Increasing Advanced Placement Passing Score Rates for Richmond Public High School Students

Applied Policy Project

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Table of Contents

Executive Summary

This document serves to inform the reader of the current Advanced Placement (AP) course trends specific to Richmond Public Schools (RPS), provide an overview of the AP program, and offer recommendations for potential interventions aimed at improving RPS' AP program. The current problem RPS faces within their high school population can best be described by the following problem statement:

Despite a steady increase in the number of students enrolling in AP courses at RPS, less than a quarter of those enrolled received a passing score (3 or higher) on an AP exam in the 2019-2020 school year (SY). Further, of the 994 students who enrolled in an AP exam in 2020: 16.6% scored a three, 5.1% scored a four, and 1.3% scored a five (Grove, 2020).

For context on the AP program, courses originated in the 1950s in response to U.S. government officials desiring to use the American education system as a means of further combating Soviet ideological hegemony. AP courses introduce high school students to college-level material, and grant the opportunity to earn college credit per course prior to matriculation if students receive a passing score on the associated AP exam hosted annually in May. The College Board assumed control of the program after its first year of implementation, and has since evolved the program into a nationally recognized brand (Rothschild, 1999). The program's success now renders it a district requirement in eight states and the District of Columbia, and influenced fourteen states to require some form of advanced coursework in high schools (which may include AP) (Advanced Placement Policies) .

In the last two decades, the College Board has attempted to adapt the program to grant socioeconomic and ethnic minority students a more equitable high school and college experience. The success of RPS' AP program coincides with the College Board's goal as they serve a majority low-income, Black student population. Offering this demographic of students the opportunity to earn college credit early or else demonstrate academic initiative and achievement to potential employers is a key means of decreasing the opportunity gap they will otherwise face in myriad aspects of their lives. By investing in AP, RPS demonstrates commitment to their stated goal of preparing students to "become successful, contributing members of society" (About RPS).

A 2020 RPS report provides information on their current AP trends. The main takeaway from this report demonstrate that a key area of improvement lies in increasing the proportion of passing AP exam scores for students enrolled in AP courses. Their AP program has seen inconsistent growth over the last four years, averaging to about 72 additional students enrolling in AP courses per year (during years that experienced growth). However, this number represents less than 1% of the total

enrolled AP students in 2020, demonstrating that there is a need for increased student participation in order to reach higher passing exam rates. Additionally the average passing exam rate over the last four years is about 154 exams per year, representing approximately 20.7% of exam takers. RPS hopes to increase this rate over the course of the next decade.

Three alternatives are presented for the purpose of addressing RPS' goal of achieving higher passing exam score rates, and will be evaluated against a set of criteria. The four main criteria used for assessment in this project are: Cost, Effectiveness, Student Participation, and Long-Term Sustainability. Cost includes calculating the estimated total cost of the alternative's implementation, which will subsequently be reported in U.S. dollars. Effectiveness refers to the perceived ability of the intervention to meet RPS' goals, based on evidence of the intervention's use in similar or directly applicable experiments. Student participation evaluates the alternative's likelihood of motivating student involvement in both the alternative itself as well as the AP program at large. Finally, long-term sustainability determines an alternative's ability to remain in place for longer than five years after implementation. With the exception of cost, all other criteria will use a scoring system on the range of Low to High to then compare alternatives against one another in the final outcomes matrix.

The first alternative intending to increase passing score rates involves maintaining the status quo of working with the National Math and Science Initiative (NMSI) to train RPS AP teachers. The second alternative involves implementing a Pay-for-Pass incentive program wherein both AP students and their teachers receive a cash prize for each passing score received on an AP exam. The final alternative is to create a peer tutoring program in which students who previously received an "A-" or higher for an AP course grade are eligible to tutor students the following year in the same course passed.

Based on criteria evaluation, this report recommends RPS implement the third alternative--construction of a peer tutoring program. Implementation will involve both district and school level stakeholders, and likely require the entire 2021 summer period to construct prior to establishment during the start of the school year in September. The main challenges associated with implementation revolve around finding tutors, creating an accountability system for tutors, AP teachers and tutees, and ensuring that implementation does not drastically increase AP teacher hours or stress.

Should RPS implement a peer tutoring program, it is likely they will succeed in reaching their AP goals by affording students the opportunity to learn from each other and offer reciprocal emotional support. AP courses are intended to challenge students, thus installing a learning support system for students will benefit their communication and time management skills specifically as well as their AP experience in general.

Mandatory Disclaimer

The author conducted this study as part of the program of professional education at the Frank Batten School of Leadership and Public Policy, University of Virginia. This paper is submitted in partial fulfillment of the course requirements for the Master of Public Policy degree. The judgements and conclusions are solely those of the author, and are not necessarily endorsed by the Batten School, by the University of Virginia, or by any other agency.

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Finally, I would like to thank my parents. To my dad, Josh Mahon, your work ethic and humility inspire me everyday; both are the reason that I refuse to quit in the face of any obstacle. I hold your constant support with the upmost gratitude and respect. To my mom, Terri Mahon, your selfless and persistent devotion to your work as a public school teacher encouraged my decision to work with RPS on this project, and I attempt to emulate your grace each day.

Honor Statement: On my honor as a UVA student, I have neither given nor received unauthorized aid on this assignment.

- Erin Marie Mahon

Introduction

This document intends to explain the history of the College Board's Advanced Placement (AP) program as well as its evolution, benefits, and applicability to Richmond Public Schools' (RPS) mission of ensuring their educational services provide opportunity for *all* students regardless of background. Additionally, this document addresses RPS' AP goal-- increasing the number of passing exam scores, assesses potential interventions to reach this goal against four main criteria, and ultimately recommends one intervention that is best estimated to meet RPS' needs. Specifically, RPS hopes to expand the AP program in all five of their high schools, increasing not only the number of students enrolled in these courses but also improving student exam performance as well.

In the last decade, RPS began applying supplemental AP interventions for students in the hopes of using the program as a means of closing the opportunity gap for minority and low-income high school students. RPS offers an opportunity to examine the benefits of strategic alternatives aimed at increasing the number of passing scores students receive on the end-of-year AP exam. The school district serves both a majority low-income and majority Black demographic of students, which comprises a community that remains at a disadvantage regarding high school and college graduation rates, college acceptance rates, and eventual income levels (compared to their white and middle-upper income peers). Focusing greater time and resources towards RPS' AP Program is thus an instrumental means of enacting opportunities that will benefit their specific demographic of students. RPS hopes to prepare students for a range of post-graduate outcomes-- military entrance, workforce entrance, and college matriculation. Resultantly, they view the success of their AP program as a means of facilitating leadership and time management skills, which will prove useful within any one of these paths.

The following sections serve to explain the origin and evolution of the AP program in the background section, offer a brief overview of the national AP opportunity gap, and discuss the applicability of this problem to RPS. Finally, proposed alternatives and their evaluation against relevant criteria lead into the final recommendation and implementation steps requisite to addressing RPS's AP goals.

Problem Statement

Despite a steady increase in the number of students enrolling in AP courses at RPS, less than a quarter of those enrolled received a passing score (3 or higher) on an AP exam in the 2019-2020 school year (SY). Further, of the 994 students who enrolled in an AP exam in 2020: 16.6% scored a three, 5.1% scored a four, and 1.3% scored a five (Grove, 2020).

Literature concerning the benefits of AP courses on projected student academic and professional outcomes consistently reference passing AP exam scores as a key indicator of future success. Mere enrollment in AP courses offers benefits as well, but the majority of evidence focuses specifically on students who passed the exam. This body of evidence demonstrates that AP courses mitigate growing socioeconomic inequities in America by: introducing ethnic and income minority students to college-level material and expectations, attract more qualified teachers to schools, reflect positively on student transcripts for college applications and resumes for job applications, and numerous others (Mattern, Marini & Shaw, 2013). A comprehensive discussion regarding AP benefits continues in the following section.

Background

Origin of the AP Program

Originally, the AP program existed as a study funded by the Ford Foundation's Fund for the Advancement of Education (FAE) in 1951. Researchers hoped to better understand the state of academics at "elite" American prep schools and universities. Concurrently, a parallel FAE project focused on developing introductory college-level courses for high school students across the nation. The impetus for both of these projects stems back to the fear mongering effects of the Cold War as U.S. government officials and legislators worried that inadequate high school curricula hindered the American "brand," especially when contrasted with the triumphs and failures of the Soviet Union. Part of proliferating the success of a democratic, capitalist state involved demonstrating a successful school system—at all levels of education (Rothschild, 1999).

The FAE's efforts culminated in 1954 with the first AP tests administered in 27 schools. Satisfied with the students' performance on these exams, the FAE subsequently granted program management to the College Board in 1955. In its first official year, the AP program offered ten AP exams nationally in: Math, Physics, Biology, Chemistry, English Composition, Literature, French, German, Spanish and Latin (Rothschild, 1999). In the last sixty-five years, the AP program has exponentially grown in both course offerings as well as school placement. As of 2018, 22,678 schools offered AP courses, with 2.8 million students taking at least one AP test (College Board, 2019a).The graphic below demonstrates the number of courses (and associated exams) now offered to high school students.

Current AP Exams Offered from the College Board

Discipline Area	AP Exams
Arts	Music Theory; Studio Art: 2-D Design, Studio Art: 3-D Design, Studio Art: Drawing
English	English Language and Composition, English Literature and Composition
Foreign Languages	French Language, French Literature, German Language, Latin Literature, Latin: Virgil, Spanish Language, Spanish Literature
Math	Calculus AB, Calculus BC, Statistics
Science/Computer Science	Biology, Chemistry, Computer Science A, Computer Science AB, Environmental Science, Physics B, Physics C – Electricity and Magnetism, Physics C – Mechanics
Social Sciences	Art History, European History, Government and Politics: Comparative, Government and Politics: United States, Human Geography, Macroeconomics, Microeconomics, Psychology, United States History, World History

Source: The College Board.

How the Program Works

The basic framework for the AP program involves the College Board's construction of a comprehensive, standard curriculum for each AP course, which they test student's mastery of via individual, cumulative exams hosted annually in May. Although AP teachers retain flexibility over course homework, testing schedules and questions, and even how much time they spend both in and out of the classroom preparing for the AP exam, they must adhere to the curriculum's outlined topics. Enrollment in AP courses does not always imply enrolling in the subsequent AP exam, but for students who elect to do so, the cost of AP exams starts at $95. For those who qualify, the College Board offers a reduced fee of $33 per exam.

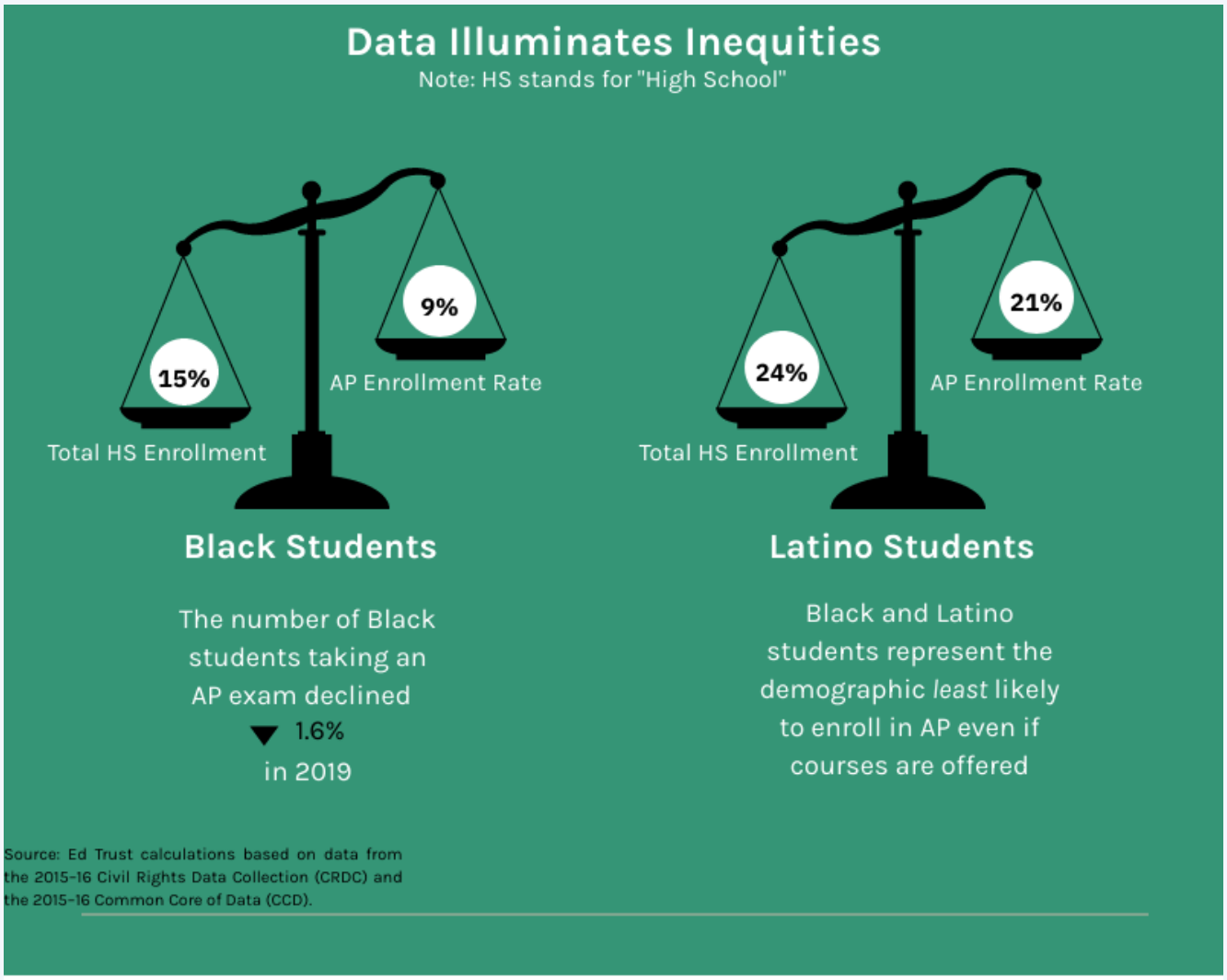
AP exams can last between two and three hours depending on the subject area, and consist of two main parts-- a multiple choice section and a written response portion; the amount of time allotted for each section also depends on the AP course subject. Students may take as many AP exams as they wish, though they must pay for each individual exam if it is not otherwise subsidized or reduced. Students are also allowed to take AP exams for courses they did not enroll in, however this is more a technicality than a practiced action as students would most often find this extremely challenging. Each high school coordinates the location of AP exams, either hosting them on campus or else outsourcing to a local facility. Finally, exams are scored on a scale of one through five, with multiple choice responses automatically graded by computers and the written responses graded by high school teachers and college professors at annual reading conferences hosted in June. Students typically receive AP exam grades the second week of July, and can then elect to keep their score and report to potential employers or colleges, or else retake the same exam the following year in May.

Program Evolution & Modern Inequities

Prior to the turn of the century, the program predominantly served wealthy, white students through the private school system across the nation. In response to this inequity, the College Board began prioritizing increased accessibility to AP courses for ethnic minority and low-income students. A direct statement from the College Board noted that "AP access for specific groups of underserved students continues to fall behind and, in some cases, has declined over the last year." There exists overwhelming literature affirming AP courses benefit students through the introduction of college-level material, increased college acceptance rates, and better grades during the first year of college (Gregory 2009). The value and necessity of a college degree continues to increase, with the Lumina Foundation projecting that 60% of all new jobs will require some form of postsecondary credit by 2025 (Kolluri 2018). The AP program thus provides an opportunity for minority and low-income students to gain better access to college and decrease the myriad societal gaps between minorities and their wealthy, white counterparts in America.

Despite the cited benefits of AP, minority students still struggle to gain access to AP courses. Additionally, even if minority students are aware of AP courses offered at their school, many cite feeling outside the bounds of what constitutes an "AP student," and are thus discouraged from pursuing these courses (Anderson, 2020). The College Board reports AP exam data each year, and offers reports specific to grade-level, ethnicity, and state information. The 2019 Virginia data illuminates the discrepancy between Black and white AP exam takers. For context, there were 159,084 AP exams administered to a total of 79,554 students, with a mean exam score (across all subjects) of 3.07 (College Board, 2019b). The mean exam score for Black students was 2.34, while the mean for white students was 3.13. Additionally, according to the Virginia Department of Education's 2019 data, Black high school students comprised 21.8% of all high schoolers and white students represented 47.6% ("Fall Membership Reports", 2019). Comparatively, among AP test takers the same year, Black students only represented 9.3%, while white students represented 55.2% (College Board, 2019b). There exists a clear gap between white and Black student access to and success on AP exams. Considering RPS represents a majority Black student demographic, focusing interventions on their high school AP programs is an important step towards creating a more equitable education experience for minority students in Virginia.

Minority student underrepresentation in AP courses and exams is not unique to Virginia alone, but also extends in high schools across the nation. Black and Latino students represent the groups least likely to enroll in AP courses even if they're offered (Anderson 2020). Factors responsible for this underrepresentation include: educator bias in the identification process for AP eligible students, a lack of diverse teachers, inequitable access to early childhood opportunities (e.g. gifted programs), and a lack of school communication with families about AP opportunities for their high school students. Black students constitute 15% of high schoolers nationwide, but represent only 9% of those enrolled in at least one AP course. Similarly, Latino students constitute nearly a quarter of all high schoolers (24%), but only 21% of AP enrolled students (Patrick et. al 2020). The infographic on the next page provides a visualization of these statistics:



In an attempt to increase the prevalence of minority students in AP courses, the College Board subsidized $159 million worth of AP exams last year (Anderson, 2020). This kind of reform demonstrates how the College Board's original goal of preparing high school students for collegiate academic rigor has now morphed into using AP as a means of mitigating the aforementioned societal gaps. Investing in high school students' AP experience thus remains in RPS' best interest regarding their goal of providing educational opportunities to low income and minority students. The following section expands on RPS' goals and current AP trends.

Client Overview

RPS Demographics & AP Structure

RPS comprises 25 elementary schools, seven middle schools, five high schools and three specialty schools. Their total enrollment during School Year (SY) 2020-21 exceeded 28,000 students, 90.7% of which identify as low income. Each high school varies in its specific demographics, but all high schools contain over 90% ethnic minority students. With the overwhelming majority of students identifying as low-income, RPS now subsidizes every AP exam for any student who elects to enroll in the course (Explore Richmond City Public Schools 2020).

The point of contact for this project is Autumn Nabors, the Director of Curriculum and Instruction. She provided access to a SY 2019-2020 AP report (Grove, 2020) that granted several key takeaways. Figure 1 defines one of these takeaways—despite increased AP enrollment numbers over the last four years (represented in blue above), passing, or "qualified," score rates (represented in green below) are not trending upwards with nearly the same speed or significance. Ensuring more students pass AP exams in RPS high schools represents an opportunity to meet their stated goal of preparing students "to become successful, contributing members of society" (About RPS).

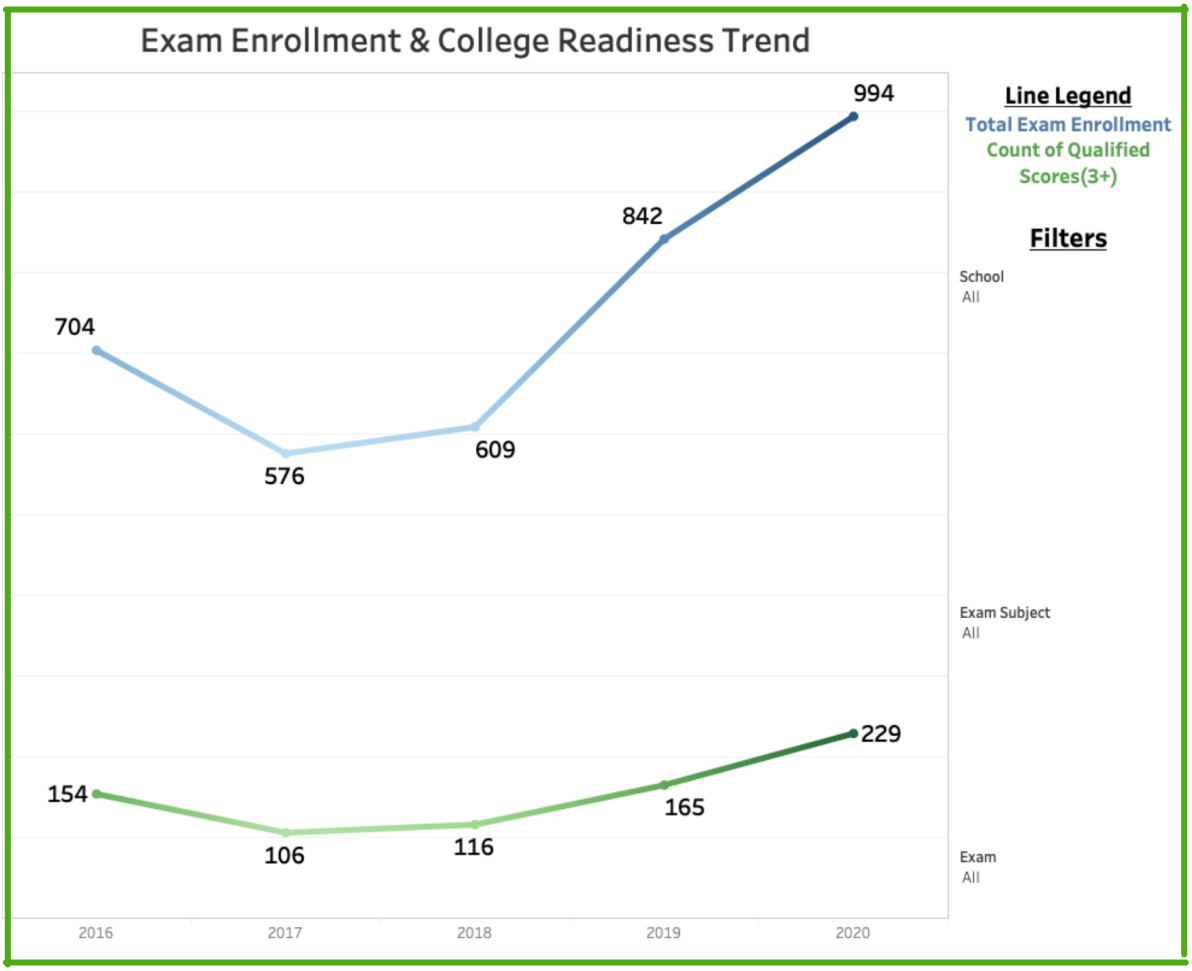


Figure 1

Criteria for Evaluating Potential Alternatives

In order to provide RPS with relevant and effective alternatives aimed at increasing the number of passing AP scores, there must first exist some form of comparative evaluation. This section describes the four criteria that proposed alternatives are weighed against in order to establish a clearer consensus on which alternatives are the best fit for RPS. A discussion on the general goals and values inherent to RPS's mission frames why specific criteria were chosen, and is then followed by each criterion's description.

One of the most important values RPS holds is ensuring they provide their students with an equitable and accessible education. Creating this experience requires constructing coursework that is relevant to the life choices students make after graduating; many enter the workforce or military right away, and thus need both technical and practical skills they can implement in their positions. Finally, though RPS affirms that both enrollment and exam passing rates increased in the last year, they desire that proposed alternatives will focus on minority student success as past improvements predominantly occurred in the subgroup of white students.

Criteria

Cost: Measured in monetary values, this criterion provides the estimated cost associated with each alternative. As a result of pandemic-related budget cuts, RPS seeks alternatives that are as inexpensive as possible. It remains important that if alternatives are expected to cost more than RPS can afford, there exist opportunities to draw on external funding opportunities. Some alternatives include an associated opportunity cost, referring to time and effort exerted during implementation.

Effectiveness: Perceived effectiveness demonstrates an alternative's propensity for increasing student passing score rates. Each alternative will include evidence of success in prior studies that published data on AP passing score rates before and after intervention implementation. Based on the literature, this report will then assign values of High, Medium, or Low to each alternative depending on its applicability and expected performance in addressing RPS' problem.

Student Participation: This criterion remains the most subjective, as it encompasses an educated inference regarding the level of student participation in the AP program for each alternative. Ideally, alternatives will incentivize students to participate in the AP program, and specifically, to study for and take AP exams at higher rates. Likelihood of student participation is based on the alternative's accessibility to students, which involves answering questions such as: (i) are students of all income levels able to participate in the intervention; (ii) does the alternative seem likely to fit within students' schedules; (iii) and finally, will the alternative appeal to students in general? Evaluation against this criterion will include an assigned value for each alternative of High, Medium, or Low.

Long-Term Sustainability: This final criterion addresses RPS' goal of ensuring that any intervention implemented will remain in place over a long period of time (i.e. longer than five years). Alternatives that are highly effective or inexpensive are of great value to RPS, but if they only provide a year or two of results before they grow ineffective then they are not necessarily worth the effort of implementation. RPS places great emphasis on finding sustainable alternatives in order to provide as many students who matriculate into RPS high schools with the opportunity of succeeding in AP courses. Evaluation against this criterion will involve reviewing literature on each alternative, and discerning the degree to which data supports the intervention's sustainability. As per the last two criteria, this criterion will also assign values of High, Medium, or Low to each alternative proposed.

Proposed Alternatives

This section intends to present the reader with three proposed alternatives aimed at increasing the proportion of RPS AP students who pass the end-of-year AP exam. The first alternative intending to increase passing score rates involves maintaining the status quo of working with the National Math and Science Initiative (NMSI) to train RPS AP teachers. The second alternative involves implementing a Pay-for-Pass incentive program wherein both AP students and their teachers receive a cash prize for each passing score received on an AP exam. The final alternative is to create a peer tutoring program in which students who previously received an "A-" or higher for an AP course grade are eligible to tutor students the following year in the same course passed. Alternatives will be evaluated against four main criteria: cost, effectiveness, student participation, and long-term sustainability. Cost will represent the total projected monetary cost of implementation, while effectiveness, student participation and sustainability will range from a scale of low to high likelihood for success.

Alternative 1: Maintain the Status Quo--NMSI Training

RPS partners with NMSI through the organization's College Readiness Program. Specifically, the program grants AP teachers curriculum pacing and content guidance that is tailored to the College Board's AP course and exam descriptions. Additionally, teachers receive year-round training, online resources, and access to a NMSI-run online community of AP teachers across America (Grove, 2020).

Regarding student-focused support, RPS funds every AP exam for students. Each AP exam costs $95, and considering that most students elect to enroll in more than one AP course to gain recognition on job and college applications, the total amount spent on AP exams easily accumulates to a relatively expensive endeavor. RPS serves a majority Black and low-income student population, thus it is an imperative intervention that RPS pay for every AP exam in order to create student access to both the exams and their potential benefits.

Maintaining the status quo is an appropriate alternative as it would encompass continued involvement in NMSI's College Readiness Program and AP exam fee subsidization. RPS' partnership with NMSI mainly serves to support AP teachers, but the larger, indirect effect ultimately helps students as they benefit from well-trained and engaging teachers. Subsidizing exam fees directly benefits students and ensures they retain access to AP exams. Both interventions demonstrate an effort to support students' AP experience in the hopes of enabling them to succeed in both the course and on the exam.

Evaluation Against Criteria

Cost ($)	Effectiveness	Student Participation	Long-Term Sustainability
~ 90,000	Low	Low	High

Cost: The cost of maintaining the status quo is valued at *Medium*, as RPS routinely allocates tens of thousands of dollars (depending on the year, upwards of $90,000) towards AP exam fee subsidization. RPS pays for each AP exam, thus mulitplying the cost of an exam-- $90, by the most recent count of exams-- 994 yields an estimate of the total cost of this intervention. However, in comparison to the rest of RPS' budget, and other academic improvement interventions, this cost is relatively lower.

Effectiveness: Over the last decade, RPS student involvement and success in AP courses and exams has increased. However, the proportional increase in student AP enrollment and passing scores is not substantive enough to constitute demonstrated efficacy of the status quo. Referring to figure 1, exam enrollment increases at an average rate of 72 students per year, representing a less than 1% increase proportional to the number of enrolled AP students in 2020. Additionally, since 2016 RPS has seen an average annual increase in passing score rates of about 18 students. RPS high schools serve around 2,000 juniors and seniors--the majority grades enrolling in AP courses-- thus enrollment and passing score rates represent a mere 3.6% and 0.9% increase respectively. Resulting from RPS' dissatisfaction with current trends, this alternative is rated *Low* for effectiveness as it is highly likely that these trends will persist in future years.

Student Participation: According to RPS data, 290 more students enrolled in AP courses from 2016 to 2017; by extension, passing score rates increased merely due to more students taking exams (Grove, 2020). However, this still constitutes a small proportion of students compared to the total population of high school students in the district. Despite marginal increases in enrollment and qualifying score rates, student participation remains low compared to the total population. Additionally, considering the low proportion of enrollment and qualifying score rates in the context of the interventions RPS has already implemented-- NMSI resources and exam fee subsidization-- this alternative receives a score of *Low* as it is unlikely that it will produce different results than those already seen.

Long-Term Sustainability: RPS is likely to continue working with NMSI as the organization has demonstrated significant positive influence on schools' ability to support students in their AP success. RPS is also highly likely to continue funding students' AP exam fees as this is instrumental means of maintaining access to AP courses for their majority low-income demographic. For these reasons, this alternative receives a score of *High* for long-term sustainability.

Alternative 2: Pay-for-Pass Cash Rewards

The idea for the "pay-for-pass" (a.k.a "cash incentive") program, as it applies to AP exams, sprang from the company Advanced Placement Strategies Inc. in the year 2000 (Advanced Placement Strategies Inc.). AP Strategies is a Dallas-based nonprofit that aimed, in cooperation with the College Board, to increase the presence of AP courses within underserved Texas school districts. The basic framework of the intervention involved rewarding both students and teachers for each individual AP exam scores of 3 or higher with cash prizes of $100-300. Teachers were also eligible for salary bonuses based on their proportion of students with passing exam scores. The program rapidly grew throughout school districts in Texas for over a decade before the company decided to expand their operations (Cavanagh, 2003).

In 2012, AP Strategies merged with the National Math and Science Initiative (NMSI) with the same goal of integrating AP courses into high schools, but with the ability to now reach districts across the country. NMSI is also a nonprofit organization, which launched in 2007 with the goal of "improving student achievement in math and science across the American public school system" (Advanced Placement Strategies Joins, 2012).

Applying to the pay-for-pass program begins with school districts contacting NMSI for placement on their company's listserv; the listserv alerts schools when grant money is available throughout the year. Richmond Public Schools (RPS) is already a NMSI partner, but they do not yet participate in the cash incentive aspect of the program. Contacting NMSI at the outset of grants and fundraising seasons is one way to generate money for students and teachers, however a second option lies in applying for funding via other grants.

Evaluation Against Criteria

Cost ($)	Effectiveness	Student Participation	Long-Term Sustainability
60,400-120,800	High	High	Medium/Low

Cost: Based on the RPS AP exam data from 2020, as well as the presence of AP teachers, the total cost of a cash incentive program would require raising between $60,400 and $120,800. This money would include paying students their passing rewards as well as the matched amount for teachers. The total varies within this range depending on the number of AP tests with a passing (or, "qualifying") score of 3 or higher. Total cost calculations assumed the intervention would double passing score rates in RPS, based on the applicability and evidence from similar studies. RPS 2020 AP exam data was used for baseline passing score count by score (i.e. score of 3, 4, or 5), doubled to account for the intervention, and multiplied by the associated cash reward. Students who scored a 3 would receive $100, a 4 would receive $200, and a 5 would receive $300. Total rewards for students were then totaled and doubled, to account for the matched teacher amount. A comprehensive description of how this range was found is located in Appendix 1.

Effectiveness: The first cohort of schools AP Strategies Inc. targeted in Texas demonstrated significant increases in the amount of passing AP scores after implementing the cash incentive program. From 1996 to 2002, the program nearly tripled the number of passing scores for junior and senior AP test takers (Cavanagh, 2003). In 2011, a similar cash incentive program run by the Colorado Education Initiative (CEI) resulted in increased numbers of minority students participating and succeeding in the AP program (Schimel and Todd, 2016). The first year after implementation witnessed 70% higher enrollment rates and subsequently a 65% increase in the proportion of passing scores. Finally, a 2015 report analyzed the causal effect of the NMSI College Readiness Program on 287 schools across the country (compared with 10,097 non-treated schools). The findings of this report demonstrated statistically significant increases in the number of AP test takers and qualifying scores over a three-year period in treated schools, and both substantive and statistically significant effects for specific groups such as female and minority students (Brown and Choi, 2015). Specifically, the study found that school participation in the College Readiness Program increased qualifying score numbers by a count of 27 for one cohort of sampled schools and a count of 32 for a second cohort. The study also confirmed that the program's effects were generalizable across STEM and English disciplines.

Compared with the results of RPS data-- average qualifying score increase of 18 exams per year, the 2015 report's annual qualifying score increases represent the desired outcome of supplemental AP interventions. Both the Texas and Colorado cases describe similar low-income, ethnic minority populations to those found in RPS, granting greater applicability of results to the potential effects on RPS. Additionally, the 2015 report's sample size is arguably large enough to replicate the positive direction of effects if not the same magnitude in RPS (no detail was granted as to the demographics or size of schools). This alternative thus earns a score of *High* for the criterion effectiveness based on the evidence of similar strategies which demonstrate substantive, positive impacts on qualifying score rates after implementing a cash incentive program.

Student Participation: Student participation is expected to be high for this intervention based on the success and similarity of the Texas study. Over a four-year period, the number of passing scores for Black and Hispanic students increased from 79 in the baseline year to 417 by year four (Cavanagh, 2003). Students at RPS face myriad barriers to AP participation mainly due to their income level, similar to those in the 10 participating Texas schools at the time the study occurred. Income level barriers manifest frustrations for RPS AP teachers as limited opportunities for teacher-student interaction outside of class inhibit teachers from providing the desired amount of AP exam preparation. While teachers wanted to offer Saturday study sessions, they struggled to find windows of time that would accommodate more than one or two students. The pandemic has increased strain on students' schedules as teachers described many of them support or supplement their families' income with jobs. Earning cash for passing scores helps support students' academic careers by increasing their confidence and appealing to their financial needs. Cash rewards offer a tangible benefit to the many hours exerted studying for these difficult AP exams, as opposed to merely hoping to incur benefits beyond high school. Pay-for-pass earns a score of *High* for student participation.

Long-Term Sustainability: Arguably the most challenging aspect to implementing this intervention involves securing funding for the cash rewards. It remains extremely important to RPS to find alternatives that are both effective in increasing passing score rates and liable to remain in place over a long period of time. Short-term interventions are less appealing, as RPS hopes to use the AP program as a means of increasing access to and success in academic and professional opportunities after high school. If RPS secures funding via the NMSI College Readiness Program, then it is likely that the program will run as long as RPS partners with the non-profit. However if RPS receives funding elsewhere (e.g. Richmond non-profits, local businesses, etc.), then this will prove harder to sustain over a long period of time as it would likely require multiple partnerships. As a result of the uncertainty surrounding the origin of funding, this criterion rests at *Medium* to *Low*.

Alternative 3: Peer Tutoring Program

Establishing a peer tutoring program is the third and final alternative proposed. The basic framework involves asking students who received an "A-" or higher, or an AP exam score of 4 or higher, in a specific AP course to then tutor students the following year in that same course. Peer tutoring has proven beneficial to students since its formal research evidence beginning in the late 1960s. Its cited success results from affording students the opportunity for increased participation, immediate feedback, and emotional support-- i.e. peer solidarity enables learning by removing barriers to difficult course material such as isolation (Bowman & Perrott, 2013).

Creating the program and tailoring it to the needs and capabilities of RPS, requires help from AP teachers to meet with tutors at the beginning of the school year and communicate expectations of the position. AP teachers retain insight on which material tends to prove most confusing to students, as well as the ability to determine which students might need tutors throughout the school year. Additionally, school principals will likely need to coordinate with AP teachers and school counselors to construct an accountability mechanism wherein the school provides materials to tutors and teachers, and tutors may report back to administration if necessary (e.g. a tutor requesting a different tutee or vice versa).

In order to ensure that peer tutoring works with students' limited schedules at RPS high schools, meeting times would be at the discretion of tutors and tutees. Students could communicate which times work best with their schedules, but may include: mornings before school, lunch hours, after the school day and on weekends either in person or via zoom. Tutors would work one-on-one with a tutee to help with a specific homework assignment, studying strategies, and/or to review difficult course material. Additionally, if the tutor felt comfortable, she could work with multiple students whose confusion overlaps. Tutors would not be required to work with the same student the entire year, but would instead work according to the availability of their own schedule and with whomever needed help throughout the year.

Evaluation Against Criteria

Cost ($)	Effectiveness	Student Participation	Long-Term Sustainability
2,800	Medium	Medium	High

Cost: RPS views the possibility of hosting a peer tutoring program through two lenses-- (i) a biweekly library reservation on high school campuses; (ii) working with local businesses to reserve spaces (tables) for students after school. Hosting peer tutoring sessions on campus would encompass providing food to students, but no other costs associated seeing as both administrators and teachers are salaried employees and thus rotating one adult to supervisor each session would not incur further costs to RPS. Conversely, financing pizza for tutors and tutees is easily calculated based on the statistic that the median price of a large pizza in Virginia is $9.99 (rounded to $10 for clarity in calculations) (Forbes, 2017). Buying five large pizzas, twice a month, for the duration of seven months (September-April), across the four participating high schools, yields a total price of about $2,800 per academic year.

Regarding off-campus tutoring sessions at local businesses, costs are less intuitive but still plausible to calculate. In 2018, RPS partnered with the Greater Richmond Transit Company (GRTC) to create a bus pass program at no cost to students who received written permission from their parents to participate (Perrot, 2019). The program affords students unlimited rides on local bus routes for as long as they are enrolled students at an RPS high school. This implies that there is no additional transportation cost to RPS for this intervention as students already have the option to enroll in the bus program and transport themselves to a tutoring session. The other cost consideration for off-campus tutoring sessions rests in coordinating with local businesses. There is an argument RPS could potentially make when negotiating with businesses wherein the business receives free advertising and increased purchases as students will likely buy themselves snacks or drinks while studying. This might incentivize businesses to then partner with RPS and reserve two-three tables for incoming students during specific time slots in the late afternoon. If RPS succeeds in finding open-minded and willing businesses, then there is no cost associated with off-campus tutoring sessions. The cost for peer tutoring, encompassing both on-campus and off-campus sessions remains at $2,800.

Effectiveness: There exists significant evidence for the effectiveness of peer tutoring. A general consensus on peer tutoring, cited by Evidence for Learning, asserts that the approach yields a positive impact on student learning. According to the organization, the average effect of peer tutoring is equivalent to about five months worth of additional learning (Peer Tutoring). A 2013 study reviewed 26 single-case studies analyzing the effects of peer tutoring on over 900 students. This review found that peer tutoring proved more effective for secondary education (high school) than either middle or elementary school age children (Bowmann Perrott, 2013). The same study reported increased tutee confidence with course material and academics in general, improved cooperative learning strategies and academic performance, mainly obtained through qualitative research techniques.

Another report noted that one of the reasons minority students struggle in AP courses was due to an inability to identify with other students in their class, leading to a lost sense of class community (Ketelsen, 2017). Peer tutoring helps mitigate this by providing a space for social bonding as well as offering an opportunity for tutees to see students of similar backgrounds who succeeded in the course. Ultimately, this grants a greater chance of student empowerment for both tutors and tutees as they tackle difficult course material together. The score for effectiveness is Medium as it depends on the amount of time tutors devote to the position and how well they are trained.

Student Participation: Student participation for this intervention focuses on the likelihood of tutee involvement-- the degree to which students will seek tutors and utilize them as a resource. RPS believes that this program would prove useful to students, but likely need a large campaign to encourage student participation at the onset. Once established, they believe this program would incur greater student involvement as students begin to see results from the program. However, there still exists a concern regarding potential tutee absence, and therefore limited student ability to reap the benefits of the program if students are either not motivated or capable of attending tutoring sessions. For these reasons, student participation receives a score of Medium, for its cited pros and cons.

Long-Term Sustainability: The most difficult aspect of this alternative lies in its establishment. It would require time exerted on behalf of both administration and AP teachers to communicate expectations of the program, but once established this program is an easy alternative to maintain. The simple framework of eligible tutors aiding students in the same course they passed is an easy loop to follow, and one that does not require much management beyond monthly meetings between AP teachers and tutors. It is likely that this program would sustain itself over a long period of time, and thus is awarded a score of High for this criterion.

Outcomes Matrix

Direct Alternative Comparison

The following outcomes matrix provides a direct comparison of each alternatives' criteria scores. Based on the comparison, the highest rated alternative overall will lead into the subsequent section on which alternative is the proposed recommendation for RPS. Criteria are listed on the left and associated by row with the listed alternative. Scores are granted colors, ranging from lightest green as *Low* to dark green as *High*.

Criterion	Alternative		
	1: Status-Quo	2: Pay-for-Pass	3: Peer Tutoring
Cost	$90,000	$60,400-120,800	$2,800
Effectiveness	Low	High	Medium
Student Participation	Low	High	Medium
Long-Term Sustainability	High	Medium/Low	High

Recommendation

Alternative 3: Peer Tutoring Program

The matrix above demonstrates that alternatives one and two—Pay-for-Pass and Peer Tutoring respectively, are more competitive than maintaining the status quo. A comparison by criterion, beginning with Cost, shows that Pay-for-Pass is the more expensive option monetarily. Peer tutoring's associated cost somewhat depends on RPS' ability to negotiate partnerships with local businesses for tutoring spaces, but it remains likely that: (i) RPS could successfully do so; (ii) Pay-for-Pass would still prove more expensive. Pay-for-Pass scores higher for both Effectiveness and Student Participation, but lower for Long-Term Sustainability than Peer Tutoring. Peer tutoring does not score Low in any criterion category, and its score for Long-Term Sustainability is granted slightly more consideration as this criterion is especially important to RPS. The combination of a lower cost, scores of Medium or higher, and a High scoring for a particularly important criterion thus renders the second alternative—Peer Tutoring—the recommended intervention for RPS. The following section continues the discussion on this intervention and outlines the recommended implementation steps.

Implementation

Evidence for the effectiveness of peer tutoring, as well as the likelihood of the program's success at RPS high schools, previously provided the reasoning behind choosing this alternative as the proposed recommendation. However, prior to implementation it remains important to consider the cited and potential challenges of this alternative. Namely, communication issues, tutee commitment and attendance, time management, tutor ability to explain, tutor-tutee expectation differences and faculty opposition represent the most cited challenges.

Communication issues include difficulties on both sides of tutor-tutee dyads. In a 2019 peer tutoring report, one author noted that when tutees arrived to tutoring sessions unprepared, this forced tutors to provide questions and attempt to unearth where the tutee's confusion lied (Ling, 2019). Lack of tutee preparation could then imply that tutors are not addressing the direct needs of their tutees, and further that tutees are not reaping the full benefits of each session. Remedying this challenge requires teacher influence on both tutors and tutees, ensuring that both parties understand how to use each session to further advance a tutees academic success. Similarly, tutee attendance and commitment proved difficult depending on the student (Siew Ling, 2019). In order to gain access to tutoring sessions, tutees must maintain the AP courses' attendance requirements. If this initial objective is not met, then tutees must understand that tutoring sessions are not a substitute for attending class ("Peer Tutoring Policy"). Motivating tutees to attend sessions includes enforcing limited tutor access if tutees fail to show up to either the AP class or tutoring sessions.

Time management concerns mainly refer to inconsistent meeting schedules for tutors and tutees. Tutors will likely have busy schedules prior to incorporating tutoring sessions, thus it is important that the committee selected for implementation outline the expected frequency of tutoring sessions (e.g. 30 minutes per week, or every other week, etc.). The 2019 peer tutoring report also indicated that a tutor's ability to explain the material and answer tutee questions proved challenging at times (Siew Ling, 2019). This problem is easily remedied by increasing tutor confidence throughout the school year. Teachers should remind tutors that they will likely incur this problem eventually, and further that tutors retain the ability to note the question or confusing material that arose during a session and ask the teacher for clarity later. Once the tutor gains the ability to answer the tutee's question or concern, they should return to the next session or contact the tutee with the correct information.

Finally, expectation differences and faculty opposition represented the last of the main challenges cited. Some expectation differences are described above, such as tutees misunderstanding their use of tutoring sessions as substitutes for class instead of supplemental. Ensuring smooth implementation and operation of this alternative requires that teachers communicate with both tutors and tutees the expected treatment of tutoring sessions (Mynard and Almarzouqi, 2006). Faculty opposition arose in a 2006 peer tutoring report, as teachers feared tutors granting incorrect information and overall affecting the linear transition of course material from teacher to student (Mynard and Almarzouqi, 2006). Informing teachers of the myriad benefits peer tutoring affords students is one way to mitigate this challenge. Further, enabling teachers to facilitate proper tutoring sessions includes providing them with an initial framework for assessing tutor success.

Stakeholders

The relevant stakeholders for implementing this alternative work at both the district and school level. Specifically, the Curriculum and Instruction (C&I) Department for RPS is responsible for forming a committee early this summer to outline the expectations of teachers, tutors and tutees regarding the tutoring program. Additionally, at each high school principals will need to appoint faculty to another implementation committee which may consist of AP teachers, counselors and/or academic deans. Faculty committee members are then tasked with constructing tutor-tutee communication networks, tutor accessibility to relevant course materials (e.g. exam study sheets, course syllabi, etc.), and tutor selection.

It is highly likely that members of the C&I Department will involve themselves in committee positions as they harbor concerns towards facilitating student success on AP exams. Additionally, principals likely share the same goal and will see the tutoring program as an essential step towards achieving it. However, both principals and C&I committee members may face opposition due to potential AP teacher frustrations regarding increased time devoted to a new project. The peer tutoring program would lie outside of their previously designated responsibilities, thus relevant stakeholders should bear in mind that they will likely incur the onus of implementation in order to avoid further AP teacher stress and workloads.

Recommended Implementation Steps

May/June 2021: C&I forms peer tutoring planning committee and concurrently reports to high school principals

June/July 2021: Principals inform AP teachers of new peer tutoring program and recruits faculty members for implementation and accountability team

August 2021: Student tutor recruitment and training

September 2021-April 2022: Bimonthly tutoring sessions hosted at the discretion of RPS (on or off campus). AP teachers should meet with tutors once a month during this period, and ensure that tutors have all necessary resources as well as field any questions and/or concerns

Early May 2022: AP exams; student feedback obtained from tutors and tutees regarding program experience

Late May 2022: Once the AP exam period is over, AP teachers will collect feedback and send to C&I team for review

June-July 2022: C&I Team reflects on the program's first year and discerns where to apply changes

Conclusion

Potential Risks & Final Thoughts

Final risks that are not cited above but still relevant to implementation at RPS include lack of tutors and determining how to facilitate peer tutors for classes that predominantly serve seniors. Garnering interest in the peer tutoring program is a necessary means of avoiding a lack of tutors. It is important that AP teachers and the implementation team introduce potential tutors to the benefits of tutoring—demonstrated leadership skills to potential college admissions and employers, better academic performance as tutors learn through teaching and hone their time management skills, and the ability to help their peers succeed. Addressing classes that serve seniors, and thus will not have older students who previously passed the course eligible to tutor, will require working with RPS to formulate a concurrent peer tutoring program. This is not an additional program, but instead would involve AP teachers matching struggling students with students in the same class who are performing well. This would still allow tutors to benefit from the program, and arguably more so as they would learn the courses' material better and focus their extracurricular tutoring time on a class in which they are already enrolled.

RPS' cultural awareness has led them to their modern mission of providing an equitable educational experience to every student they serve. By focusing their efforts on supplementing high school students' AP work, they further work to act on their promise to students. The combined feasibility of implementing a peer tutoring program, with the many benefits of both peer tutoring *and* the AP program itself, will hopefully result in RPS' desired outcome and serve the students who elect to enroll in AP courses.

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Appendix 1

Total Cost Calculation for Alternative 2: Pay-for-Pass Cash Incentives

(1) Qualifying Scores (3 or higher) Breakdown (Grove, 2020):

Total no. of 3's.....	**164**	x	**$100**	=	**$16,400**
Total no. of 4's.....	**51**	x	**$200**	=	**$10,200**
Total no. of 5's.....	**12**	x	**$300**	=	**$3,600**

Sum Total Cash Prizes for Students: **$30,200**

- This calculation uses RPS AP 2020 exam scores as the baseline figures.

(2) Cash incentive program about doubled no. of qualifying scores:

Assumed Total no. of 3's.....	**328**	x	**$100**	=	**$32,800**
Assumed Total no. of 4's.....	**102**	x	**$200**	=	**$20,400**
Assumed Total no. of 5's.....	**24**	x	**$300**	=	**$7,200**

Assumed Sum Total Cash Prizes for Students: **$60,400**

- The intervention is assumed to double score rates based on the results and similarity of the original experiment, which included a demographic of students that were both low income and ethnic minorities.

(3) Each qualifying score is matched for teachers:

[1]**$30,200** x 2 = **$60,400**

[2]**$60,400** x 2 = **$120,800**

(4) The least amount of money needed to fund a cash incentive program is **$60,400** based on the exact number of qualifying scores in 2020. The estimated higher bound of **$120,800** includes the assumption that a cash incentive program will double the number of qualifying scores. It is therefore likely that the actual number of qualifying scores will fall within the ranges between (1) and (2) totals, thus the total cost represents a projected range dependent on student scores.

*N.B. This calculation does not include amounts granted in salary bonuses for teachers with the highest proportion of students who earned a qualifying score. RPS has not yet decided if salary bonuses would be included in the cash incentive program.