015-16 school

year from nearly every local educational agencies (LEA) and public school, in addition to alternative schools, charter schools and juvenile justice facilities and is part of the CRDC (CRDC, 2019b). First implemented in 1968, the CRDC is a biennial survey required by the U.S. Department of Education. The data from the 2015-6 school year is the most recent available for Advanced Placement analysis. The College Board is a non-profit association that was originally established to streamline the college admissions process over 120 years ago; currently, it develops and administers standardized tests, such as the SAT and the AP program (College Board, 2019).

Secondary data analysis involves the analysis of a pre-existing data set; often the current analysis differs from the intent of the original study. Benefits of conducting secondary analysis include: a larger sample size, data quality, savings, scholarly contribution, and the ability to answer questions with cross-national or longitudinal data (Heaton, 2003). Another benefit of secondary data analysis is that the data are readily available for others to employ, which lends itself to replication and critical review by other researchers. Utilizing other data sets allows for the reinterpretation and utilization of data elements to answer a myriad of questions. Further, the collection of governmental data is often regulated and secured by law (Dale, Wathan & Higgins, 2008). Drawbacks include the relevancy of the dataset to your purposes, sampling issues and the lack of flexibility of the data, as you may not be able to answer the questions you would like with the existing data set (Heaton, 2003).

Procedures

The Civil Rights Data Collection (CRDC)

In order to determine which data set would best answer my questions, I initially compared the following data sets: the Civil Rights Data Collection (CRDC), the Education Longitudinal Study (EDLS), the Stanford Education Data Archive (SEDA), and the High School Longitudinal Study (HSLS). Of these data sets, the CRDC was both the most recent and contained data specifically regarding AP coursework and completion.

The CRDC is based upon a biannual survey of public school LEAs that have been collected by the Office of Civil Rights (OCR) since 1968 (CRDC, 2019a). The data included LEAs, schools, as well as juvenile justice facilities, alternative schools, and schools for students with disabilities. One of the primary uses of this collection is to protect students from discrimination of race, color, national origin, sex, and disability (CRDC, 2019b). As a result, variables in the CRDC include race, national origin, sex, disability, and English proficiency. From those base variables, the CRDC also collects information regarding academics, such as AP participation and Dual Enrollment.

When attempting to answer questions regarding access to advanced courses, there were several options. Students may engage in advanced coursework through the AP program, dual enrollment, International Baccalaureate (IB), or honors programs. I chose to focus on the AP program for one main reason. Both nationally and in Virginia, a greater number of students participate in the AP program than in dual enrollment and IB (VDOE, 2020a).

The Civil Rights Data Collection was utilized to obtain the following information: race, student enrollment, AP enrollment (overall, Math, Science, nonSTEM), AP

completion, and school district. The data were used to explore variations of AP offerings at the regional level, as well as disparities in overall AP enrollment by race. Further, the data were used to examine racial variations in AP STEM enrollment. Finally, the data were used to measure variability in AP completion rates by race. While CRDC offers a metric for free and reduced lunch, which many studies use a proxy for socioeconomic status (SES), I chose not to include SES in my calculations, as I wanted the focus of the research to be on ethnicity, race and urbanicity.

College Board: AP Program and Participation Data

In order to be able to answer questions regarding racial/ethnic groups and the specific scores and completion of the exams, I used the College Board archival data for AP Program and Participation, 2016. I chose 2016 in order to align as closely as possible with the 2015-16 CRDC data set.

Every year, the College Board collects data regarding AP exam participation and completion, in both excel and pdf formats, including score distributions and number of exams (College Board, 2016). This archived data is available for longitudinal analysis, as well as analysis regarding participation and completion.

I was able to obtain data regarding race/ethnicity and a score breakdown for each type of test in Virginia in 2016. This proved especially useful for analyzing patterns of participation and completion in STEM coursework. The data were used to explore variations in AP exam participation and completion at the state level, and disparities in overall AP exam participation by race/ethnicity. In addition, I used the data to analyze mean scores for specific exams.

There were 37 total AP courses and exams available in Virginia in 2015-6 (College Board, 2020). Of those, 25 were nonSTEM AP courses; the 12 STEM AP courses and exams included Biology, Calculus AB, Calculus BC, Chemistry, Computer Science A, Environmental Science, Physics A, Physics B, Physics C: Electric, Physics C Mechanical, Psychology and Statistics (College Board, 2020).

Converting the CRDC file into SPSS

For analysis, I decided to use SPSS; however, importing the CRDC file into SPSS proved to be complex, as the CRDC file is a flat file. This meant that all of the tabulations had to be reconfigured into SPSS for analysis purposes. For this work, I had to collapse the format to one row per school. I selected a wide format, which placed my variables in rows and in columns. I went to data, select cases, and created a conditional statement, which allowed me to delete what I did not want. For identical fields, I identified duplicate cases. To collapse the file, I selected data, then transpose. I used the school as an anchor variable. Then, data and restructure. I transformed the cases into variables using two identifier variables (school and LEA).

My specific steps were a follows:

CRDC: State of Virginia: Advanced Course taking by subject

1. State of Virginia: Advanced Placement Course and Test taking
2. Removed state, LEA state, ID, year, IDEA from both sets.
3. Combined both csv and removed redundant fields.
4. SPSS - uploaded csv combined file

SPSS

1. Collapsed the data by selecting **"**Data" and then "restructure" I opted for "Cases into variables" using two identifier variables (school & LEA).
2. From there I removed the following:
    a. Remove redundancies (Total enrollment in AP)
    b. Remove IB and Dual Enrollment
    c. Remove "Passing, some AP tests taken" and "Taking AP tests for some AP courses taken"

The Search Process

I conducted my literature search in several databases: Education Research Complete (EBSCO), ERIC (Institute of Education Sciences), Web of Science and Proquest Dissertations. The rationale for using multiple databases was to cast a wide-enough net to capture a robust sample of peer-reviewed studies and journal articles. Within each database, I conducted a systematic search with the following terms:

- Tracking and Hispanic/Latino/Latinx/minority students
- Segregation and Hispanic/Latino/Latinx/minority students
- Second-generation and Hispanic/Latino/Latinx/minority students
- Advanced Classes/Advanced Placement and Hispanic/Latino/Latinx/minority students
- Cultural Capital and Hispanic/Latino/Latinx/minority students
- Gifted Gap and Hispanic/Latino/Latinx/minority students
- Discrimination and Hispanic/Latino/Latinx/minority students
- Bias and Hispanic/Latino/Latinx/minority students
- Access and Hispanic/Latino/Latinx/minority students

Selection of School Districts for the Case Study

In order to conduct a district-level analysis of enrollment and completion for Latinx students, I first determined where Latinx students are attending school and taking

AP courses in Virginia. First, I ran a list of Latinx enrollment and Latinx AP enrollment by school in order to determine which schools to analyze.

Highest Latinx enrollment	**Highest Latinx AP enrollment**
Fairfax County (14,355)	Fairfax County (1,155)
Prince William County (7957)	Prince William County (1,122)
Loudoun County (3,714)	Loudoun County (927)
Virginia Beach (2,059)	Virginia Beach (612)
Arlington (2,026)	Arlington (595)

Schools with the highest Latinx enrollment and Latinx AP enrollment tend to center around the suburbs of Washington D.C. Both Fairfax and Prince William County had the overall same percentage of Latinx students (30%) in secondary schools. Fairfax County and Prince William County are on both lists for high Latinx enrollment and high Latinx AP enrollment. Both are suburbs of the Washington D.C. metropolitan area.

Fairfax County is Virginia's most populous jurisdiction with a population of 1,147,532 people (Census Bureau, 2020), and it has the seventh-highest median household income of any county-level jurisdiction in the United States (Fairfax County, 2020). Prince William County is Virginia's second most populous jurisdiction at just over 470,000 as of 2019 (Census Bureau, 2020). In 2019, it had the 20th highest income of any county in the United States (Fox Business, 2020). Thus, both districts have financial and logistical resources that should encourage access for all students. Additionally, both school districts have a robust amount of AP offerings. Segregation categorizations for the the school districts were intended for the case study, and not necessarly indicative of the state, as a whole.

Creating a Variable: School Setting

Because I wanted to be able to analyze school districts by urbanicity and the CRDC does not collect information on this, I had to develop a categorical variable for the school setting of each school district. Federal enrollment statistics do not have an urbanicity variable, indicating a potential weakness in its data for my purposes. I consulted both the U.S. Census Bureau, as well as the Pew Research Center for their definitions of urbanicity. The U.S. Census Bureau categorizes an urban area as an area with a population greater than 50,000. A rural area contains fewer than 1,500 people. An MSA consists of one or more counties that contain a city of 50,000 or more inhabitants or contain a Census Bureau-defined urbanized area (UA) and has a total population of at least 100,000. There is no designation for suburbs.

For Virginia, this proves tricky, as there are several large metropolitan areas - northern Virginia (suburban Washington D.C.), Richmond, and Hampton Roads (a conglomerate of seven cities and surrounding suburbs). For example, if relying solely on a city vs. county designation, Fairfax is technically a county, but it has a massive population. Bristol, by comparison, is an incorporated city, but only has a population of 17,750. Ultimately, I defined a rural school district as one that had no greater metro area associated with it and had a population less than 50,000. I defined a suburban school district as one that was designated as a county, but associated with a metro area that is more than 50,000 or a city that is between 50,000-100,000. Finally, I determined that an urban school district was within a city that had a population greater than 100,000. Using both the Census Bureau's designation of MSAs and classification of city or county for the

school districts in Virginia, I was able to create categories for urban, suburban and rural. In the state of Virginia, there are 139 rural, 156 suburban and 51 urban school districts.

There was a need to categorize schools beyond urbanicity, as in Virginia, there are alternative schools, special education schools, regional, magnet, and charter schools, as well as schools associated with the Department of Justice. VDOE had 332 schools listed for the state of Virginia; CRDC has 438. Upon review, the CRDC listing contained more alternative education and DOJ schools. In some cases, the VDOE would list a regional alternative education system as a collective whole, while the CRDC reported data for individual sites.

There are noted inconsistencies in the data reporting, as well as complications. For example, VDOE designated 28 Alternative Education programs, some of which were regional; 16 of those programs were not in the CRDC file. For example, the VDOE designated a regional system, such as the Southeastern Cooperative Education Program, as one collective whole, whereas the CRDC reported data for individual sites, such as Chesapeake. In order to accurately account for the discrepancies, I looked up individual schools to ensure proper categorization for alternative, special education, regional, or DOE/DOJ.

Alternative - refers to a transitional school for behavioral infractions.

Special Education - refers to schools for students with physical or intellectual disabilities. The Virginia School for the Blind and Deaf, as well as schools for autism fell under this category. In addition, there is one transitional ESOL center in this category.

Regional - Schools that were regional magnets or governor's schools.

If a school was both alternative and regional, I selected alternative, as this seemed the more important distinction. In the end, this resulted in the following count for schools: urban (51), suburban (156), rural (139), regional/magnet (4), alternative (48), Department of Justice (19) and special education (21). For the variable *school setting*, I assigned the following categories: rural (1), suburban (2), urban (3), regional/magnet (4), alternative (5), DOE/DOJ (6), special education (7).

Creating a Variable: School Segregation

In order to determine the degree of segregation in a school, I first calculated overall enrollment by dividing the total Asian enrollment by total secondary enrollment. This gave me a percentage of enrollment for Asian students. I did this for Black, Latinx and White students, as well. I then created a variable *Black/Latinx enrollment* that combined Black and Latinx enrollment over total enrollment in order to get a percentage of minority students relative to total school enrollment.

From there I created a variable, *school segregation*, with four levels:

1 – Predominantly White	(< 30% Black/Latinx enrollment)
2 - Diverse	(30-59% Black/Latinx enrollment)
3 - Segregated	(60-79% Black/Latinx enrollment)
4 - Intensely Segregated	(80-99% Black/Latinx enrollment)

These decisions were based both on the work of Orfield & Siegel Hawley (2013) and using descriptives to determine the range of Black and Latinx enrollment in Virginia, as well as Fairfax county and Prince William county. The rationale for not including Asian students is two-fold: segregation is often viewed through the difference between White and Black/Latinx communities, and AP disproportionality often reflects the following schism: White/Asian v. Black/Latinx. Segregation can be a rather loaded and

misunderstood term. In truth, we often use such segregation to refer to schools that are predominantly minority; however, schools that are predominantly White are segregated, as well. Perhaps a more accurate representation is that schools are segregated on either ends of the spectrum (predominantly White or predominantly Black/Latinx) with diverse schools being poised in the center. I utilized predominantly White to differentiate from the segregation that is predominantly Black/Latinx for clarity and simplicity.

Measuring Disproportionality

For school enrollment, AP enrollment and completion, I explored the degree of disproportionality by analyzing the school enrollment for each racial/ethnic group and compared it to the AP enrollment for the comparison group.

1. **School enrollment** = race or ethnic group enrollment/total school enrollment
2. **AP enrollment** = race or ethnic AP group enrollment/total AP enrollment
3. **AP Completion (taking the exam)** = race or ethnic group exams not taken/sum AP course enrollment
4. **AP Completion (passing the exam)** = race or ethnic group total AP exams not passed/sum AP course enrollment – total AP course enrollments less exams not taken

For example, school enrollment tells us what percentage of students of a certain race/ethnicity attend individual schools within the school district. AP enrollment (AP Math, AP science, AP nonSTEM) tells us the percentage of race/ethnicity enrollment in the AP program, as well as AP completion (AP did not pass and AP did not take the test).

Because the school enrollment and AP enrollment measures are relative to the individual race or ethnic groups, I was able to document the gap in AP enrollment, which demonstrates the difference between proportion of racial/ethnic group school enrollment and proportion of racial/ethnic group AP enrollment. Thus, if 15% of White students are enrolled in AP and 5% of Latinx students are enrolled in AP, there is a 10% disproportionality gap.

Measuring Completion

AP completion in this study refers to the outcomes of an AP course: (1) whether students take the AP exam and (2) whether students pass the exam with a score of three or above. Therefore, examining test taking patterns and scores are both facets of AP completion. I analyzed AP completion patterns for not passing the AP exam, not taking the AP exam, and scores for students in the 2015-6 school year.

To answer this question, I utilized data from both the CRDC and College Board. The CRDC data set provided two metrics regarding completion: those who did not take the exam and those who did not pass the exam, whereas the College Board provided scores for the exams.

The College Board data provided means and scores for all tests taken in Virginia in the year 2016 by race/ethnicity. Because the data included scores (1-5) for all race/ethnicities and all exams, this provided a more robust picture of completion rates for students. The College Board completion data was not connected to any specific school district or school; rather it was statewide data that allowed for distinctions between different categories of schools. I selected only public schools to better align with the

CRDC data set. I used the College Board data to calculate completion rates for different rates and disproportionality.

While AP scores can range from 1-5, scores of three or more are generally considered acceptable for university coursework. Thus, a student can pass a course, but not "pass" an exam if the student receives less than a score of three. There are three steps in the AP course completion process: (1) took the course; (2) took the exam; (3) passed the exam. Completion is measured by students who both took and received a score of a three or greater on the AP exam. The unit of analysis was the AP course, not necessarily the student, since students might be taking more than one AP course. The CRDC data set provided two metrics regarding completion: those who did not take the exam and those who did not pass the exam, whereas the College Board provides scores for the exams. In order to measure completion, I had to contend with a limitation: the CRDC only measures if students are enrolled in *at least one* AP course. The unit of analysis was the AP course, not necessarily the student, since students might be taking more than one AP course. Should one create measures strictly based on this CRDC value, you would get a potentially distorted view. As a result, I created completion variables in the following way:

Sum enrollment = [total students enrolled in AP Math + total students enrolled in AP Science + total students enrolled in AP nonSTEM]

Exams not taken = exams not taken/sum enrollment

Exams not passed = AP exams not passed/sum enrollment – exams not taken

For my purposes, I analyzed the following: those who did not take the exam and those who did not pass the exam. To be included in these calculations, proportions had to be independently calculated for each racial/ethnic group based upon these parameters:

1. The school had to offer AP coursework
2. Members of the respective racial/ethnic group had to be enrolled in the AP course.

Analyzing Latinx Completion

I analyzed Latinx AP completion of AP coursework by urbanicity for patterns in taking the AP exam and passing the exam. Regarding Latinx student completion and school setting, I only included schools (n=248) that offered at least one AP course and had Latinx students enrolled in AP (Table 19). In order to account for differences in enrollment patterns by urbanicity, I conducted the analysis in the following way: Latinx did not take the exam/Latinx AP total courses.

Latinx did not pass the exam/Latinx AP total courses - tests not taken.

Decisions Regarding Measurement

Of the traditional schools in Virginia, 301 offer AP coursework; however, not all these schools offer or have AP Math, AP Science, or AP nonSTEM enrollment. Thus, while 301 schools in Virginia offer at least one course in AP, only 218 schools offer at least one course in AP Math, AP Science, and AP nonSTEM. Schools that have all types of AP offered, as well as all race/ethnicities enrolled in AP are pared down even further (n=190).

When drawing comparisons between groups, there are multiple decisions regarding measurement that can be made. For example, the decision to include all

race/ethnic groups may result in the loss of data or information elsewhere, as schools may be left out. Further, if I want to only include schools that offer all three categories (AP Math, AP science and AP nonSTEM) this may mean that the data is pared down even further. Thus, there is a tension between being representative and inclusive and having enough data to make meaningful comparisons. Each decision can result in different results and different sample sizes (Table 1). In order to contend with this tension, I first measured completion in the following ways:

1. Only all types of AP offered (n=218)
2. All types of AP offered and all four race/ethnicities enrolled in school (n=214)
3. All types of AP offered and all four race/ethnicities enrolled in AP (n=190).
4. Schools with AP available (n=301) with respective calculations for each race/ethnicity; Asian (n=236), Black (n=252), Latinx (n=248), White (n=300).

After conducting analysis all four different ways, I concluded that because I was not relying on inferential statistics, the most representative and accurate choice would be number four. As a result, I am presenting the analysis for completion with schools that have AP available (n=301), but samples depend upon respective race/ethnicity enrolled in AP (Table 1). I will present a table in the appendix with the information from the other three analyses for comparison.

Table 1:
School Sample Sizes for AP Completion Analysis

	Schools with AP available	Schools with Latinx students enrolled in AP	Schools with all 4 race/ethnicities in enrolled AP
Total Schools	301	248	216
Offers AP Math	248	222	203
Offers AP Science	249	223	200
Offers AP Math & AP Science	223	208	194
Offers AP nonSTEM	292	244	212
Offers AP Math, AP Science, AP NonSTEM	218	204	190

When I conducted analysis specifically regarding Latinx students, I included only schools that have Latinx students enrolled in AP (n=248).[5] Out of the traditional schools in Virginia that offer AP (n=301), 82% offer AP Math, 83% AP Science, 97% AP nonSTEM, and 72% offer all three (n=218). Of the schools that offer AP and have Latinx enrolled in AP (n=248), 90% offer AP Math and AP Science, 98% offer AP nonSTEM and 82% offer all three (n=204). Of the schools that offer AP and have all four race/ethnicities enrolled in AP (n=216), 94% offer AP Math, 93% AP Science, 98% AP

[5] In the AP enrollment section, it was important to consider Latinx secondary enrollment and those students who did not take AP even when it was available. For completion, the focus is on students who are enrolled in AP already, but may not be completing or passing the exam.

nonSTEM and 90% offer all three (n=190). These numbers speak to enrollment patterns: schools that offer AP usually offer nonSTEM; English Language & Literature is the most popular exam, followed by U.S. History and English Composition (College Board 2019).

Data Analysis

The data from the CRDC and College Board were based on actual student counts, thus inferential statistics was not necessary; however, I conducted inferential statistical analysis with the intention of making this research useful to a broader population of scholars in the hopes that they can either replicate or use this research to draw conclusions. Descriptive statistics analyses, including frequency distributions, and Pearson correlations were performed for the 438 public high schools and variables, in addition to inferential statistics (one way ANOVAS) for the 301 public high schools offering AP. Because the sample sizes were small for the case study of Fairfax County schools (n=25) and Prince William County schools (n=11), I did not run inferential statistical tests for research question four. Because the data reflects real numbers regarding students and school districts, I compared means in order to draw conclusions.

I chose not to incorporate power analysis for several reasons. First, it is not necessary when analyzing a population. There was also a risk that the power analysis would not generalize well; should one change the statistical procedure or methodology, the results may change. Finally, the number of the sample size varies within this study, and would vary widely if used in another state or school district. As a result, I analyzed the data in the following way (Table 2).

Table 2:
Data Analysis: Independent and Dependent Variables

RQ	Question	Category	Dependent Variable (Y)	Independent Variable (X)	Method of analysis	Sample Size
1	How do the number of advanced placement course offerings vary by urbanicity (rural, suburban, urban) in the State of Virginia?	**Access**	No. of AP courses	School setting	one way ANOVA	n=301
1	To what extent do the availability in offerings affect AP enrollment in Latinx students?	**Access**	No. of AP courses	AP Latinx enrollment	Pearson Correlation	n=298
2	To what extent does racial disproportionality in AP enrollment exist?	**Enrollment**	AP enrollment	School setting	one way ANOVA	n=301
2	Are Latinx students disproportionately enrolled in AP coursework and AP STEM coursework?	**Enrollment**	Latinx AP enrollment	School setting	one way ANOVA	n=295
3	To what extent does racial disproportionality for Latinx AP completion exist? Are there differences by type of exam in passing the course for Latinx students?	**Completion**	Latinx Passing the Exam	Type of Exam	one way ANOVA	n=35

Chapter 4: Findings - Access, Enrollment and Completion

Introduction

This study was designed to analyze Advanced Placement access, enrollment, and completion for Latinx students in the state of Virginia during 2015-2016. Ultimately, the intent of this study was to ascertain whether access to AP and STEM is equitable for Latinx students in Virginia, as well as to analyze the outcomes of Latinx students in regard to AP completion.

I analyzed Advanced Placement offerings in Virginia and their variation by school setting. Second, I examined the level of racial disproportionality in AP enrollment, especially in regard to STEM. Then, I analyzed patterns of AP completion for Latinx students and determined if there was racial disproportionality and differences by school setting. Finally, I analyzed patterns of AP access, enrollment and completion for Latinx students in two diverse, affluent, suburban school districts to reveal the degree of access and disproportionality within school districts, as well as the degree of segregation.

Research Question 1: AP Access

Regarding RQ1, which asks: *How do the number of advanced placement course offerings vary by school setting (rural, suburban, urban) in the State of Virginia? To what extent does the amount of AP course offerings affect AP enrollment for Latinx students?* I began my analysis by looking at the school setting and types of schools in Virginia. The CRDC lists 438 high schools in Virginia: 347 (79%) are public high schools that are not categorized as alternative, Department of Justice, regional, or special

education. Of those 347 schools, 139 (31%) are in rural districts, 157 (36%) are in suburban districts, and 51 (12%) are in urban districts.

Virginia Schools and School Setting

Most high schools in Virginia are suburban, followed by rural, and urban (Table 3). Of all school districts, nearly 80% fall into these categories with the remainder represented by regional, alternative, DOE/DOJ, and special education schools/districts.

Table 3:
Virginia Schools by School Setting

	Total Schools		School Setting	
	n	%	*n*	%
Rural	139	31.7	139	40.2
Suburban	156	35.6	156	45.1
Urban	51	11.6	51	14.7
Regional	4	0.9		
Alternative	48	11.0		
DOE/DOJ	19	4.3		
Special Education	21	4.8		
Total	438	100[6]	34	100

In regard to demographics and urbanicity, Asian (*M*=322) and White students (*M*=300) have higher average enrollment in regional schools compared to Black (*M*=53) and Latinx (*M*=17) students (Table 4). Black students are more likely to attend urban schools (*M*=618) than suburban schools (*M*=262).

Latinx students (*M*=118) comprise 12.9% of total enrollment in Virginia and are enrolled in 91% (n=397) of the 438 schools in Virginia, ranging from a mean of four

[6] Total may not add up due to rounding

Latinx students in DOE schools to a mean of 249 Latinx students in suburban schools. Latinx students attend all categories of schools in Virginia, with the highest mean enrollment in suburban schools (*M*=249), followed by urban (*M*=133), rural (*M*=30), special education (*M*=30)[7], alternative (*M*=24), regional (*M*=17) and DOE/DOJ (*M*=6) (Table 4).

Table 4:
Demographics by School Setting

	Schools	Asian	Black	Latinx	White	Total
School Setting	*n*	*M*[8]	*M*	*M*	*M*	M
Rural	139	6	118	30	450	627
Suburban	156	133	262	249	767	1486
Urban	51	51	618	133	500	1380
Regional	4	322	53	17	300	737
Alternative	48	3	36	24	27	94
DOE/DOJ	19	0.21	32	4	9	47
Special Education	21	6	26	30	31	96
Total	438	59	210	118	482	913

By traditional school setting, Latinx comprise a larger percentage of enrollment (16.7%) in suburban schools than in urban schools (9.6%); Latinx students comprise only 4.8% of rural school enrollment and regional enrollment (2.2%) (Table 5). Latinx students comprise 25.5% of alternative school enrollment, a percentage almost double their overall school enrollment (12.9%).

[7] At first glance, Latinx students appear overrepresented in special education; however, when adjusting for a transitional ESOL center, Latinx students comprise 13.9% of special education enrollment and 12.9% of enrollment overall in the state, with an enrollment of 213 out of 1,536 secondary students.
[8] Means were rounded to the nearest whole number.

Table 5:
Latinx Enrollment by School Setting

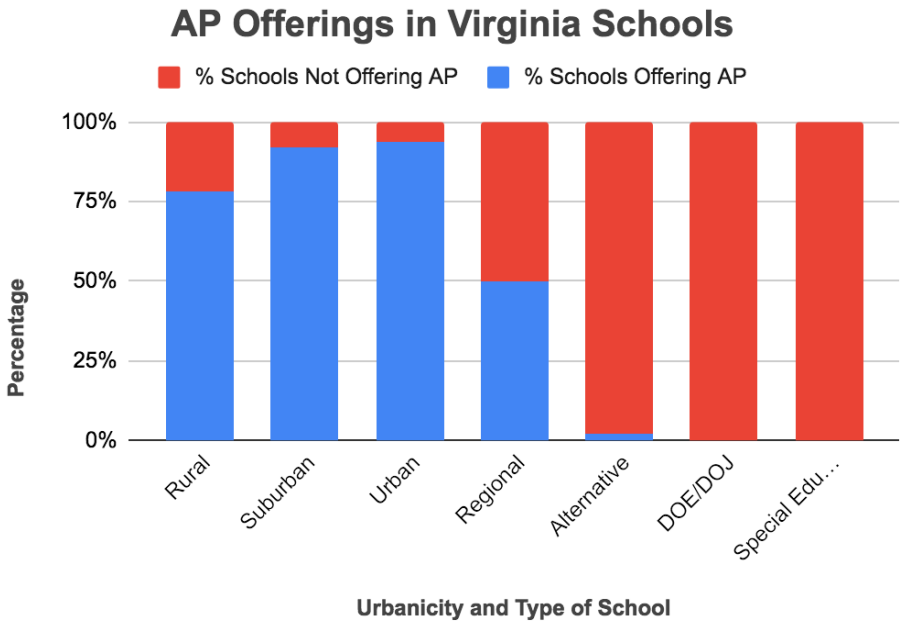
	Schools	Latinx enrollment	Total enrollment	Latinx % Total Enrollment
	n	*n*	*n*	%
Rural	139	4,160	87,124	4.8
Suburban	156	38,827	231,799	16.7
Urban	51	6,786	70,400	9.6
Regional	4	66	2,949	2.2
Alternative	48	1,142	4,530	25.2
DOE/DOJ	19	78	896	8.7
Special Education	21	622	2,020	30.8[9]
Total	438	51,681	399,718	12.9

AP Course Offerings in Virginia

Of the 438 schools in Virginia, 304 (69%) offer at least one AP course, slightly less than the national average (74%), (NCES, 2019). 134 (31%) do not offer any AP courses. In regard to AP offerings, 78% rural schools offer AP whereas over 90% of suburban and urban offer at least one AP course. Of the four regional schools listed in the CRDC, only two offer AP (50%). Only one alternative school (2%) offers at least one AP course, and DOE/DOJ or special education do not offer any AP courses (Figure 2).

[9] Transitional ESOL center is included in special education designation

Figure 2:
AP Offerings in Virginia Schools



Overview of AP Enrollment

If AP enrollment is proportionate by race/ethnicity, then the proportion of students taking AP classes should be similar to their overall enrollment in the school. In Virginia, Asian and White students are overrepresented in AP enrollment, in relation to their representation in the school population as a whole, while Black and Latinx students are underrepresented. While there are various ways to calculate disproportionate enrollment, for this section, I looked at the gaps in percentage between AP enrollment and total student enrollment.

Asian students comprise (12%) of overall AP enrollment and 6% of total student enrollment; thus Asian students are enrolled in AP at twice their overall enrollment or a gap of +6%. White students comprise 60% of AP enrollment, yet only 53% of total student enrollment, a gap of +7%. Black students comprise 13% of AP enrollment,

despite being 23% of overall student enrollment, a gap of -10%. Latinx students comprise 9% of AP enrollment, yet are 13% of the overall student enrollment in Virginia, a gap of -4%.

One limitation of the CRDC data set is that students are considered AP students if they enroll in one course; so the gap could be potentially larger if we take into account the difference between enrolling in one course vs. more than one course (Table 6). For schools that do not offer AP (n=134), Asian students are underrepresented by a gap of -4%, and Black students are overrepresented by 11% in comparison to total enrollment, and are more likely to attend a school that does not offer AP.

Table 6:
Demographics of Schools with AP v. with No AP

	Percent by Race/ethnicity All schools (n=438) %	Percent by Race/ethnicity Schools that do not offer AP (n=134) %	Percent by Race/ethnicity Schools that offer AP (n=304) %
Asian	6	2	7
Black	23	34	22
Latinx	13	11	13
White	53	50	53
Other	5	3	5
Total	100	100	100

Overview of Latinx Enrollment

For this analysis, I included only schools that had a Latinx enrollment greater than zero. Latinx students are enrolled in 397 of the 438 or 91% of schools in Virginia. Of those 397 schools, 75% offer AP (n=298) and 25% do not offer AP (n=99). Mean Latinx

enrollment in schools that offer AP is higher than it is in schools that do not offer AP (*M*=166 vs. *M*=23) (Table 7).

Only two regional schools offer AP out of four. Latinx students are enrolled in all four regional schools. Of the two regional schools that offer AP, Latinx enrollment is higher (*M*=31) than the two regional schools that do not offer AP (*M*=2). Only one alternative school offers AP where Latinx students are enrolled (M=208). Latinx students are enrolled (*M*=29) in 32 of 46 alternative schools (70%); thus, with the exception of one alternative school, they do not have access to AP coursework. Latinx students (*M*=7) are enrolled in 12 of 19 DOE/DOJ schools (63%). None of these types of schools offer AP coursework in Virginia. Latinx students (*M*=37) are enrolled in 81% or 17 out of 21 Special Education schools, which do not offer AP coursework.

Table 7:
Latinx Secondary Enrollment in Schools with No AP v. Schools with AP

	No AP			Offers AP		
	n	*M*	SD	*n*	*M*	SD
Rural	22	16	19.33	104	37	42.58
Suburban	12	24	40.17	143	270	289.49
Urban	2	3	1.41	48	141	202.11
Regional	2	2	0	2	31	12.73
Alternative	32	29	64.11	1	208	0[10]
DOE/DOJ	12	7	7.90	0	0	0
Special Education	17	37	96.64	0	0	0
Total	99	23	56.56	298	166	241.63

[10] No SD is available with only one school.

Overall, Latinx students in alternative schools and DOE/DOJ do not have access to AP coursework. For the purpose of this study, due to the lack of AP course offerings in alternative schools, DOE/DOJ and special education, as well as the potential for regional schools (n= 2) to skew data, I focused on AP access, enrollment and completion in the rural, suburban, and urban schools.

Self-Selection of AP Coursework

Of the schools that offered AP in Virginia (n= 301), in 82% percent of schools, students were allowed to self-select AP course participation, while in the remaining schools, AP access came through other pathways, such as teacher or counselor recommendation.

In all sectors, the largest proportion of schools allowed self-selection. Where self-selection was not allowed, the largest proportion was in urban schools (23%), and suburban (23%), followed by rural (18%). Rural schools (82%) were the most likely to allow students to self-select into AP coursework; a finding that merits further exploration and future research (Table 8).

Table 8:
Self-Selection for AP in Virginia

	Total Schools	Self Selected AP		Not Self Selected	
	n	*n*	%	*n*	%
Rural	109	89	82.0	20	18.0
Suburban	144	111	77.0	33	23.0
Urban	48	37	77.0	11	23.0
Total	301	237	78.7	64	21.2

Mean AP Course Offerings in Virginia by School Setting

Examining only those schools that offer AP courses (n=301), in regard to the average number of AP courses available, suburban (M=19.58) have the most offerings, followed by urban (M=16.96) and rural (M=9.87) (Table 9). Results[11] of a one way ANOVA suggest that there was a statistically significant difference in course offerings overall by school setting[12], F (2, 298) = 47.59 p <.001, η^2=.24. This is a large effect size according to Cohen's (1988) guidelines. A post hoc analysis was conducted to further examine differences between specific groups, and found statistically significant differences between rural and suburban and rural and urban (p <.001), but not between suburban and urban (p = .143). Thus, rural schools had the least amount of course offerings, and suburban schools had the greatest amount of AP courses available. However, there were not significant differences between the AP course offerings between urban and rural schools.

Table 9:
Mean Course Offerings by School Setting

	Total Number of AP courses offered				
	Schools *n*	*M*	SD	Minimum	Maximum
Rural	109	9.87	6.96	1	28
Suburban	144	19.58	8.49	1	36
Urban	48	16.96	8.09	2	31
Total	301	15.64	9.045	1	36

[11] Data for alternative schools were not included in the ANOVA as they only had a set of one, which would have prevented post-hoc analysis.
[12] Because regional schools (n=1) have the potential to skew data (M = 20.00) for school setting, it was not included in this ANOVA.

AP Course Offerings and Latinx AP Enrollment

A bivariate correlation analysis was conducted to examine the associations between AP course offerings and Latinx AP enrollment. Latinx AP enrollment was statistically significant and positively correlated with AP course offerings ($r = .52$, $p < .001$; $r2=.27$). Thus, as the number of AP courses increases, so do the number of Latinx students enrolled in AP.

Research Question 2: AP Enrollment & Disproportionality

Regarding RQ2, which asks: *To what extent does racial disproportionality for Latinx students in AP enrollment exist? Are Latinx students disproportionately enrolled in AP STEM coursework?,* I analyzed AP enrollment patterns for STEM coursework (AP Math and AP Science) and nonSTEM coursework.

In Virginia, there is a gap for Black and Latinx students in regard to AP enrollment. Black students comprise 23% of schools, but only 13% of AP enrollment, a gap of ten points. Latinx students comprise 13% of school enrollment, but only 9% of AP enrollment, thus a gap of four percentage points. Asian students are overrepresented by four percentage points, or twice their school enrollment. White students are overrepresented by nine percent points (Table 10).

Table 10:
Overall AP Enrollment Disproportionality[13]

	% School Enrollment	% AP Enrollment	AP Enrollment Discrepancy
Asian	7	11	**4**
Black	23	13	**-10**
Latinx	13	9	**-4**
White	52	61	**9**

An additional consideration, when comparing enrollments is that not all schools that offer AP necessarily offer AP Math, Science or nonSTEM. Of the schools that offer AP (n= 301), 97% (n= 292) offer nonSTEM courses, 83% (n= 249) offer AP Science, and 82% (n= 248) offer AP Math.

Asian and White students are disproportionately overrepresented in AP Math enrollment, when comparing total enrollment in secondary schools. Black students (10%) and Latinx students (7%) are underrepresented when compared to general enrollment. Asian and White students are also disproportionately overrepresented in AP Science enrollment, when comparing total enrollment in secondary schools. Black students (11%) and Latinx students (8%) are underrepresented when compared to general enrollment. Finally, for nonSTEM AP, Black students (13%) and Latinx students (9%) are underrepresented when compared to general enrollment (Table 11). In regard to Latinx students, the largest enrollment gap is for AP Math (-7%) or almost half of Latinx school enrollment (13%)

[13] Calculated by the following: School enrollment = Race or ethnic group enrollment/total school enrollment; AP enrollment = race or ethnic AP group enrollment/total AP enrollment

Table 11:
AP STEM & nonSTEM Enrollment Disproportionality

	% School Enrollment	% AP Enrollment	% AP Discrepancy
		AP Math	
Asian	7	16	**8**
Black	23	10	**-13**
Latinx	12	7	**-7**
White	52	61	**9**
		AP Science	
Asian	6	15	**9**
Black	23	11	**-12**
Latinx	12	8	**-4**
White	54	61	**7**
		AP NonSTEM	
Asian	6	11	**5**
Black	23	13	**-10**
Latinx	12	9	**-3**
White	54	60	**6**

AP Enrollment by School Setting and Race/Ethnicity

In order to examine enrollment patterns by school setting, I measured AP enrollment/total school enrollment to ascertain the percentage of AP enrollment of a race or ethnic group relative to that group's school population. For example, in order to create a comparable variable for rural Latinx students who were enrolled in AP, I computed rural Latinx AP enrollment/rural Latinx school enrollment, which would tell me how many Latinx students in rural schools were enrolled relative to their group.

Overall, Asian students have the highest percentage of AP enrollment; across all schools, 37% of Asian high school students enroll in AP, followed by 23% of White, 17% of Latinx, and 13% of Black students (Table 12). Over twice the proportion of Asian students enroll in AP compared to Latinx students and Black students.

For all groups, the highest percentage of enrollment is in urban schools, followed by suburban schools. The highest proportion of Latinx students in AP (23%) are in urban schools compared to only 10% in rural schools. Thus, a Latinx student is almost two and half times more likely to enroll in AP in urban settings compared to rural schools.

Results[14] of a one way ANOVA suggest that there was a statistically significant difference in AP enrollment overall by school setting in three categories (rural, suburban, urban) and race/ethnicity for each group: Asian AP enrollment $F(2, 277) = 6.99$ $p = .001$, $\eta^2 = .05$; Black AP enrollment, $F(2,293) = 34.65$ $p < .001$, $\eta^2 = .19$.; Latinx AP enrollment $F(2, 292) = 26.96$ $p < .001$, $\eta^2 = .16$ and White AP enrollment $F(2, 298) = 57.51$ $p < .001$, $\eta^2 = .28$. These are large effect sizes according to Cohen's (1988) guidelines, with the exception of Asian AP enrollment, which is a small to medium effect. A post hoc analysis was conducted to further examine differences between specific groups, and found statistically significant differences between rural and suburban and rural and urban ($p < .001$), but not between suburban and urban ($p = .229$), with suburban and urban schools more likely to have higher percentages of AP enrollment than rural school

[14] Data for alternative schools and regional schools were not included in the ANOVA as they only had a set of one, which would have prevented post-hoc analysis.

Table 12:
AP Enrollment by Race/Ethnicity & School Setting

			Percentage AP Enrollment, Overall[15]		
	Schools	Asian	Black	Latinx	White
School Setting	*n*	%	%	%	%
Rural	94	29	6	10	11
Suburban	144	40	17	19	29
Urban	48	43	18	23	32
Total	301	37	13	17	23

Latinx AP Enrollment & School Setting

I analyzed Latinx AP enrollment in two ways. First, I analyzed Latinx enrollment by school setting in order to get a better understanding of where Latinx students were enrolled in AP coursework. Next, I analyzed Latinx AP enrollment as a proportion (Latinx AP enrollment/Latinx secondary enrollment) in order to determine the magnitude of enrollment for this group. For this analysis, only schools that have Latinx enrollment (n= 295) were included.

In rural, suburban, and urban school districts that offer AP classes and enroll Latinx students, Latinx students enroll in nonSTEM (M=25.12) at a rate of three times AP Science (M=8.24) and over four times AP Math (M=6.46) (Table 13).

In regard to school setting, rural schools had the least Latinx AP enrollment and suburban schools had the highest amount of Latinx students enrolled in AP. In consideration of type of AP course and school setting, the gap between AP nonSTEM enrollment and STEM enrollment was smallest for rural schools. The gap between

[15] Calculated by AP Enrollment/Total Secondary Enrollment

nonSTEM and STEM enrollment was largest for suburban schools. The mean for Latinx nonSTEM enrollment was 3.34 times higher than AP science in suburban schools. In urban schools, the nonSTEM enrollment gap was almost three times higher than AP science (Table 13). AP nonSTEM has the highest average enrollments in each of the school settings, followed by AP science, and AP math.

Table 13:
Latinx AP Enrollment & School Setting

	Latinx AP Enrollment			
	AP Math	AP Science	AP nonSTEM	AP Total
	M	*M*	*M*	*M*
Rural	1.13	1.51	3.48	4.08
Suburban	9.21	11.95	39.96	42.90
Urban	6.02	9.39	27.30	29.79
Total	6.46	8.24	25.12	27.08

Results[16] of a one way ANOVA suggest that there was a statistically significant difference in AP enrollment overall by school setting in three categories (rural, suburban, urban) and Latinx AP enrollment for each group: AP enrollment F (2, 292) = 38.07 p <.001, η^2= .21; AP Math enrollment F (2, 245) = 29.60 p <.001, η^2= .20; AP Science enrollment, F (2,244) = 21.41 p <.001, η^2= .15.; and AP nonSTEM enrollment F (2, 283) = 35.93 p <.001, η^2=.20. These are large effect sizes according to Cohen's (1988) guidelines. A post hoc analysis was conducted to further examine differences between specific groups, and found statistically significant differences between rural and suburban

[16] Data for alternative schools and regional schools were not included in the ANOVA as they only had a set of one, which would have prevented post-hoc analysis.

and rural and urban (p. <.001), but not between suburban and urban for AP Science (p = .057), AP nonSTEM (p = .07), AP overall (p = .07). Suburban and urban schools had higher AP enrollment than rural schools for Latinx students.

Latinx AP Enrollment, Proportion[17]

Another way to consider Latinx AP enrollment is as a proportion of Latinx secondary enrollment. This allows for an analysis relative to overall enrollment and avoids conflating AP enrollment patterns with overall enrollment patterns. This was calculated by Latinx AP enrollment/Latinx school enrollment.

In rural, suburban, and urban school districts that offer AP classes and enroll Latinx students (n= 298), Latinx students are more likely to enroll in nonSTEM AP courses than in either AP Math or AP Science. When considering proportion, a Latinx student is 3.5 times more likely to take nonSTEM AP than AP Math and three times more likely to take AP science (Table 14).

In regard to school setting, rural schools had the least Latinx AP enrollment and urban schools had the highest amount of Latinx students enrolled in AP. In consideration of the type of AP course and school setting, urban Latinx students had higher enrollment in AP nonSTEM. Latinx enrollment for AP Math was highest in suburban schools. The gap between AP nonSTEM enrollment and STEM enrollment was smallest for rural schools. The gap between nonSTEM and STEM enrollment was largest for urban schools. The mean for Latinx nonSTEM enrollment was 3.5 times higher than AP science in urban schools (Table 14).

[17] Calculated by Latinx AP enrollment/Latinx school enrollment

When taking the proportion of Latinx students into account, a greater percentage of Latinx students are enrolled in AP in urban schools. Thus, while there is a higher number of Latinx students enrolled in AP in suburban schools (Table 13), a greater proportion of urban Latinx students are enrolled in AP (Table 14).

Table 14:
Latinx AP Enrollment & School Setting, Proportion

	Latinx Enrollment, Proportion			
	AP Math	AP Science	AP nonSTEM	AP Total[18]
	%	%	%	%
Rural	3	3	9	10
Suburban	5	6	17	19
Urban	4	6	21	23
Total	4	5	15	17

AP STEM v. nonSTEM Enrollment by School Setting

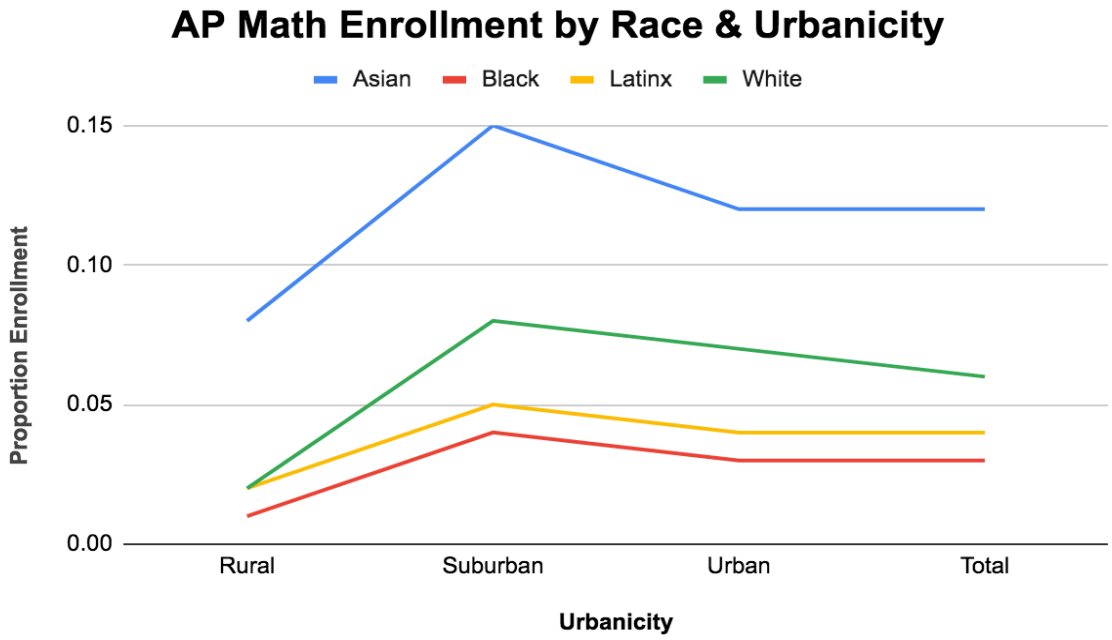
In order to calculate the AP STEM and nonSTEM enrollment, I analyzed traditional schools (rural, suburban, urban) that offered AP (n=301). AP Math, AP science, and AP nonSTEM enrollment were calculated in the following manner: race or ethnic group AP Math enrollment/race or ethnic group secondary enrollment. For example Latinx AP Math was calculated as: Latinx AP Math enrollment/Latinx secondary enrollment. This tells us the proportion of Latinx students who are enrolled in AP Math in a school and allows for comparison of the proportion of enrollment across racial groups.

[18] Totals do not necessarily add up, due to students being able to enroll in more than one course

AP Math Enrollment

Of the schools that offered AP (n=301), 12% of Asian students enrolled in AP Math, compared to 6% of White students and 4% of Latinx and 3% of Black students (Figure 3). Thus, Asian students are three times more likely to enroll in AP Math than Black or Latinx students. White students are almost twice as likely to enroll in AP Math than Latinx students.

Figure 3:
AP Math Enrollment by Race/Ethnicity & School Setting



In regard to school setting, suburban schools have the highest AP enrollment for all groups, followed by urban schools. Latinx students have the highest proportion of AP Math enrollment in suburban schools (5%), then urban schools (4%), and rural schools (3%). The largest Latinx-White AP Math gap is found in suburban and urban schools (-3%) (Table 15).

Table 15:
AP Math Enrollment by Race/Ethnicity & School Setting

	Proportion AP Math Enrollment[19]				
	Schools	Asian	Black	Latinx	White
School Setting	*n*	*%*	*%*	*%*	*%*
Rural	109	8	1	3	2
Suburban	144	15	4	5	8
Urban	48	12	3	4	7
Total	301	12	3	4	6

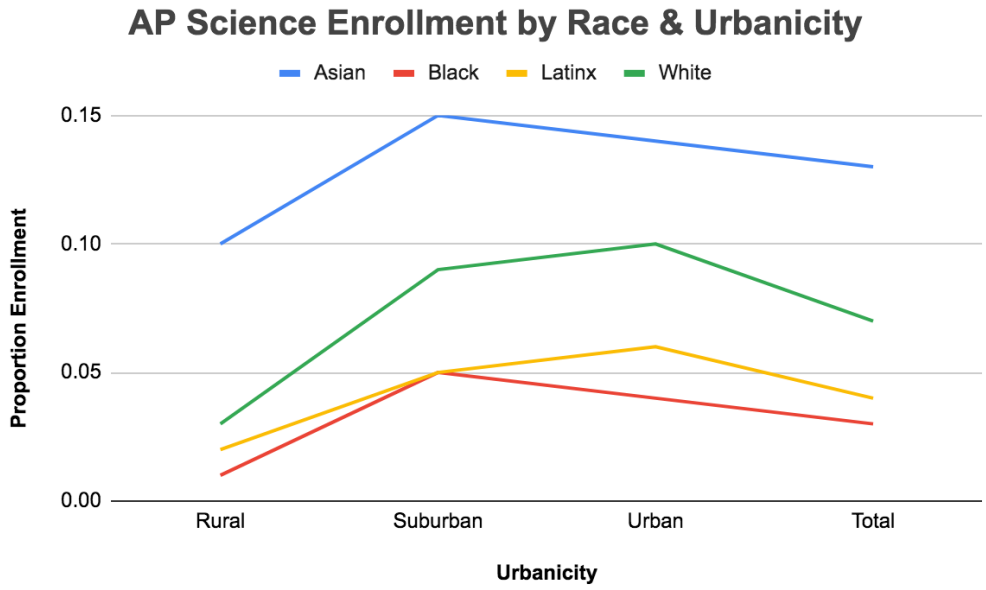
AP Science

Of the schools that offered AP (n=301), 13% of Asian students enrolled in AP Science, compared to 7% of White students and Latinx (4%) and Black students (3%) (Figure 4). Thus, Asian students are three times more likely to enroll in AP Science than Latinx students and four times more likely than Black students.

[19] Calculated by Math AP Enrollment/Total School Enrollment

Figure 4:

AP Science Enrollment by Race/Ethnicity & School Setting



In regard to school setting, suburban schools have the highest AP Science enrollment for Asian (15%) and Black (5%) students (Table 16). Urban schools have the highest AP science enrollment for Latinx (6%) and White students (10%). The Latinx-White AP science gap is largest in urban and suburban schools (-4%).

Table 16:
AP Science Enrollment by Race/Ethnicity & School Setting

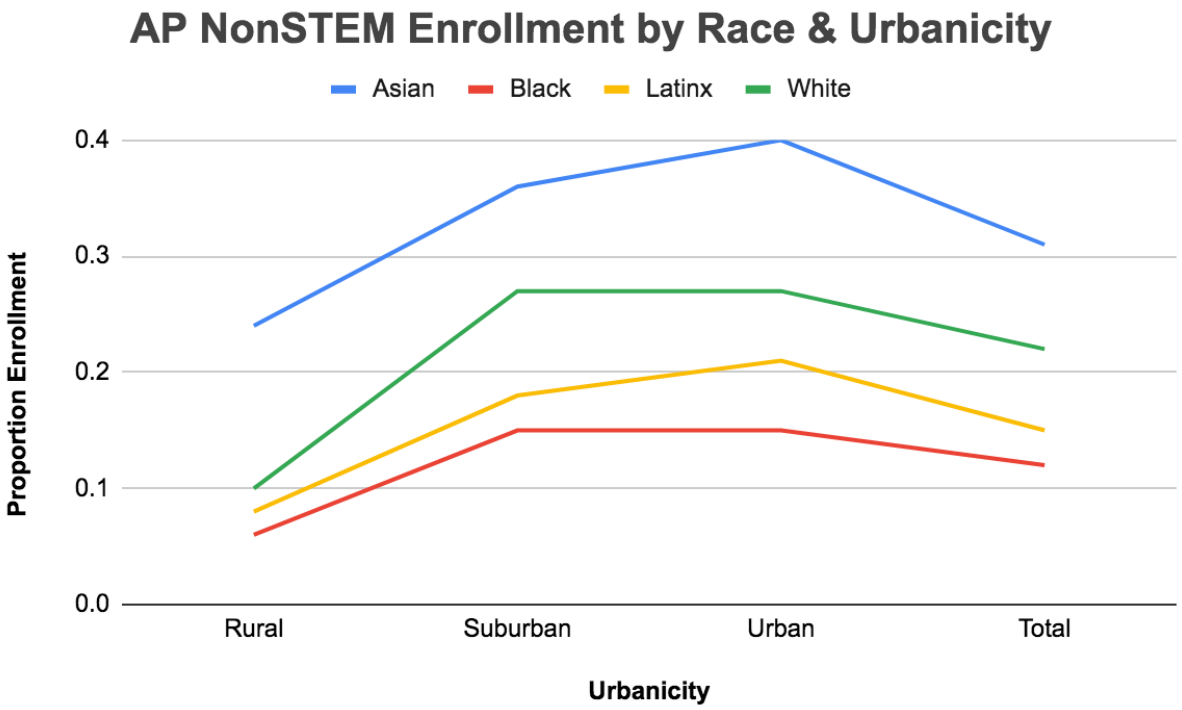
	Proportion AP Science Enrollment[20]				
	School	Asian	Black	Latinx	White
School setting	*n*	*%*	*%*	*%*	*%*
Rural	109	10	1	2	3
Suburban	144	15	5	5	9
Urban	48	14	4	6	10
Total	301	13	3	4	7

AP NonSTEM

Of the schools that offered (n= 301), 31% of Asian students enrolled in AP nonSTEM, compared to 20% of White students and Latinx (14%) and Black students (12%) (Figure 5). Thus, Asian students are twice more likely to enroll in AP nonSTEM than Latinx students and Black students. White students are 1.5 times more likely to enroll in AP nonSTEM than Latinx students.

[20] Calculated by AP Science Enrollment/Total Enrollment

Figure 5:
AP nonSTEM Enrollment by Race/Ethnicity & School Setting



Urban students have the highest nonSTEM enrollment, regardless of race or ethnicity. In regard to school setting, Latinx students have the highest proportion of AP nonSTEM enrollment in urban schools (21%), followed by suburban schools (17%) and rural schools (8%) (Table 17).

Asian students are (40%) twice as likely to be enrolled in nonSTEM AP than Latinx students (21%) in urban schools. Asian students (23%) are three times more likely to be enrolled in nonSTEM AP than Latinx students (8%) in rural schools and they are twice as likely (33%) in suburban schools.

Gaps also exist between White and Latinx students regardless of school setting. There is a gap of (-2%) in rural schools, (-8%) in suburban schools, and (-6%) in urban schools. Thus the Latinx-White nonSTEM gap is largest in suburban schools.

Table 17:
AP nonSTEM enrollment by Race/Ethnicity & School Setting

		Proportion AP nonSTEM Enrollment[21]			
	Schools	Asian	Black	Latinx	White
School Setting	*n*	*%*	*%*	*%*	*%*
Rural	109	23	6	8	10
Suburban	144	33	15	17	25
Urban	48	40	15	21	27
Total	301	31	12	14	20

For AP Math, there is a Latinx-Asian gap of (-8%) and a (-2%) Latinx-White gap. For AP Science, there is a Latinx-Asian gap (-9%) and a (-3%) Latinx-White gap. For AP nonSTEM, there is a gap of (-17%) between Asian students and Latinx students and (-6%) between White and Latinx students.

Thus, the greatest enrollment gap for Latinx students and Asian and White students is in AP nonSTEM enrollment. However, a larger proportion (15%) of Latinx students enroll in nonSTEM compared to AP Math (4%) and AP science (5%). This demonstrates that while AP NonSTEM has higher enrollment for Latinx students, it has even higher enrollment for Asian and White students as well; thus, gaps persist.

Research Question 3: AP Completion

Regarding RQ3, which asks: *To what extent does racial disproportionality for Latinx AP completion exist? Are there differences by school setting in passing the course and taking the exam for Latinx students*?, I first had to define the meaning of AP completion.

[21] Calculated by AP Enrollment/Total Enrollment

AP completion in this study refers to the outcomes of an AP course: (1) whether students take the AP exam and (2) whether students pass the exam with a score of three or above. Therefore, examining test taking patterns and scores are both facets of AP completion. I analyzed AP completion patterns for not passing the AP exam, not taking the AP exam, and scores for students in the 2015-6 school year.

Completion: Not Taking the Exam

Out of schools with at least one AP course available (n=301), the highest proportion of students not taking the exam out of possible courses enrolled are Black students (26.3%), followed by Latinx (16.0%), White (15.2%) and Asian students (7.1%) (Table 18).

Table 18:
AP Completion: Students Taking the AP Exam

Took the Exam		
Race/Ethnicity[22]	*n*	%
Asian	15,293	92.9
Black	11,324	73.7
Latinx	9,092	84.0
White	64,596	84.8

Completion: Not Passing the Exam

Out of schools with at least one AP course available, the highest percentage of students who took the exam but did not pass are Black students (40.3%), followed by Latinx (27.6%), White (18.7%) and Asian students (13.8%) (Table 19).

[22] Sample size for Asian students (n=236), Black (n=252), Latinx (n=248) and White (n=300).

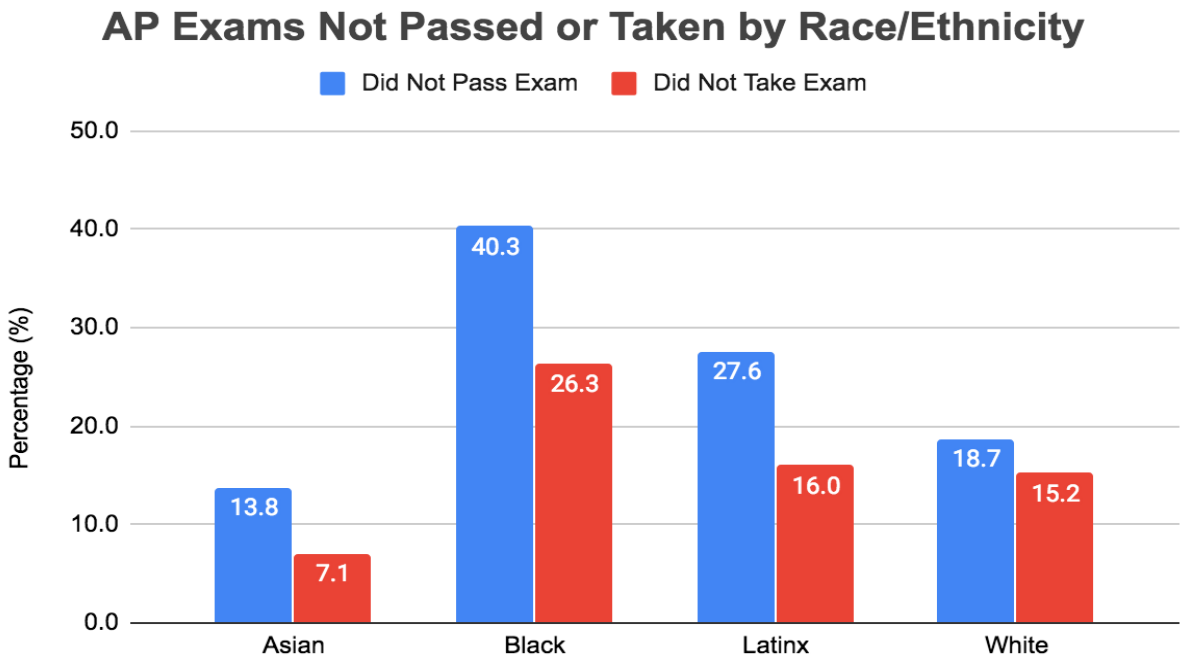
Black students are 2.15 times more likely to not pass compared to White students and Latinx students are 1.5 times more likely to not pass compared to White students. Compared to Asian students, Latinx students are twice as likely to not pass the exam and Black students are three times as likely to not pass the exam (Figure 6).

Table 19:
AP Completion: Students Who Did Not Pass the Exam

	Did Not Pass the Exam	
Race/Ethnicity[23]	*n*	%
Asian	2,111	13.8
Black	4,565	40.3
Latinx	2,509	27.6
White	12,068	18.7

[23] Sample size for Asian students (n=236), Black (n=252), Latinx (n=248) and White (n=300).

***Figure 6*:**
AP Exams Not Passed or Taken by Race/Ethnicity



Latinx AP Completion and School Setting

The calculations for Latinx AP completion represent the mean percentages of students by type of school setting. A higher percentage of rural (35%) Latinx students did not take the exam compared to suburban (25%) or urban (20%). Urban Latinx students (27%) were three times more likely to not pass compared to rural (9%) students (Table 20).

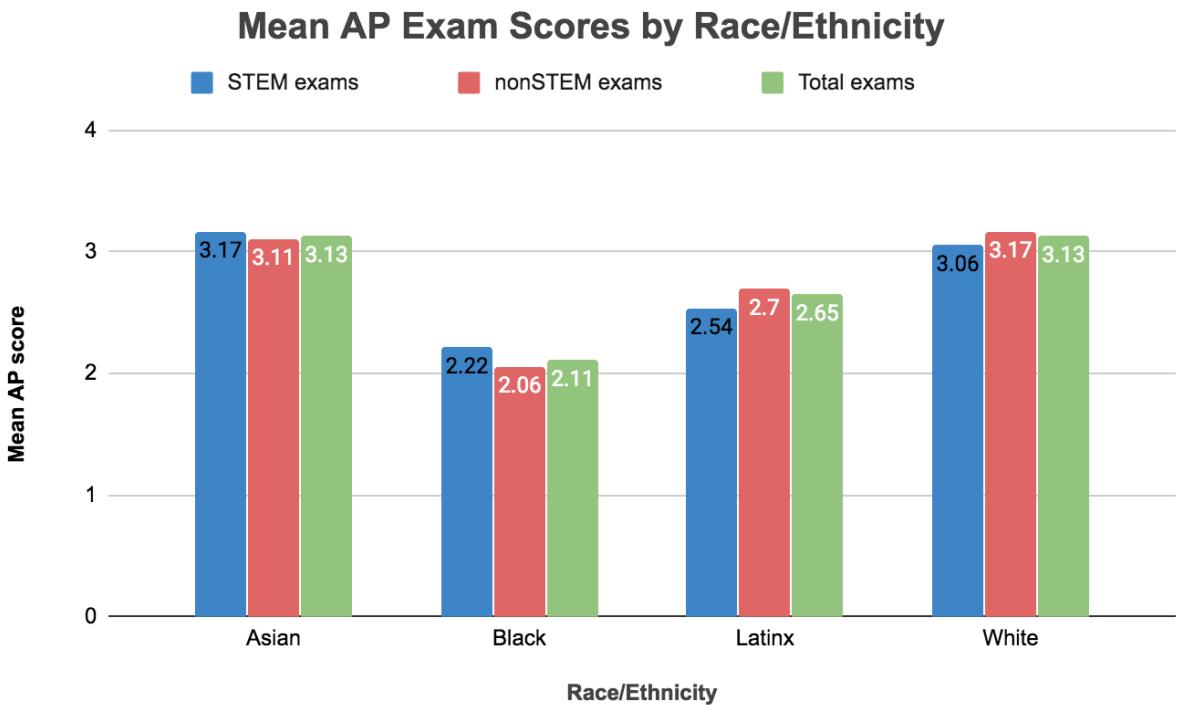
Table 20:
Latinx AP Completion by School Setting

	Did Not Take the Exam *n*=243		Did Not Pass Exam *n*=230	
School Setting	%	SD	%	SD
Rural	35.0	0.90	9.0	0.31
Suburban	25.0	0.31	22.0	0.22
Urban	20.0	0.19	27.0	0.25
Total	27.0	0.53	20.0	0.27

Disproportionality and AP Scores

College Board data (2016) was used for the analysis of AP scores in Virginia. Across all AP exams in Virginia (n=37), Asian (M = 3.13) and White students (M = 3.13) had higher mean AP exam scores than Black (M = 2.11) and Latinx students (M =2.65) (Figure 7).

Figure 7:
Mean AP Exam Scores by Race/Ethnicity



Regardless of category, students passed at higher rates for nonSTEM exams in comparison to STEM exams. Asian and White students completed the course at higher rates and passed the exam, in comparison to Black and Latinx students (Table 21).

Table 21:
AP Scores by Race/Ethnicity and Type of Exam

	Total Exams *n*=37		STEM Exams *n*=12		NonSTEM Exams *n*=25	
Race/Ethnicity	*M*	%[24]	*M*	%	*M*	%
Asian	3.13	70.4	3.17	67.4	3.11	73.2
Black	2.11	36.6	2.22	34.9	2.06	37.5
Latinx	2.65	54.1	2.54	47.9	2.70	57.3
White	3.13	67.0	3.06	63.9	3.17	68.5

[24] Percentage is a calculation of total pass scores/total group of students

STEM Completion

Within STEM, the average of all Latinx students taking AP STEM exams did not exceed a score of a three or above, with the exception of Calculus BC (*M* = 3.30). Mean scores ranged from 1.93 (Physics A) to 3.30 (Calculus BC). The highest percentage pass rate for Latinx students was for Calculus BC (71%) followed by Psychology (56%), Calculus AB (*55%*), and Physics-Electrical (*54%*). The lowest percentage pass rate was for Physics A (*25%*) (Figure 8, Table 22).

Figure 8:
AP STEM Scores by Race/Ethnicity

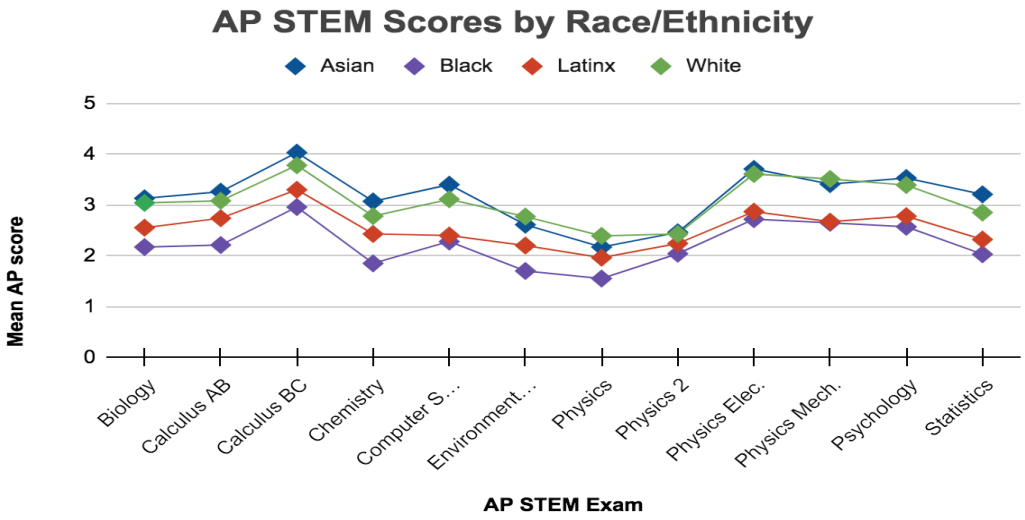


Table 22:
STEM AP scores by Race/Ethnicity

	STEM Pass Rate			
AP Exam	Asian	Black	Latinx	White
	%	*%*	*%*	*%*
Calculus BC	87	62	71	82
Psychology	77	50	56	75
Calculus AB	69	39	55	66
Physics, Elec.	79	64	54	76
Computer Science	72	42	48	65
Biology	70	29	47	70
Physics, Mech.	72	47	46	73
Chemistry	65	21	44	58
Statistics	70	30	42	61
Env. Science	47	19	34	53
Physics B	38	27	30	44
Physics A	31	12	25	41

Latinx AP Completion

In order to analyze Latinx AP scores, only exams with Latinx participants were included (n=35). Overall, there were more passing scores for Latinx students than failures, as 53% of Latinx students passed their AP exams. However, when broken down by STEM v. nonSTEM, only 47% of Latinx students passed STEM exams in contrast to 65% passing nonSTEM exams (Table 23).

Table 23:
Mean Latinx AP Scores: Pass and Failures

		Pass		Fail	
Exams	*n*	*%*	SD	*%*	SD
STEM	12	46.6	0.13	53.4	0.13
nonSTEM	23	65.3	0.17	38.3	0.14
Total	35	58.9	0.18	44.0	0.15

Comparing mean STEM/Non-STEM AP scores, the results of a one way ANOVA found a statistically significant difference in Latinx passing scores and type of exam, $F(1, 33) = 11.68$ $p = .002$ $\eta^2 = .26$. Latinx students were much more likely to pass nonSTEM AP exams than to pass STEM AP exams, as well as Latinx failing scores and type of exam (STEM,nonSTEM), $F(1,33) = 11.14$ $p = .002$ $\eta^2 = .25$. These are large effect sizes according to Cohen's (1988) guidelines.

Latinx and nonSTEM Scores

On the whole, nonSTEM passing scores can be grouped into two categories: languages and art for Latinx students. With the exception of Spanish Language (*M = 4.10)* (Table 24), within nonSTEM, the average of all Latinx students taking AP nonSTEM exams did not exceed a score of four or above. Both the Chinese Language exam and Studio Art-3D had 100% pass rates; however, there were fewer than ten students who took the course or exam. Spanish Language had a 95% pass rate.

Table 24:
Latinx Students and AP NonSTEM Scores

AP NonSTEM Exam	AP Score M	Pass Rate %
Chinese Language*	3.40	**100**
Studio Art 3D*	3.50	**100**
Spanish Language	4.09	**95**
Studio Art Draw	3.35	**85**
Studio Art 2D	3.44	**83**
French Language	3.16	**77**
Art History	2.98	**72**
Seminar	2.86	**72**
Italian	2.81	**69**
Spanish Literature	3.02	**68**
Economics, Micro	2.87	**65**
German Language	3.27	**64**
Economics, Macro	2.77	**54**
Latin	2.65	**53**
English Composition	2.75	**52**
English Literature	2.68	**52**
Human Geography	2.66	**51**
Government, U.S.	2.61	**50**
World History	2.57	**50**
U.S. History	2.59	**49**
Music Theory	2.39	**45**
European History	2.44	**44**
Government, Comp.	2.44	**43**

*note - Less than ten students took the exam

In the state of Virginia, over two thirds (69%) of public high school students have access to at least one AP course. Suburban schools, where the highest number of Latinx students are enrolled, have the greatest amount of course offerings. One area of access disproportionality is for alternative schools. Only one alternative school in Virginia offers

an AP course, a troubling consideration because Latinx students are disproportionately enrolled in alternative schools in Virginia. There is disproportionality for Latinx students in regard to AP enrollment, especially for STEM coursework. In regard to completion, a disproportionate amount of Latinx students fail to pass the exam. In the next section, I analyzed two school districts in order to determine access, enrollment and completion at the school level.

Chapter 5: Findings - School District Analysis

Regarding RQ4, *To what extent does racial disproportionality for Latinx AP access, enrollment, and completion exist between and within diverse school districts? How is AP access and participation impacted by racial segregation?,* I selected two districts that were diverse and had a high percentage of Latinx school and AP enrollment. In addition to having financial resources and the benefit of being a suburb of Washington D.C., both Fairfax County and Prince William County have larger proportions of non-White students than other school districts in the state of Virginia (Table 25).

Table 25:
Racial/Ethnic Demographics in Secondary Schools, 2015-16[25]

	Fairfax	Prince William	Virginia
	%	%	%
Asian	16	8	6
Black	14	22	23
Latinx	30	30	13
White	36	33	53
Other	4	7	5

Fairfax County has 39 high schools: 62% are traditional (n=25), 21% are alternative (n=8), 15% are special education (n=6), and one is a regional school. Of all the secondary schools in Fairfax County, 25% or 14 do not offer AP; these are the alternative and special education schools. Of the schools that offer AP, 32% (n=8) offer

[25] Although more current numbers are available, I chose to review 2015-16 Enrollment data in order to align with the 2015-6 Civil Rights Data Collection data and 2016 College Board data.

fewer than eight courses; 68% (n=17) offer more than 21 courses. There are no schools that offer 8-20 courses.

Prince William County has 13 secondary schools of which 85% are traditional (n=11); one is special education and one is alternative. With the exception of the special education school, all schools offer AP (91.7%), including alternative. Course offerings range from 1-30. For this analysis, I analyzed the traditional schools (n=11) and the alternative school (n=1). Of the traditional schools, 27% (n=3) offer fewer than five courses, 55% (n=6) offer more than 21 courses, and 18% (n=2) offer a midrange of courses.

Fairfax County Schools

Disproportionality in Access: AP Course Offerings

Of the total schools in Fairfax County (n=39), 38% (n=15) are considered diverse (30-59% Black/Latinx enrollment); 33% (n=13) of schools are Predominantly White (< 30% Black/Latinx enrollment), 21% (n=8) are segregated (60-79% Black/Latinx enrollment), and 8% (n=3) are intensely segregated (80-99% Black/Latinx enrollment).

Of traditional schools (n=25), the three segregated schools have the least number of course offerings available (2-5 courses; *M*= 3), in contrast to diverse schools (2 - 29 courses; *M*=18.11) or predominantly White schools (3-29 courses; *M*= 22.31). One magnet school, Thomas Jefferson is 96% White, with 2% Latinx and 4% minority overall that offers 24 courses (Table 26). Alternative and special education schools are overwhelmingly segregated or intensely segregated; with no AP classes available in

schools in either of these categories, many minority students do not have access to advanced coursework (Table 27).

Table 26:
AP Course Availability in Traditional And Regional Schools in Fairfax County

Traditional	School Segregation	AP Courses Available *n*	Latinx Enrollment %	Black/Latinx Enrollment %
Lake Braddock	Predominantly White	29	18	24
Langley High	Predominantly White	29	5	6
Oakton High	Predominantly White	29	1	15
Westfield High	Diverse	29	21	33
Fairfax High	Diverse	27	21	31
West Springfield	Predominantly White	27	16	23
Falls Church High	Diverse	26	48	55
Herndon High	Diverse	25	39	47
Madison High	Predominantly White	25	12	14
Woodson High	Predominantly White	25	11	16
Mclean High	Predominantly White	24	12	15
Thomas Jefferson*[26]	Predominantly White	24	2	4
Chantilly High	Predominantly White	23	14	21
South County	Predominantly White	23	11	29
Centreville High	Predominantly White	22	17	26

[26] Thomas Jefferson is a regional magnet school

Traditional	School Segregation	AP Courses Available *n*	Latinx Enrollment %	Black/Latinx Enrollment %
Hayfield	Diverse	22	21	48
West Potomac	Diverse	22	34	52
Robinson	Predominantly White	7	14	20
South Lakes High	Diverse	6	24	37
Annandale High	**Segregated**	5	43	60
Edison High	Diverse	4	32	54
Marshall High	Predominantly White	3	17	22
Lee High	Diverse	2	40	54
Mount Vernon	**Segregated**	2	42	69
Stuart High	**Segregated**	2	50	60

Table 27:
Percent Black/Latinx Enrollment In Alternative And Special Education Schools in Fairfax County

School Setting	School Segregation	AP Courses Available *n*	Latinx Enrollment %	Black/Latinx Enrollment %
Alternative				
Alc At Bryant	**Intensely Segregated**	0	53	87
Achievement Integrity And Maturity	**Intensely Segregated**	0	44	80
Bryant Alternative High	**Intensely Segregated**	0	56	80
Fairfax County Adult High	**Segregated**	0	66	75
Mountain View High	**Segregated**	0	59	72
Alc At Mountain View	**Segregated**	0	50	65
Interagency Alt. Sec. Ctr	**Segregated**	0	39	58
Cedar Lane School	Diverse	0	26	44
Special Education				
Transitional Esol	**Intensely Segregated**	0	85	88
Key Center	**Segregated**	0	25	68
Quanter School Road	Diverse	0	31	56
Kilmer Center	Diverse	0	21	46
Pulley Career Center	Diverse	0	22	41
Davis Career Center	Diverse	0	26	36

Disproportionality in AP Enrollment

In Fairfax County schools offering AP (n=25), Asian students comprise 18% of total school enrollment, and 29% of AP enrollment. White students are also disproportionately enrolled in AP at 50% compared to their school enrollment or 43%.

Black (-5%) and Latinx students (-14%) are also disproportionately enrolled, but in the opposite direction (Table 28).

Table 28:
Overall AP Enrollment Disproportionality in Fairfax County Schools

	% School[27] Enrollment	% AP Enrollment	AP Enrollment Discrepancy
Asian	18	29	**11**
Black	11	6	**-5**
Latinx	23	9	**-14**
White	43	50	**7**

Gaps between school and AP enrollment proportions vary widely within the school district. As can be seen in Table 28, Asian students were disproportionately overrepresented in AP enrollment in the majority of Fairfax County schools. White students were disproportionately overrepresented in AP classes based upon their enrollment, as well. In contrast, Black students and Latinx were disproportionately underrepresented (Table 29).

[27] School enrollment reflects out of schools offering AP (n=25).

Table 29:
School Enrollment [28] and AP Enrollment[29] by Race/Ethnicity in Fairfax County Schools

	Asian		Black		Latinx		White	
School	% School Enroll	% AP Enroll	% School Enroll	% AP Enroll	% School Enroll	% AP Enroll	% School Enroll	% AP Enroll
Annandale	20	21	17	21	43	25	17	29
Centreville	32	44	9	5	17	8	38	40
Chantilly	30	44	7	6	14	6	44	41
Edison	15	20	21	20	32	0	27	40
Fairfax High	22	31	10	8	21	14	41	42
Falls Church	21	27	7	9	48	29	20	31
Hayfield	14	19	27	25	21	12	32	37
Herndon	12	16	8	6	39	15	37	58
Lake Braddock	19	23	6	5	18	13	50	53
Langley	24	29	1	0[30]	5	4	65	62
Lee	24	13	14	23	40	23	19	33
Madison	14	15	2	1	12	7	66	71
Marshall	18	33	5	0	17	0	54	67
McLean	22	28	3	2	12	6	58	60
Mount Vernon	6	7	27	24	42	27	20	35
Oakton	27	29	5	3	10	6	53	56
Robinson	14	19	6	7	14	9	59	60
South County	19	22	18	12	11	9	46	50
South Lakes	12	22	13	5	24	11	44	54
Stuart	14	33	10	0	50	0	23	67

[28] School enrollment is %enrollment/%total secondary enrollment excluding alternative and special education schools (n=25)
[29] AP enrollment is % AP enrollment/total AP enrollment (n=25)
[30] Percentage is less than 1 (.44%)

	Asian		Black		Latinx		White	
School	% School Enroll	% AP Enroll	% School Enroll	% AP Enroll	% School Enroll	% AP Enroll	% School Enroll	% AP Enroll
West Potomac	6	8	18	10	34	17	37	61
West Springfield	14	17	7	5	16	11	57	61
Westfield	21	32	12	9	21	10	41	46
Woodson	22	28	5	3	11	8	56	57
Thomas Jefferson	63	63	2	1	2	2	26	26

Gaps persist for Black and Latinx students regardless of AP Math, AP Science or AP nonSTEM; however gaps are larger for STEM coursework between Latinx students and Asian and White students. For example, Latinx students are underrepresented in AP Math (-18%) and Asian students are overrepresented (+20%) (Table 30).

Of the schools that offer AP, 32% (n=8) do not offer AP Science: Annandale, Edison, Lee, Marshall, Mount Vernon, Robinson, South Lakes, and Stuart. These are also schools with fewer than seven AP course offerings available.

As a result, the AP science enrollment only reflects those schools that offer AP Science (n=17). Latinx students have the largest AP Math underrepresentation (-16%), AP Science underrepresentation (-15%) and AP nonSTEM underrepresentation (-12%) of any racial/ethnic group. Asian students have the largest overrepresentation in STEM and White students in nonSTEM.

Table 30:
Fairfax County Schools: AP STEM & nonSTEM Enrollment Disproportionality

	% School Enrollment	% AP Math[31] Enrollment	AP Math Discrepancy	% AP Science[32] Enrollment	AP Science Discrepancy	% AP NonSTEM Enrollment	NonSTEM Discrepancy
Asian	18	35	**17**	33	**15**	22	**4**
Black	11	8	**-3**	5	**-6**	7	**-4**
Latinx	23	7	**-16**	8	**-15**	11	**-12**
White	43	45	2	48	**5**	55	**12**

Latinx AP enrollment

Of the 25 schools with Latinx students that offer AP, 44% (n=11) have a disproportionality greater than -10% for AP course enrollment. The high school with the greatest disproportionality is Stuart (50%), followed by Edison (32%), and Herndon (24%). One school, Thomas Jefferson has proportional enrollment (Table 31).

[31] AP Math is calculated by AP Math enrollment/total AP math enrollment
[32] AP Science (n=17) and AP Math and NonSTEM (n=25) due to course availability.

Table 31:
Latinx School Enrollment and AP Enrollment Disproportionality in Fairfax County Schools

School	No. of AP courses offered	School Enrollment, Latinx %	AP Enrollment Latinx %	Disproportionality[33]
Stuart	2	50	0	**-50**
Edison	4	32	0	**-32**
Herndon	25	39	15	**-24**
Falls Church	26	48	29	**-19**
Annandale	5	43	25	**-18**
West Potomac	22	34	16	**-18**
Lee	2	40	23	**-17**
Marshall	3	17	0	**-17**
Mount Vernon	2	42	27	**-15**
South Lakes	6	24	11	**-13**
Westfield	29	21	10	**-11**
Centreville	22	17	8	**-9**
Hayfield Secondary	22	21	12	**-9**
Chantilly	23	14	6	**-8**
Fairfax High	27	21	14	**-7**
Madison	25	12	6	**-6**
McLean	24	12	6	**-6**
West Springfield	27	16	10	**-6**
Lake Braddock	29	18	13	**-5**
Robinson	7	14	9	**-5**
Oakton	29	10	6	**-4**
Woodson	25	11	8	**-3**
South County	23	11	9	**-2**
Langley	29	5	4	**-1**
Thomas Jefferson	24	2	2	**0**

[33] Difference between school enrollment and AP enrollment

Overall, out of traditional schools offering AP (n=25), Latinx student STEM AP enrollment is slightly less than nonSTEM AP enrollment. Gaps and differences emerge when analyzing at the school level. One high school has higher Latinx enrollment for AP Math than nonSTEM: Annandale. Of the schools having Latinx students enrolled in AP (n= 22), NonSTEM enrollment is higher than STEM in 20 schools or 90% (Table 32).

Table 32:
Latinx and AP STEM Enrollment in Fairfax County Schools

School	Total AP Enrollment %	AP Math Enrollment %	AP Science Enrollment %	AP nonSTEM Enrollment %
Falls Church	**29**	4	8	25
Mount Vernon	**27**	7	n/a	21
Annandale	**25**	17	n/a	9
Lee	**23**	0	n/a	23
West Potomac	**17**	3	5	16
Herndon	**15**	2	4	15
Fairfax	**14**	2	5	13
Lake Braddock	**13**	3	5	12
Hayfield	**12**	2	3	12
South Lakes	**11**	**0**	n/a	11
West Springfield	**11**	2	5	10
Westfield	**10**	2	4	9
Robinson	**9**	2	n/a	7
South County	**9**	2	2	8
Centreville	**8**	2	2	7
Woodson	**8**	2	3	7
Madison	**7**	1	3	7
Chantilly	**6**	2	2	5
McLean	**6**	1	2	5
Oakton	**6**	2	2	5
Langley	**4**	2	3	3
Thomas Jefferson	**2**	1	0	2
Edison	**0**	0	n/a	0
Marshall	**0**	0	n/a	0
Stuart	**0**	0	n/a	0

Latinx AP Enrollment and Segregated Schools

Of the schools that offer AP (n=25), Latinx students have a higher AP Math enrollment in predominantly White schools (*M*=15), compared to segregated schools (*M*=7). Latinx students have higher enrollment in diverse schools in regard to total AP enrollment (*M*=77), AP Science (*M*=35) and AP nonSTEM (*M*=73 (Table 33).

Table 33:

Latinx AP Enrollment and Segregated Schools in Fairfax County

		Latinx AP Enrollment		
	Segregation Index	Schools *n*	Enrollment[34] M	SD
AP Math enrollment	**Predominantly White**	**13**	**15**	**7.01**
	Diverse	9	12	9.54
	Segregated	3	7	6.51
	Total	25	13	8.14
AP science enrollment	Predominantly White	11	26	14.70
	Diverse	**6**	**35**	**7.51**
	Segregated	0	0	0
	Total	17	29	13.16
AP nonSTEM enrollment	Predominantly White	13	58	31.68
	Diverse	**9**	**73**	**50.56**
	Segregated	3	10	11.24
	Total	25	57	41.70
Total AP enrollment	Predominantly White	13	63	33.68
	Diverse	**9**	**77**	**53.65**
	Segregated	3	16	14.29
	Total	25	62	43.49

[34] Because these means reflect students, means have been rounded to the nearest whole number.

Disproportionality in AP Completion

Out of schools with all race/ethnicities enrolled in AP (n=22), the highest proportion of students not taking the exam out of possible courses enrolled are Latinx students (5.6%), followed by Black (5.4%), White (2.4%) and Asian students (1.7 %).

Latinx students are 3.3 times more likely to not take an exam compared to Asian students and 2.3 times more likely than Whites students (Table 34).

Table 34:
AP Completion: Students Taking the Exam in Fairfax County Schools

	Did Not Take the Exam		Took the Exam	
Race/Ethnicity	*n*	%	*n*	%
Asian	140	1.7	8,301	98.3
Black	74	5.2	1,345	94.8
Latinx	127	5.6	2,128	94.4
White	320	2.4	12,874	97.6

Out of schools with all race/ethnicities enrolled in AP and AP available (n=22), the highest proportion of students not passing the exam out of possible courses enrolled are Black students (26.8%), followed by Latinx (22.0%), White (11.8%) and Asian students (9.2%) (Table 35). Black students are 2.3 times more likely to not pass compared to White students and Latinx students are 1.86 times more likely to not pass compared to White students. Compared to Asian students, Black and Latinx students are almost three times less likely to pass the exam.

Table 35:
AP Completion: Students Not Passing the Exam in Fairfax County Schools

	Did Not Pass the Exam		Took the Exam	
Race/Ethnicity	*n*	%	*n*	%
Asian	767	9.2	8,301	98.3
Black	361	26.8	1,345	94.8
Latinx	468	22.0	2,128	94.4
White	1522	11.8	12,874	97.6

When analyzing by Latinx completion and schools, stark contrasts emerge among schools. Of the schools with Latinx enrollment and offering AP (n=22), only one, Lee, had a 100% pass and test-taking rate. Of the remainder, 18% had Latinx students with a failure rate above 50%. The remainder had failure rates ranging from 0% (Lee, Thomas Jefferson) to 41% (West Potomac).In regard to not taking the exam, two schools had over 25% of Latinx students not taking the exam: Annandale and Mount Vernon (Table 36).

Table 36:
Latinx Students and Completion in Fairfax County Schools

	Latinx AP enrollment	Did not take the exam	Did not take the exam[35]	Total Taking the Exam	Did not pass	**Did not pass[36]**
	n	*n*	%	*n*	*n*	**%**
Annandale	19	4	28	15	14	**93**
Mount Vernon	28	7	25	21	14	**67**
Robinson	55	2	4	53	35	**66**
South Lakes	16	2	13	14	8	**57**
West Potomac	121	7	6	114	47	**41**
Herndon	112	2	2	110	41	**37**
Oakton	73	7	10	138	23	**37**
Hayfield	88	2	2	86	32	**36**
Fairfax	127	19	15	108	38	**35**
Lake Braddock	142	4	3	138	44	**32**
Westfield	91	5	5	86	26	**30**
South County	64	7	11	57	17	**30**
West Springfield	97	7	7	90	26	**29**
Centreville	73	7	10	66	17	**26**
Falls Church	127	19	15	108	35	**26**
Madison	67	7	11	60	14	**23**
Woodson	67	4	6	63	14	**22**

[35] Calculated by the number of Latinx who did not take the test/ Latinx AP enrollment
[36] Calculated by the number of Latinx who did not pass/ Latinx AP enrollment

	Latinx AP enrollment	Did not take the exam	Did not take the exam[37]	Total Taking the Exam	Did not pass	**Did not pass[38]**
	n	*n*	%	*n*	*n*	**%**
Chantilly	58	5	7	54	11	**20**
McLean	58	7	12	51	8	**16**
Langley	37	4	11	33	4	**12**
Thomas Jefferson	28	0	0	0	0	**0**
Lee	7	0	0	0	0	**0**
Edison[39]	0	0	0	0	0	0
Marshall	0	0	0	0	0	0
Stuart	0	0	0	0	0	0

Latinx Completion and Segregated Schools

On average, Latinx students in segregated schools had a greater proportion of students not passing the exam (16%) followed by diverse schools (5%) and Predominantly White schools (2%). Latinx students in segregated schools had a greater instance of not taking the exam (23%) followed by Predominantly White schools (7.5%) and diverse schools (7.2%).

[37] Calculated by the number of Latinx who did not take the test/ Latinx AP enrollment
[38] Calculated by the number of Latinx who did not pass/ Latinx AP enrollment
[39] Three schools: Lee, Marshall, and Stuart do not have Latinx AP enrollment.

Prince William County Schools

Disproportionality in Access: AP Course Offerings

Of the total secondary schools in Prince William County, fewer than a third have diverse student bodies. Predominantly White schools (segregated), on average, have nearly twice as many AP offerings as schools that are predominantly minority (segregated). Alternative (n=1) and schools for students with special needs (n=0) have the least number of AP courses offered. Schools with the highest Latinx enrollment (50% or higher) offer, on average, 10 AP courses, nearly half the average offered in predominantly White schools (Table 37).

Table 37:
AP Course Availability in Prince William County Schools

Traditional	School Segregation	AP Courses Available *n*	Latinx Enrollment %	Black/Latinx Enrollment %
Battlefield	Predominantly White	30	13	21
C.D. Hylton	**Segregated**	25	31	60
Osbourn Park	Diverse	25	25	40
Woodbridge	Diverse	24	29	52
Patriot High	Predominantly White	22	15	27
Forest Park	Diverse	21	19	45
Freedom High	**Intensely Segregated**	16	53	83
Potomac High	**Segregated**	10	22	74
Brentville	Predominantly White	5	13	17
Stonewall Jackson	**Segregated**	4	52	70
Garfield	**Segregated**	1	49	73
Alternative & Special Education				
New Direction[40]	**Segregated**	1	46	78
Independent Hill	Diverse	0	20	55

[40] Alternative School

Disproportionality in AP Enrollment

Although one alternative school offers AP, it is not included in the following calculations because of its potential to skew data. Of traditional schools offering AP (n=11), Asian and White students were disproportionately overrepresented in AP enrollment. In contrast, Black and Latinx students were disproportionately underrepresented.

White students comprise 34% of total school enrollment, and 45% of AP enrollment. Asian students are also disproportionately overenrolled in AP at 12% compared to their school enrollment of 8%. Black students are disproportionately underenrolled in AP at 17% compared to their school enrollment of 22%. Latinx students comprise 29% of total school enrollment, and only 18% of AP enrollment (Table 38). Thus, Latinx students have the highest disproportionality.

Table 38:
Overall AP Enrollment Disproportionality in Prince William County Schools

	% School[41] Enrollment	% AP Enrollment	AP Enrollment Discrepancy
Asian	8	12	**4**
Black	22	17	**-5**
Latinx	29	18	**-11**
White	34[42]	45	**9**

[41] School enrollment reflects out of traditional schools offering AP (n=11).
[42] White school enrollment is 33% for all schools in Prince William; 34% for traditional schools (n=11).

Gaps between school and AP enrollment proportions vary widely within the school district. For Latinx students, gaps in AP enrollment range from (-26%) at Stonewall Jackson to (+2%) at Brentville. The largest gaps for Latinx students were for Stonewall Jackson (-26%) and Osbourn Park (-10%). In contrast, White students at Stonewall Jackson were overrepresented by +20% and +8% at Osbourn (Table 39).

Table 39:

School Enrollment[43] and AP Enrollment[44] by Race/Ethnicity in Prince William County Schools

	Asian		**Black**		**Latinx**		**White**	
	% School Enrollment	% AP Enrollment	% School Enrollment	% AP enrollment	% School Enrollment	% AP enrollment	% School Enrollment	% AP enrollment
Battlefield	11	15	8	8	13	10	61	61
Brentville	4	3	4	0	13	15	74	76
C.D. Hylton	7	9	29	29	31	24	23	27
Forest Park	7	9	25	17	19	13	39	49
Freedom High	6	9	30	30	53	49	7	8
Garfield	9	12	24	29	49	35	12	17
Osbourn Park	10	13	15	14	25	15	43	51
Patriot High	11	14	12	9	15	11	55	57
Potomac High	7	13	51	43	22	15	13	22
Stonewall Jackson	6	12	18	15	52	26	19	39
Woodbridge	8	11	23	16	29	21	33	45

[43] School enrollment is %enrollment/%total secondary enrollment excluding alternative and special education schools (n=11)

[44] AP enrollment is % AP enrollment/total AP enrollment (n=11)

For the following section, I will present data in two tables (Table 40 and 41): one will differentiate between AP Math and AP Science (as done in CRDC data) and the other will combine and average the data into one category: AP STEM. While it is useful to conceptualize coursework as either STEM or nonSTEM, it is also important to differentiate between AP Math and AP Science for policy recommendations.

Of the traditional schools that offer AP (n=11), 33% (n=3) do not offer AP Science: C.D Hylton, Garfield, and Stonewall Jackson; 9% (n=1) does not offer AP Math: Garfield. Out of Prince William's traditional schools, gaps persist for Black and Latinx students regardless of AP Math, AP science or AP nonSTEM; however gaps are larger for STEM coursework between Latinx students and Asian and White students. For example, Latinx students are underrepresented in AP Math (-12%), whereas Asian students (+8%) and White students (+18%) are overrepresented. Latinx students are also underrepresented (-12%) in AP Science, whereas Asian students (8%) and White students (17%) are overrepresented (Table 40). White students exhibit the largest gap (+18%) with AP Math enrollment (Table 40).

Table 40:
AP Enrollment Disproportionality in Prince William County Schools

	% School Enrollment	% AP Math Enrollment	AP Math Discrepancy	% AP Science Enrollment	AP Science Discrepancy	% AP Non STEM Enrollment	Non STEM Discrepancy
Asian	8	16	**8**	16	**8**	12	**4**
Black	22	15	**-7**	16	**-6**	17	**-5**
Latinx	29	17	**-12**	17	**-12**	18	**-11**
White	34[45]	52	**18**	51	**17**	51	**17**

[45] White school enrollment is 33% for all schools in Prince William; 34% for traditional schools (n=11).

Latinx students have the largest underrepresentation in both STEM and nonSTEM coursework in Prince William. White students have the largest overrepresentation in both categories (Table 41).

Table 41:
AP STEM v. nonSTEM Enrollment Disproportionality in Prince William County Schools

	% School Enrollment	% AP STEM[46] Enrollment	AP STEM Discrepancy	% AP Non STEM Enrollment	Non STEM Discrepancy
Asian	8	16	**8**	12	**4**
Black	22	15	**-7**	17	**-5**
Latinx	29	17	**-12**	18	**-11**
White	34[47]	52	**18**	51	**17**

Latinx AP enrollment

Of the traditional schools with Latinx students that offer AP, 36% (n=4) have a disproportionality greater than -10% for AP course enrollment. The high school with the greatest disproportionality is Stonewall Jackson (-26%), followed by Woodbridge (-18%) and Garfield (-14%). No schools have proportional AP enrollment (Table 42).

[46] AP Stem is average of AP Math and AP Science
[47] White school enrollment is 33% for all schools in Prince William; 34% for traditional schools (n=11).

Table 42:
Latinx AP Enrollment Disproportionality in Prince William County

School	No. of AP courses offered	School Enrollment, Latinx %	AP enrollment Latinx %	Disproportionality[48]
Stonewall Jackson	4	52	26	**-26**
Woodbridge	24	29	21	**-18**
Garfield	1	49	35	**-14**
Osbourn Park	25	25	15	**-10**
C.D. Hylton	25	31	24	**-7**
Potomac High	10	22	15	**-7**
Forest Park	21	19	13	**-6**
Freedom High	16	53	49	**-4**
Patriot High	22	15	11	**-4**
Battlefield	30	13	10	**-3**
Brentville	5	13	15	**-2**

As with the earlier section on AP enrollment, I will present data in two tables (Table 43 and 44): one will differentiate between AP Math and AP Science (as done in CRDC data) and the other will combine and average the data into one category: AP STEM.

Several high schools (n=6) have higher Latinx proportion for AP STEM than nonSTEM: Brentville, Forest Park, Osbourn Park, Potomac, Stonewall Jackson and Woodbridge. Higher proportion of enrollment in AP Science over other AP courses include: Forest Park, Osbourn, Patriot and Woodbridge. NonSTEM enrollment is higher

[48] Difference between school enrollment and AP enrollment

than STEM for the following: Battlefield, C Hylton, Freedom and Patriot. Garfield, a school with 49% Latinx enrollment, only has nonSTEM coursework available (Table 43).

Table 43:
Latinx and STEM Enrollment in Prince William County Schools

	Percent Latinx Enrollment				
School	School Enrollment %	AP Enrollment %	AP Math Enrollment %	AP Science Enrollment %	AP nonSTEM Enrollment %
Freedom High	**53**	**49**	43	47	**50**
Garfield	**49**	**35**	n/a	n/a	35
Stonewall Jackson	**52**	**26**	38	n/a	22
C.D. Hylton	**31**	**24**	18	18	24
Woodbridge	**29**	**21**	23	21	20
Brentville	**13**	**15**	18	n/a	13
Osbourn Park	**25**	**15**	16	15	14
Potomac High	**22**	**15**	16	0	14
Forest Park	**19**	**13**	12	13	12
Patriot High	**15**	**11**	9	12	11
Battlefield	**13**	**9**	9	8	**10**

Note: n/a = *schools do not offer AP Math or AP Science*

Table 44:
Latinx and STEM v. nonSTEM Enrollment in Prince William County Schools

		Percent Latinx Enrollment		
School	School Enrollment %	AP Enrollment %	AP STEM Enrollment %	AP nonSTEM Enrollment %
Freedom High	53	**49**	45	**50**
Garfield	49	**35**	n/a	35
Stonewall Jackson	52	**26**	**38**	22
C.D. Hylton	31	**24**	18	**24**
Woodbridge	29	**21**	**22**	20
Brentville	13	**15**	**18**	13
Osbourn Park	25	**15**	**16**	14
Potomac High	22	**15**	**16**	14
Forest Park	19	**13**	**13**	12
Patriot High	15	**11**	10	**11**
Battlefield	13	**9**	9	**10**

Latinx AP Enrollment and Segregated Schools

One school, Freedom High, is intensely segregated; it has the highest Latinx enrollment for AP science and AP nonSTEM. Of the remaining schools, Latinx AP enrollment is highest in diverse schools; this remains true regardless of whether the coursework is STEM or nonSTEM (Table 45).

This may be related to the fact that diverse schools in Prince William county offer, on average, the highest amount of course offerings available (M=23), whereas segregated schools offer on average 10 courses.

Table 45:
Latinx AP Enrollment and Segregated Schools in Prince William County Schools

	Latinx AP Enrollment			
		Schools	Enrollment	
	Segregation	*n*	M	SD
AP Math enrollment	Predominantly White	3	14	9.64
	Diverse	3	36	15.10
	Segregated	4	14	9.43
	Intensely Segregated	1	25	
	Total	11	21	14.04
AP Science enrollment	Predominantly White	3	17	15.63
	Diverse	3	57	28.36
	Segregated	4	6	12.50
	Intensely Segregated	1	64	
	Total	11	28	29.43
AP nonSTEM enrollment	Predominantly White	3	67	54.08
	Diverse	3	114	25.16
	Segregated	4	75	88.27
	Intensely Segregated	1	151	
	Total	11	90	62.04
Total AP enrollment	Predominantly White	3	70	53.33
	Diverse	3	134	35.79
	Segregated	4	82	82.08
	Intensely Segregated	1	178	
	Total	11	102	64.79

Disproportionality in AP Completion

Out of schools with all race/ethnicities enrolled in AP and courses available (n=11), the highest proportion of students not taking the exam out of possible courses enrolled are Latinx students (4.1%), followed by Black (3.5%), White (2.7%) and Asian students (2.2%). Latinx students are 1.5 times more likely to not take an exam than White students and twice more likely than Asian students (Table 46).

Table 46:
AP Completion: Taking the Exam by Race/Ethnicity in Prince William County

	Did Not Take the Exam		Took the Exam	
Race/Ethnicity	*n*	%	*n*	%
Asian	26	2.2	1,118	97.8
Black	50	3.5	1,371	96.5
Latinx	63	4.1	1,468	95.9
White	112	2.7	4,016	97.3

Out of traditional schools in Prince William (n=11), the highest proportion of students not passing the exam out of possible courses enrolled are Black students (45.8%), followed by Latinx (37.8%), White (24.8%) and Asian students (25.7%) Latinx students are 1.5 times likely to not pass compared to Asian and White students (Table 47).

Table 47:
AP Completion: Students not Passing the Exam in Prince William County

	Did Not Pass the Exam		Took the Exam	
Race/Ethnicity	*n*	%	*n*	%
Asian	290	25.7	1,118	97.8
Black	629	45.8	1,371	96.5
Latinx	555	37.8	1,468	95.9
White	994	24.8	4,016	97.3

Latinx Students and Completion

When analyzing by Latinx completion and schools, stark contrasts emerge between schools. Of the traditional schools with Latinx enrollment and offering AP (n=11), the failure rates of Latinx AP enrollment ranges from 38% (Battlefield) to 100% (Potomac). Rates for students who did not take the exam range from 0 to 12% (Table 48).

Table 48:
Latinx Students and Completion in Prince William County Schools

	Latinx AP enrollment	Did not take the exam	Did not take the exam	Total Taking the Exam	Did not pass	Did not pass[49]
	n	*n*	%	*n*	*n*	%
Potomac High	19	2	11	17	17	**100**
Stonewall Jackson	43	5	12	38	26	**68**
Freedom High	178	10	6	168	104	**62**
Garfield	64	7	11	57	35	**62**
C.D. Hylton	202	10	5	192	119	**61**
Woodbridge	163	10	6	153	80	**52**
Forest Park	94	4	4	90	41	**46**
Osbourn Park	145	7	5	138	56	**41**
Brentville	10	0	0	10	4	**40**
Patriot High	112	4	4	108	41	**38**
Battlefield	88	4	5	84	32	**38**

[49] Calculated by Did not pass/AP enrollment

Chapter 6: Discussion

Nationally, the AP and STEM conversation suggests that many underserved students have barriers to AP access, enrollment, and completion. This opportunity gap has a multitude of implications including college readiness, college persistence, and future economic opportunity. While many studies exist that address AP access, there are fewer that address completion, STEM, or segregation specifically for Latinx students. This study set out to weave those disparate pieces together -AP access, enrollment, and completion - in order to analyze the impacts on Latinx students. Through this research, I sought to provide a well-developed picture of the AP experience for Latinx students in Virginia, in the hopes of improving current practices and to shed light on areas for future policy and practice.

The first section of the chapter discusses findings and synthesizes the results of the quantitative analysis with extant literature. In essence, it is a discussion of the data in terms of impact on Latinx students in regard to AP and addresses common themes that were apparent among various facets of AP access, enrollment and completion. Finally, a discussion of policy implications, recommendations, and areas for future research will conclude this chapter.

AP Access for Latinx Students

My first research question centered on whether or not Latinx students had access to advanced placement coursework. In Virginia, Latinx student AP enrollment was positively correlated with the number of AP courses provided, which suggests a positive

relationship between Latinx AP enrollment and access to courses. Thus, having access is a powerful determinant in whether or not a Latinx student enrolls in an AP course.

At the state level, Latinx students do have access to AP coursework; however, there is a lack of access in alternative schools where Latinx students are disproportionately enrolled. The case study revealed that access varies widely in the number of courses available within a school district.

How does urbanicity impact Latinx students in terms of access? The largest number of Latinx students were found in suburban schools in Virginia, where the highest amount of AP access is present; so, in theory, Latinx students should be attending schools where there is the most access to AP coursework (Cha, 2015). This finding contrasts with research that finds Latinx students are often concentrated in urban, minority-majority schools in other parts of the country. Overall, rural students had less access to AP than students in other areas. Suburban school students had the greatest access to AP, closely followed by students in urban schools. This echoes the finding of Garland & Rappaport (2018). Within suburban school districts, however, as the case study reveals, segregation is a factor in the amount of course offerings available to Latinx students. Latinx students attended segregated schools had less access or number of AP courses available in both school districts.

Not having self-selection can be a barrier to AP enrollment. In Virginia, however, the majority of school districts do allow for self-selection; in fact, 77% of suburban and urban schools (where many Latinx students attend) allowed for self-selection into AP. Rural schools are the most likely to offer self-selection to AP, despite the lower amount of access to advanced courses. Therefore, gaps in enrollment must be attributed to factors

other than relying solely on teacher recommendation or testing into a course. In reality, the reasons Latinx students are underenrolled in AP are more complex and indirect than an obvious barrier such as teacher recommendation; more research is needed to determine why students are still underrepresented in AP enrollment, despite having self-selection available.

Finally, in regard to school setting, the majority of alternative and DOE/DOJ schools do not have AP courses available. This is an important finding considering that Latinx and Black students were disproportionately enrolled in such schools. Latinx students comprised 25% of the population of alternative schools, a rate that was almost double their overall school enrollment (12.9%). This means that a significant portion of Latinx students were automatically and disproportionately shut out of AP due to lack of course offerings. So, while many Latinx students attended suburban and urban schools where access exists, they also comprised 33.9% (alternative and DOE/DOJ combined) of total enrollment in schools with no access available.

AP Enrollment for Latinx Students

My second research question centered on whether or not AP enrollment was representative for Latinx students. In short, Latinx students were underrepresented in all areas of AP enrollment in Virginia, which affirms prior research (Cannon, 2011, Kolluri, 2018; Scafidi et al., 2015). Disproportionality exists for Latinx students in all facets of AP enrollment; however, enrollment gaps were most profound in STEM coursework, especially for AP Math. Suburban Latinx students were more likely to enroll in STEM coursework, and Urban Latinx students were more likely to enroll in nonSTEM. These findings affirmed prior studies that found that the largest enrollment gaps for Latinx

students were in STEM courses (Gilroy, 2015). The school district analysis also affirmed these findings.

One key finding for AP enrollment was that a greater proportion of Latinx students were most likely to enroll in AP in urban schools than in suburban schools, where a greater amount of courses are offered. The highest proportion of Latinx students enrolled in AP were in urban schools, over double the enrollment in rural schools. Thus, while urban Latinx students enrolled in AP in higher proportions, they had less variety and offerings than their suburban counterparts.

The Latinx-White gap was largest for AP nonSTEM and largest in suburban schools, where the greatest number of Latinx students are enrolled in school. In the state of Virginia, Latinx students were underrepresented in all three categories of AP coursework, whereas Asian and White students were generally overrepresented. Thus, even though AP enrollment overall may be increasing over the years (College Board, 2019), gaps persist.

In the case study, gaps in AP enrollment varied widely school to school. One notable example is Thomas Jefferson, a regional magnet school, often cited as being a top-ranking school in the state. Admissions are based on a combination of scores, recommendations, and achievement. Despite drawing from a population of students in Fairfax County that is 30% Latinx and 14% Black, Latinx and Black students only comprised 2% of the school population. The Latinx-White gap and disproportionality in AP enrollment was more profound in the two school districts compared to the entire state of Virginia.

In regard to school segregation, Latinx students had higher overall AP enrollment, AP Science, and nonSTEM enrollment in diverse schools. Latinx students had a higher AP Math enrollment in predominantly White schools. Thus, schools that were segregated or intensely segregated had less Latinx AP enrollment.

AP Completion for Latinx Students

While there has been a push towards greater equity in access and enrollment, there is less discussion on how well students are able to pass the exam with a three or higher. The area of completion (taking the exam, passing the exam, scores), specifically for Latinx students, remains underexplored. In Virginia, there is racial disproportionality in regard to completing the exam for Latinx students.

For Virginia, a key finding was Latinx students were twice as likely to not pass their exam compared to Asian students and 1.5 times more likely to not pass compared to White students. Suburban Latinx students had the highest passing rate and rural students had the lowest passing rate. These findings affirm the prior research finding marked completion gaps for Latinx and Black students (Cannon, 2011; Judson & Hobson, 2015). In the case study, Fairfax County Latinx students were 2.4 times more likely to not pass compared to Asian students and almost twice as likely as White students to not pass. Over half of Latinx students failed the exam in 55% of Prince William County schools.

In regard to taking the exam, in Virginia, Latinx student's (84.0%) test-taking rates do not seem to significantly differ from White (84.8%) students. This contrasts the work of Cisneros, et al., 2014, which found significant gaps in enrollment and test-taking for Latinx students. However, the case study revealed test-taking differences at the school level. In Fairfax County, Latinx students were 2.3 times less likely to take the exam

compared to White students and 3.3 times less likely than Asian students. In Prince William County, Latinx students were most likely to not take the AP exam compared to other groups. When taking school setting into account, rural Latinx students were far more likely to not take the exam, whereas urban students were most likely to take the exam.

Finally, in regard to scores and the College Board data, Latinx AP students consistently had lower mean scores than White or Asian students. In 2016, Latinx students had a 58.9% overall exam pass rate [STEM (46.6%); nonSTEM (65.3%)] Within STEM, with the exception of Calculus BC (71% pass rate), the average of all Latinx students taking AP STEM exams did not exceed a score of three or higher. Across all groups, students completed the course and passed at higher rates for nonSTEM exams in comparison to STEM exams. Yet, Asian and White students completed the course at higher rates and passed, in comparison to Black and Latinx students, regardless of category. This ties into prior findings that STEM gaps persist despite gains in enrollment (Riegel-Crumb & Grodsky, 2010).

In Virginia and two school districts studied (Fairfax County and Prince William county) gaps began to emerge at the source: access. There is a difference in course offerings in regard to urbanicity, school setting and segregation. Once enrolled in AP, gaps emerged between Latinx students and Asian and White students in regard to representation and STEM participation. Finally, disproportionality was present in regard to passing the exam and scores at the state level. At the school district level, Latinx students disproportionately did not take the test, in addition to failing the exam at disproportionate rates. As a result, Latinx students within Virginia and the two school

districts studied have disparate experiences in regard to access, enrollment and completion.

Implications for Future Policy

The importance of access to advanced coursework is indisputable as the AP program benefits students in innumerable ways such as greater college enrollment, financial savings, greater preparation and rigor, and greater access to quality education and educators (Cabrera & La Nasa, 2001; Crabtree et al., 2019; Long et al., 2012; Scafidi et al., 2015). However, engendering greater access to AP for underserved students is simply not enough, as we must ensure equitable enrollment and completion of the exam. A multitude of factors impact access to AP, including school setting, urbanicity and degree of segregation. As this deeper dive into differences at the district and school level has demonstrated, there are disparities and segregation within school districts regarding AP access. The implications of such access gaps cannot be understated for Latinx students.

Even when schools offer a range of AP courses, enrollment gaps between Black and Latinx students and White and Asian students were a consistent pattern within the state, between school settings and within school districts. The AP Completion gap demonstrates the importance of support and quality instruction and presents many questions. Why are Latinx students not taking the test, and more importantly, why aren't they passing the exam at the same rate as their Asian and White peers? Why aren't students prepared for the test? Do Latinx students have the same access to quality AP teachers in segregated schools? Are there enough supports for students who are close to

passing, but need assistance? Unfortunately, these questions engender even greater questions regarding educational equity and opportunity.

When considering equity and AP, a multitude of factors need to be in place in order to provide an open trajectory for opportunity. If we offer the promise of AP as a pathway to opportunity, as a gateway to college preparation, it seems cruel to create barriers for the very students we are attempting to serve. Undoubtedly, a greater proportion of Latinx students are enrolling in the AP program. However, there are huge disparities in access and STEM enrollment, which can translate into loss of future opportunity and access to college.

Policy Recommendations

While these recommendations are by no means exhaustive or comprehensive, they are offered as suggestions for engendering greater equity and access to AP. First, make access more equitable. Consider detracking policies that open up pathways to advanced coursework, and dismantling barriers to enrollment in AP, such as not allowing for self-selection. Revisiting AP access policies both within schools and within the school district itself. How exactly does a student become eligible for AP? What are the potential gatekeepers (guidance counselors, teacher recommendations, testing, gifted programs, tracking) within a school? Consider equitably distributing the amount of AP coursework available within a school district if there is disparity between schools.

In regard to enrollment, schools should examine enrollment numbers within schools and districts on a regular basis to discover enrollment gaps and patterns for both the gifted program and AP enrollment. From there, re-evaluate enrollment policy and

communication to parents and students. Create outreach to parents and students that is inclusive in terms of race, ethnicity, gender and language, and then provide meaningful instruction on the benefits of the AP program for college preparation

For supporting AP completion, a critical step is the hiring of qualified teachers for the AP program. As teachers are often hired by a district, rather than an individual school, consider placing the strongest AP teachers in the area of greatest need. Providing supports and assistance for test-taking such as study sessions, test-taking practice and tutoring may also help move the needle towards greater completion. Because students may be reluctant to take the test due to cost, ensure that students are aware of test-taking fees and how to apply to the College Board for financial assistance.

Recommendations for Future Study

This dissertation contributes to extant literature by providing a quantitative analysis of AP that focuses specifically on Latinx students. In addition, it provides insight into enrollment and completion patterns, an area that for Latinx students has been underexplored. Finally, it provides a school district analysis, which provides data that links the full AP experience (access, enrollment, completion) to the impact of segregation within a school district. However, despite the comprehensiveness of this study, there is a still such a great need to examine and ultimately dismantle barriers to equity and AP participation for all students. When considering equity and AP, a multitude of factors need to be in place in order to provide an open trajectory for opportunity.

One area of potential research is analyzing AP completion by score and type of exam within school-districts at the school level. This would help develop a clear picture

of completion in regard to race/ethnicity and type of exam. Expanding on such research could include examining which districts have stronger completion rates for Latinx students. Are factors such as teacher quality (as measured by training or experience), parental engagement, or resource availability potential explanations for which students take or pass the exam v. those who do not?

Another area of potential study is investigating the impact of segregation on AP enrollment and completion within and between school districts. Both Fairfax County and Prince William County demonstrate that there are gaps in access and enrollment even within school districts that are arguably well-resourced. The fact that disparities exist suggest further study in access policy (why do some schools have a higher number of courses than their neighbors?), enrollment policy (what systems are in place to encourage enrollment?) and completion policy (why are there such large gaps in completion within and between schools?) Funding, too, is a potential area for future study; for example, how are resources for Advanced Placement divided within a school district? Another potential research direction would be considering the role of persistence in Latinx AP enrollment and completion. What factors contribute to persistence and completion of AP coursework for Latinx students? Finally, an area of much-needed research is investigating the AP gap for English learners.

Final Thoughts

We live in a rapidly shifting world, and it is our responsibility to ensure equity and access for all students to achieve their potential and have greater opportunities. While this study specifically addresses Latinx students, my hope is that this body of work

informs policy and equity practice for all students in the dream of ensuring a better future for all. Every child deserves an equal, equitable shot towards greater opportunity. In reality, despite the illusion of greater access (and equity) for Latinx students in AP, there are significant gaps in enrollment and completion, especially in regard to STEM coursework.

How can we achieve equity without equal access? First, access must exist. There must be a rich and diverse amount of course offerings and we must further the work of removing barriers to enrollment and create a stream-lined, equitable process. Second, schools should question their policies when disproportionate patterns emerge in enrollment. Finally, once our students are enrolled, we must provide resources, support and qualified teachers to ensure they take the test, pass the test, and ultimately receive the full promise of an AP program. It is unconscionable to dangle the promise of an opportunity and not provide the key to the door, the room to work in, or the space to succeed. While this may seem daunting and overwhelming, any parent or educator knows that placing a book in a child's hand is simply not enough. Multiple factors must converge to ensure a true, holistic education.

When significant portions of your student body are not participating or not succeeding in a program, this should give us pause and raise concerns. We should all be asking ourselves, *why?* This research attempts to hold up a mirror and answer the question, *what is happening?* I chose to answer this question quantitatively in order to provide objective evidence of disproportionality for Latinx students. It is my sincerest wish that educators, policy makers, administrators use this work to justify asking *why?* From there, we must then ask *what are we going to do about it?* and begin the work of

creating greater access and opportunity for our students. While this particular study is finished, the work itself is far from complete.

Bibliography

Ackert, E. (2018). Segregation paradox? School racial/ethnic and socioeconomic composition and racial/ethnic differences in engagement. *Social Science Research, 70*, 144-162

Adam, M. (2016). New SAT favorable to Latinos. *The Hispanic Outlook in Higher Education, 26*(11), 8-11.

Battle, J., & Browne, A. (2018). The Relative importance of parental configuration for Latinx students' educational attainment. *Hispanic Journal of Behavioral Sciences, 40*(3), 351-368.

Berends, M., & Penaloza, R. (2010). Increasing racial isolation and test score gaps in mathematics: A 30-Year Perspective. *Teachers College Record*, 112(4), 978-1007.

Bernal, D. D. (2002). Critical race theory, Latino critical theory, and critical raced -gendered epistemologies: Recognizing students of color as holders and creators of knowledge. *Qualitative Inquiry,* 8(1), 105-126.

Billingham, C. (2019). Within-District racial segregation and the elusiveness of White student return to urban public schools. *Urban Education, 54*(2), 151-181.

Bjorklund, P. (2019). "Whoa. You speak Mexican?": Latina/o high school students' sense of belonging in Advanced Placement and Honors classes. *Journal of Education for Students Placed at Risk (JESPAR), 24*(2), 109-131.

Bourdieu, P. (1986) The forms of capital. In J. Richardson (Ed.) Handbook of Theory and Research for the Sociology of Education (New York, Greenwood), 241-258.

Brown v. Board of Education, 347 U.S. 483 (1954).

Brunn-Bevel, R., Byrd, W., Seamster, L., & Henricks, K. (2015). The Foundation of racial disparities in the standardized testing era: The Impact of school segregation and the assault on public education in Virginia. *Humanity & Society, 39*(4), 419-448.

Burris, C., Wiley, E., Welner, K., & Murphy, J. (2008). Accountability, rigor, and detracking: achievement effects of embracing a challenging curriculum as a universal good for all students. *Teachers College Record* (Vol. 110).

Byun, S., Irvin, M. J., & Bell, B. A. (2015). Advanced math course taking: Effects on math achievement and college enrollment. Journal of Experimental Education, 83(4), 439-468. doi:http://dx.doi.org/10.1080/00220973.2014.919570

Cabrera, A. F., & La Nasa, S. M. (2001). On the path to college: Three critical tasks facing America's disadvantaged. *Research in Higher Education*, *42*(2), 119-149.

Cannon, M. (2011). View from the border: Removing barriers for urban gifted students. *Gifted Child Today*, 34(1), 26–30.

Card, D., & Giuliano, L. (2016). Can tracking raise the test scores of high-ability minority students? †. *American Economic Review, 106*(10), 2783-2816.

Carey, R., Yee, L., & Dematthews, D. (2018). Power, penalty, and critical praxis: Employing intersectionality in educator practices to achieve school equity. *The Educational Forum, 82*(1), 111-130.

Carnoy, M., & García, E. (2017). Five key trends in U.S. student performance: Progress by Blacks and Hispanics, the takeoff of Asians, the stall of non-English speakers, the persistence of socio-economic gaps, and the damaging effect of highly segregated schools. *Economic Policy Institute*. Retrieved from: http://proxy.library.vcu.edu/login?url=https://search.proquest.com/docview/2155991896?accountid=14780

Cha, S. (2015). Exploring disparities in taking high level math courses in public high schools. *Kedi Journal Of Educational Policy*, 12(1), 3-17.

Cisneros, J., Holloway-Libell, J., Gomez, L. M., Corley, K. M., & Powers, J. M. (2014). The Advanced Placement opportunity gap in Arizona: Access, participation, and success. *AASA Journal Of Scholarship And Practice*, 11(2), 20-33.

Civil Rights Data Collection (2020). Retrieved from: https://ocrdata.ed.gov/flex/Reports.aspx?type=school

Civil Rights Data Collection: Data Story (2019a). Retrieved from: https://www2.ed.gov/datastory/stem/algebra/index.html

Civil Rights Data Collection: Frequently Asked Questions (2019b). Retrieved from: https://www2.ed.gov/about/offices/list/ocr/frontpage/faq/crdc.html

Clotfelter, C. T., Ladd, H. F., Clifton, C. R., & Turaeva, M. (2020). School segregation at the classroom level in a southern new destination state. Working Paper No. 230-0220. *National Center for Analysis of Longitudinal Data in Education Research (CALDER)*.

College Board (2014). *The 10th annual Advanced Placement report to the nation.* Princeton, NJ.

College Board (2016). *Advanced Placement score distributions 1996-2016*. Princeton, NJ.

College Board (2019). AP at a Glance. Retrieved from http://www.collegeboard.org.

Conger, D. (2005). Within-School segregation in an urban school district. *Educational Evaluation and Policy Analysis*, 27(3), 225-244.

Crabtree, L., Richardson, S., & Lewis, C. (2019). The Gifted gap, STEM education, and economic immobility. *Journal of Advanced Academics, 30*(2), 203-231.

Curran, F. C., & Kellogg, A. T. (2016). Understanding science achievement gaps by race/ethnicity and gender in kindergarten and first grade. *Educational Researcher*, *45*(5), 273-282.

Dale, A., Wathan, J., & Higgins, V. (2008). Secondary analysis of quantitative data sources. *Social Research Methods*, 520-535.

Delgado, R., Stefancic, J., author, & Harris, Angela P., writer of foreword. (2017). Critical race theory : An introduction (Third ed., Critical America).

D'Errico, B., & Castruita, Rudy. (2018). *Examining Hispanic students' access to AP courses in high schools in Los Angeles County,* ProQuest Dissertations and Theses.

Dondero, M., & Muller, C. (2012). School Stratification in New and Established Latino Destinations. *Social Forces*, 91(2), 477–502. https://doi-org.proxy.library.vcu.edu/10.1093/sf/sos127

Duncheon, J., & Muñoz, J. (2019). Examining teacher perspectives on college readiness in an early college high school context. *American Journal of Education, 125*(3), 453-478.

Federal study documents increasing segregation in K-12 education. (2016). *Journal of Blacks in Higher Education (Online).* Retrieved from: https://www.jbhe.com/2016/05/federal-study-documents-increasing-segregation-in-k-12-education/

Finkelstein, N. D., & Fong, A. B. (2008). *Course-taking patterns and preparation for postsecondary education in California's public university systems among minority youth*. National Center for Educational Evaluation and Regional Assistance, Institute of Education Sciences, US Department of Education.

Finn, C. E., Jr., & Northern, A. M. (2018). Foreword. In C. B. Yaluma & A. Tyner (Eds.), Is there a gifted gap? Gifted education in high poverty schools (pp. 4-6). Retrieved from https://edexcellence.net/publications/is-there-a-gifted-gap

Flores, S., & Gomez, M. (2011). Strategies for Increasing Advanced Placement

Participation for Underrepresented Students: Barriers, Practices, and Positive Outcomes. *NASSP Bulletin, 95*(1), 65-79.

Ford, D. (2015). Multicultural issues: Recruiting and retaining Black and Hispanic students in gifted education: Equality versus equity schools. *Gifted Child Today, 38*(3), 187-191.

Fox, L. (2015). Seeing Potential: The Effects of student–teacher demographic congruence on teacher expectations and recommendations. *AERA Open, 2*(1), AERA Open, 22 December 2015, Vol.2(1).

Frankenberg, E. (2016). Segregation at an early age. *National Coalition on School Diversity*. Pennsylvania State University. Center for Education and Civil Rights. Retrieved from:https://cecr.ed.psu.edu/sites/default/files/Segregation_At_An_Early_Age_Frankenberg_2016.pdf

Fuller, B., Kim, Y., Galindo, C., Bathia, S., Bridges, M., Duncan, G., & García Valdivia, I. (2019). Worsening school segregation for Latino children? *Educational Researcher,* 48(7), 407-420.

Gagnon, Douglas J., & Mattingly, Marybeth J. (2018). Racial/Ethnic test score gaps and the urban continuum. *Journal of Research in Rural Education, 33*(2), 1-16.

Gándara, P. & Contreras, F. (2009). *The Latino education crisis: the consequences of failed social policies*. Cambridge: Harvard Press.

Gándara, P., & Mordechay, K. (2017, April). Demographic change and the new (and not so new) challenges for Latino education. In *The Educational Forum* (Vol. 81, No. 2, pp. 148-159). Routledge.

Garland, M., & Rapaport, A. (2018). Advanced course offerings and completion in science, technology, engineering, and math in Texas public high schools (REL 2018–276). Washington, DC: U.S. Department of Education, Institute of Education Sciences, National Center for Education Evaluation and Regional Assistance, Regional Educational Laboratory Southwest. Retrieved from http://ies.ed.gov/ncee/edlabs.

Garner, B. (2017). Teachers interpreting data for instructional decisions: Where does equity come in? *Journal of Educational Administration, 55*(4), 407-426.

Giersch, Jason, Bottia, Martha Cecilia, Mickelson, Roslyn Arlin, & Stearns, Elizabeth. (2016). Exposure to school and classroom racial segregation in Charlotte-Mecklenburg high schools and students' college achievement. *Education Policy Analysis Archives, 24*(32), 28.

Gilroy, M. (2015). College Board targets Latinos as part of "all in" AP campaign. *The Hispanic Outlook in Higher Education, 25*(19), 16-17,19

Government Accountability Office (GAO) (2016). Better use of information could help agencies identify disparities and address racial discrimination. Retrieved from: https://www.gao.gov/assets/680/676745.pdf

Government Accountability Office (GAO) (2018). Retrieved from: https://www.gao.gov/

Graefe, A., & Ritchotte, J. (2019). An exploration of factors that predict Advanced Placement exam success for gifted Hispanic students. *Journal of Advanced Academics,* 1932202X1985319.

Handwerk, P., Tognata, N., Coley, R. J., & Gitomer, D. H. (2008). Access to success: Patterns of Advanced Placement. Princeton, NJ: Educational Testing Service

Hanselman, P., & Fiel, J. (2017). School opportunity hoarding? Racial segregation and access to high growth schools. *Social Forces; a Scientific Medium of Social Study and Interpretation, 95*(3), 1077-1104.

Hardie, J., & Seltzer, J. (2016). Parent-Child relationships at the transition to adulthood: A comparison of Black, Hispanic, and White immigrant and native-born youth. *Social Forces, 95*(1), 321-353.

Heaton, J. (2003). Secondary data analysis. *The AZ of Social Research, Sage, London*, 285-288.

Ho & Cherng. (2018). How far can the apple fall? Differences in teacher perceptions of minority and immigrant parents and their impact on academic outcomes. *Social Science Research,74*, 132-145.

Horvat, E. M., Weininger, E. B., & Lareau, A. (2003). From social ties to social capital: Class differences in the relations between schools and parent networks. *American Educational Research Journal,* 40(2), 319–351

Hurt, J. (2018). "Why are the gifted classes so white?" Making space for gifted Latino students. *Journal of Cases in Educational Leadership, 21*(4), 112-130.

Irizarry, Y., & Cohen, E. (2019). Of promise and penalties: How student racial-cultural markers shape teacher perceptions. *Race and Social Problems, 11*(2), 93-111.

Jara, T. D. (2013). Hispanic student performance on advanced placement exams: A multiyear, national investigation. Available from ProQuest Dissertations & Theses Global: Social Sciences. (1431908497). Retrieved from http://proxy.library.vcu.edu/login?url=https://search-proquest-com.proxy.library.vcu.edu/docview/1431908497?accountid=14780

Judson, E., & Hobson, A. (2015). Growth and achievement trends of Advanced Placement (AP) exams in American high schools. *American Secondary Education,* 43(2), 59-77.

Kamimura-Jimenez, M., & Gonzalez, J. (2018). Understanding PhD Latinx career outcomes: A case study. *Journal of Hispanic Higher Education, 17*(2), 148-168.

Kanno, Y., & Kangas, S. (2014). "I'm not going to be, like, for the AP": English language learners' limited access to advanced college-preparatory courses in high school. *American Educational Research Journal, 51*(5), 848-878.

Keels, M., Durkee, M., & Hope, E. (2017). The psychological and academic costs of school-based racial and ethnic microaggressions. *American Educational Research Journal, 54*(6), 1316-1344.

Kettler, T., & Hurst, L. (2017). Advanced academic participation: A Longitudinal analysis of ethnicity gaps in suburban schools. *Journal for the Education of the Gifted, 40*(1), 3-19.

Klopfenstein, K. (2004). The Advanced Placement expansion of the 1990s: How did traditionally underserved students fare? *Education Policy Analysis Archives,* 12(68), 1–15. http://eric.ed.gov/?id=EJ853532

Koch, B., Slate, J., & Moore, G. (2016). Advanced Placement English exam scores: A Comparison of scores for Hispanic students From California, Texas, and Arizona. *Education and Urban Society, 48*(7), 685-716.

Kohli, R., Pizarro, M., & Nevárez, A. (2017). The "new racism" of K–12 schools: Centering critical research on racism. *Review of Research in Education, 41*(1), 182-202

Kolluri, S. (2018). Advanced Placement: The Dual challenge of equal access and effectiveness. *Review of Educational Research, 88*(5), 671-711.

Kotok, S. (2017). Unfulfilled Potential: High-Achieving Minority Students and the High School Achievement Gap in Math. *High School Journal,* 100(3), 183-202.

Kouyoumdjian, C., Guzmán, B., Garcia, N., & Talavera-Bustillos, V. (2017). A Community cultural wealth examination of sources of support and challenges among Latino first- and second-generation college students at a Hispanic serving institution. *Journal of Hispanic Higher Education, 16*(1), 61-76.

Kozlowski, K. (2015). Culture or teacher bias? Racial and ethnic variation in student–teacher effort assessment match/mismatch. *Race and Social Problems, 7*(1), 43-59.

Kucsera, John V., Siegel-Hawley, Genevieve, & Orfield, Gary. (2015). Are we segregated and satisfied? segregation and inequality in Southern California schools. *Urban Education, 50*(5), 535-571.

Ladson-Billings, G. (2000). Racialized discourses and ethnic epistemologies. *Handbook of Qualitative Research*, 2, 257-277.

Ladson-Billings, G., & Tate, W. F. (2006). Toward a critical race theory of education. *Critical* r*ace theory in education*: All God's children got a song, 11, 30.

Ladson-Billings, G. (2013). Lack of achievement or loss of opportunity? In Carter, P. & Welner, K. (Ed.), *Closing the opportunity gap : What America must do to give every child an even chance*. New York: Oxford Press: pp. 11-22.

Lew, S., & Harklau, L. (2018). Too much of a good thing? Self-Esteem and Latinx immigrant youth academic achievement. *Journal of Advanced Academics, 29*(3), 171-194.

Lewis, A., & Diamond, John B. (2015). *Despite the best intentions: How racial inequality thrives in good schools* (Transgressing boundaries).

Liebowitz, D. (2018). Ending to what end? The Impact of the termination of court-desegregation orders on residential segregation and school dropout rates. *Educational Evaluation and Policy Analysis, 40*(1), 103-128.

Liou, D., Marsh, T., & Antrop-González, R. (2017). Urban sanctuary schools for diverse populations: Examining curricular expectations and school effectiveness for student learning. *Equity & Excellence in Education, 50*(1), 68-83.

Liu, Z., White, M., Jackson, M., & Moffitt, S. (2017). Education outcomes of immigrant youth: the role of parental engagement. *The ANNALS of the American Academy of Political and Social Science, 674*(1), 27-58.

Logan, J., Burdick-Will, J., Jackson, M., & Moffitt, S. (2017). School segregation and disparities in urban, suburban, and rural areas. *The ANNALS of the American Academy of Political and Social Science, 674*(1), 199-216.

Long, M. C., Conger, D., & Iatarola, P. (2012). Effects of high school course-taking on secondary and postsecondary success. American Educational Research Journal, 49(2), 285-322.

Marrun, N. (2018). The power of ethnic studies: Portraits of first-generation Latina/o students carving out un sitio and claiming una lengua. *International Journal of Qualitative Studies in Education, 31*(4), 272-292.

Means, B., Wang, H., Wei, X., Lynch, S., Peters, V., Young, V., & Allen, C. (2017).

Expanding STEM opportunities through inclusive STEM-focused high schools. *Science Education*, 101(5), 681.

Mickelson, R. A. (2002). The Academic consequences of desegregation and segregation: evidence from the Charlotte-Mecklenburg schools. *NCL Rev.*, *81*, 1513.

Mickelson, R. (2015). The Cumulative disadvantages of first- and second-generation segregation for middle school achievement. *American Educational Research Journal, 52*(4), 657-692.

Milner, H. (2012). Beyond a test score: Explaining opportunity gaps in educational practice. *Journal of Black Studies, 43*(6), 693-718.

Moller, S., & Stearns, E. (2012). Tracking success: high school curricula and labor market outcomes by race and gender. *Urban Education,* 47(6), 1025-1054.

Morgan, P. L., Farkas, G., Hillemeier, M. M., & Maczuga, S. (2016). Science achievement gaps begin very early, persist, and are largely explained by modifiable factors. *Educational Researcher*, *45*(1), 18-35.

Musto, M. (2019). Brilliant or bad: The gendered social construction of exceptionalism in early adolescence. *American Sociological Review, 84*(3), 369-393.

National Center for Educational Statistics (NCES) (2017). Status and Trends in the Education of Racial and Ethnic Groups 2017. Retrieved from: https://nces.ed.gov/pubs2017/2017051.pdf

National Center for Education Statistics (NCES) (2019). The Condition of Education. Retrieved from: https://nces.ed.gov/pubs2019/2019144.pdf

National Education Policy Center (2013). Moving Beyond Tracking. Retrieved from: https://nepc.colorado.edu/sites/default/files/pb-options-10-tracking.pdf

New York Equity Coalition. (May, 2018). *Within Our Reach: An agenda for ensuring all New York students are prepared for college, careers, and active citizenship.* Retrieved from: https://equityinedny.edtrust.org/wp-content/uploads/sites/14/2018/05/Within-Our-Reach.pdf

Núñez, A. (2014). Employing multilevel intersectionality in educational research: Latino identities, contexts, and college access. *Educational Researcher*, 43(2), 85-92.

Oakes, J. (2005). *Keeping track: How schools structure inequality* (2nd ed.). New Haven, CT: Yale University Press.

Oluwole, J., & Green III, P. (2020). Riding the Plessy train: tracking in the lower courts. *Chicano-Latino Law Review,* 37(1), Chicano-Latino Law Review, 2020, Vol.37(1).

Orfield, G., & Lee, C. (2005). Why segregation matters: poverty and educational inequality.

Orfield, G., Kucsera, J., & Siegel-Hawley, G. (2012). E Pluribus...separation: deepening double segregation for more students. *The Civil Rights Project.* Retrieved from: https://escholarship.org/uc/item/8g58m2v9

Orfield, G., & Yun, J. (1999). Resegregation in American schools. *The Civil Rights Project*. Harvard University. Retrieved from: https://escholarship.org/uc/item/6d01084d

Palardy, Gregory J., Rumberger, Russell W., & Butler, Truman. (2015). The Effect of high school socioeconomic, racial, and linguistic segregation on academic performance and school behaviors. *Teachers College Record, 117*(12), *Teachers College Record,* 2015, Vol.117(12).

Paredes Scribner, S., Fernández, E., Quinn, R., Hopkins, M., & García Bedolla, L. (2017). Organizational politics of parental engagement: The Intersections of school reform, anti-immigration policies, and Latinx parent organizing. *Educational Policy, 31*(6), 895-920.

Perreira, K., Fuligni, A., & Potochnick, S. (2010). Fitting In: The Roles of Social Acceptance and Discrimination in Shaping the Academic Motivations of Latino Youth in the U.S. Southeast. *Journal of Social Issues,* 66(1), 131-153.

Pew Research Center: Hispanic Trends (2013). Among recent high school grads, Hispanic college enrollment rate surpasses that of whites. Retrieved from:https://www.pewresearch.org/fact-tank/2013/09/04/hispanic-college-enrollment-rate-surpasses-whites-for-the-first-time/

Pew Research Center: Hispanic trends (2014). Demographic profile of Hispanics in Virginia, 2014. Retrieved from: https://www.pewhispanic.org/states/state/va/

Pew Research Center: Hispanic trends (2017). Facts on U.S. Latinos, 2015. Retrieved from: https://www.pewhispanic.org/2017/09/18/facts-on-u-s-latinos/

The Racial Gap in Access to Advanced Courses in High Schools. (2018, May 21). *Journal of Blacks in Higher Education (Online)*. May 2018. Retrieved from: https://www.jbhe.com/2018/05/the-racial-gap-in-access-to-advanced-courses-in-high-schools/

Raudenbush, S., Rowan, B., & Cheong, Y. (1993). Higher order instructional goals in

secondary schools: Class, teacher, and school influences. *American Educational Research Journal*, 30(3), 523-553.

Reardon, S. (2016). School segregation and racial academic achievement gaps. *RSF: The Russell Sage Foundation Journal of the Social Sciences, 2*(5), 34-57.

Reardon, S., & Galindo, C. (2009). The Hispanic-White achievement gap in math and reading in the elementary grades. *American Educational Research Journal,* 46(3), 853-891.

Reardon, S., Kalogrides, D., & Shores, K. (2019). The Geography of racial/ethnic test score gaps. *American Journal of Sociology, 124*(4), 1164-1221.

Riegle-Crumb, C., & Grodsky, E. (2010). Racial-Ethnic differences at the intersection of math course-taking and achievement. *Sociology of Education*, 83(3), 248-270.

Rowland, M., & Shircliffe, B. (2016). Confronting the "acid test": Educators' perspectives on expanding access to advanced placement at a diverse Florida high school. *Peabody Journal of Education, 91*(3), 404-420.

Ryan, S. (2017). The role of parent social capital and college-aligned actions in explaining differences in intergenerational resource transfer among Hispanic and White youth on the path to college. *Teachers College Record, 119*(10), Teachers College Record, 2017, Vol.119(10).

Salinas, C. and Lozano, A. (2017). "Mapping and recontextualizing the evolution of the term Latinx: An environmental scanning in higher education*." Journal of Latinos and Education: 1.* doi*:*10.1080/15348431.2017.1390464.

Scafidi, B., Clark, C., & Swinton, J. (2015). Who takes advanced placement (AP)? *Eastern Economic Journal, 41*(3), 346-369.

Schneider, J. (2009). Privilege, equity, and the Advanced Placement program: Tug of war. *Journal of Curriculum Studies*, *41*(6), 813-831.

Siegel-Hawley, G., Ayscue, J., Kuscera, J. & Orfield, Gary. (2013). Miles to Go: A report on school segregation in Virginia, 1989-2010.

Siegle, D., Gubbins, E., O'rourke, P., Langley, S., Mun, R., Luria, S.R. ; Little, C.; Mccoach, B.D. ; Knupp, T. ; Callahan, C.M. ; Plucker, J. (2016). Barriers to underserved students' participation in gifted programs and possible solutions. *Journal for the Education of the Gifted, 39*(2), 103-131

Smith, K., & Camarena, N. (2018). Analyzing students' plans to enroll in Advanced

Placement (AP) Chemistry and Chemistry at the university level in a predominantly Hispanic region. *Journal of Women and Minorities in Science and Engineering, 24*(1), 81-93.

Solorzano, D., & Ornelas, A. (2004). A Critical Race Analysis of Latina/o and African American Advanced Placement Enrollment in Public High Schools. *High School Journal, 87*(3),15-26.

Stiff, L. V., & Harvey, W. B. (1988). On the education of black children in mathematics. *Journal of Black Studies*, *19*(2), 190-203.

Taggart, A. & Crisp, G. (2011). The Role of discriminatory experiences on Hispanic students' college choice decisions. *Hispanic Journal of Behavioral Sciences, 33*(1), 22-38.

Taylor, J., Jain, D., D'amico, M., & Giani, M. (2017). The Multiple dimensions of transfer: Examining the transfer function in American higher education. *Community College Review, 45*(4), 273-293.

Tyson, K. (2013). Tracking segregation, and the opportunity gap: Closing the opportunity gap: What America must do to give every child an even chance, 169-180.

U.S. Census (2017). School Enrollment of the Hispanic Population: Two Decades of Growth. Retrieved from: https://www.census.gov/newsroom/blogs/random-samplings/2017/08/school_enrollmentof.html

U.S. Department of Education (2013). Resolution of South Orange-Maplewood, N.J. school district civil rights investigation. Office of Civil Rights. Retrieved from: https://www.ed.gov/news/press-releases/us-department-education-announces-resolution-south-orange-maplewood-nj-school-di

U.S. Department of Education (2015). Hispanics and STEM education. Retrieved from: https://www2.ed.gov/about/inits/list/hispanic-initiative/stem-factsheet.pdf

U.S. Department of Education, National Center for Education Statistics (NCES) (2018). *TheCondition of Education 2018* (2018-144), English Language Learners in Public Schools.

Valadez, J. (2002). The Influence of Social Capital on Mathematics Course Selection by Latino High School Students. Hispanic Journal of Behavioral Sciences., 24(3), 319.

Valencia, R. R. (Ed.). (2012). *The evolution of deficit thinking: Educational thought and practice*. Routledge.

Venzant Chambers, T., Locke, L., & Tagarao, A. (2015). "That fuego, that fire in their

stomach": Academically successful Latinas/os and racial opportunity cost. *International Journal of Qualitative Studies in Education, 28*(7), 800-818.

Vidal-Ortiz, S., & Martínez, J. (2018). Latinx thoughts: Latinidad with an X. *Latino Studies,16*(3), 384-395.

Virginia Department of Education (2020a). Advanced programs participation by school report. Retrieved from: http://www.doe.virginia.gov/statistics_reports/advanced/index.shtml

Virginia Department of Education (2020b). Enrollment and Demographics. Retrieved from: http://www.doe.virginia.gov/statistics_reports/enrollment/index.shtml

Virginia Department of Education (2020c). Virginia cohort reports. Retrieved from: http://www.doe.virginia.gov/statistics_reports/graduation_completion/cohort_reports/inde__x.shtml

Wax, A. (2017). Educating the disadvantaged-Two models. *Harvard Journal of Law and Public Policy, 40*(3), 687-728.

Welsh, R. (2018). Student mobility, segregation, and achievement gaps: evidence from Clark County, Nevada. *Urban Education, 53*(1), 55-85.

Yaluma & A. Tyner (Eds.) (2018), Is there a gifted gap? Gifted education in high poverty schools. Retrieved from https://fordhaminstitute.org/sites/default/files/publication/pdfs/0131-there-gifted-gap-gifted-education-high-poverty-schools.pdf

Yosso, T. J. (2005). Whose culture has capital? A critical race theory discussion of community cultural wealth. *Race Ethnicity and Education*, 8(1), 69-91.

Young, H. (2005). Secondary education systemic issues: Addressing possible contributors to a leak in the science education pipeline and potential solutions. *Journal of Science Education and Technology,* 14, 205–216.

Appendix A: Measuring Completion

Option 1: All types of AP available (n=218)

	Did Not Take the Exam		Did Not Pass the Exam	
Race/Ethnicity	*n*	%	*n*	%
Asian	1,125	7	2,019	13.5
Black	3,858	26.2	4,319	38.9
Latinx	**1636**	**15.7**	**2,349**	**26.7**
White	10,715	14.7	11,036	18.3

Option 2: All types of AP available and all races/ethnicities enrolled in schools (n=214)

	Did Not Take the Exam		Did Not Pass the Exam	
Race/Ethnicity	n	%	n	%
Asian	1,125	7.0	2,019	13.5
Black	3,837	26.5	4,190	39.5
Latinx	**1,634**	**15.6**	**2,342**	**26.6**
White	10,615	14.5	11,005	17.6

Option 3: All types of AP available and all races enrolled in AP (n=190)

	Did Not Take the Exam		Did Not Pass the Exam	
Race/Ethnicity	n	%	n	%
Asian	1,119	7.0	2,019	13.5
Black	3,780	26.5	4,130	39.5
Latinx	**1,619**	**15.6**	**2,342**	**26.7**
White	10,374	14.5	10763	17.5