Improving Early Literacy Outcomes in Richmond Public Schools

Applied Policy Project

Prepared by Walter Herring for Richmond Public Schools

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Honor Statement

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

Disclaimers

This research was prepared using data provided under a contract with the Virginia Department of Education (VDOE). The content does not necessarily reflect the views or polices of the VDOE, the Board of Education, or the Commonwealth of Virginia. Consequently, the VDOE, the Virginia Board of Education, and the Commonwealth of Virginia are not responsible for the research brief's content or any loss suffered due to the use of such content. Moreover, the mention of any trade names, commercial products or organizations in this research brief is not an endorsement of any of these entities by the VDOE, the Virginia Board of Education, or the Commonwealth of Virginia.

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Richmond Public Schools logo on the cover of this report accessed at https://www.rvaschools.net/.

Key Abbreviations

EIRI – Early Intervention Reading Initiative. Established in 1997 by the Virginia General Assembly, EIRI provides state funding to each school division in Virginia based on the number of students that fall below a certain threshold on the PALS assessment in grades K through 3. The funding is based on a formula that accounts for 2 hours of literacy intervention each week. Divisions are required to match these funds based on their calculated ability to pay.

PALS – Phonological Awareness Literacy Screener. This is an assessment measuring students' basic literacy skills. All students are required to take the exam in the fall and spring of kindergarten as well as the spring of 1st grade. In Richmond Public Schools, all students take the exam from kindergarten through 3rd grade.

PD – Professional Development. Training for teachers or other school staff.

RPS – Richmond Public Schools

SD – Standard deviation. A statistical term that describes the "spread" of values for a given variable in a dataset. In this report, standard deviations are used to estimate the effects of different intervention options on students' scores on the PALS assessment.

SOL – Virginia Standards of Learning Assessment. This is Virginia's "high-stakes" standardized tests taken by students in grades 3 through 8.

VDOE – Virginia Department of Education. The state agency governing public education.

Key Terms

Below Benchmark – Usually in reference to the PALS exam. Students scoring very low on the PALS assessment are identified as "below benchmark", implying that they are in need of academic intervention in order to get back on track.

School Division – The local education agency operating local public schools in Virginia (commonly called "district" in other states).

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Executive Summary

Research has shown that students' early learning experiences are predictive of their future academic and career success (Chetty et al., 2011; Reynolds, Temple, Ou, Arteaga & White, 2011). In particular, evidence suggests that 3rd grade represents a critical moment in children's literacy development: students who are not reading at grade level by 3rd grade are less likely to graduate high school than their peers (Hernandez, 2011).

Given the importance of early literacy, it is concerning that nearly half of students in Richmond Public Schools (RPS) do not reach proficiency standards on Virginia's standardized reading assessment by the end of 3rd grade. Further, my data show that non-white and economically disadvantaged in the division are less likely to recover from early literacy struggles than their peers who enter kindergarten with comparable literacy skills.

In its latest strategic plan, RPS has ambitiously set out to ensure that all students in Richmond exit third grade reading at grade level. Based on a review of the relevant scholarly literature and consideration of the policy context in Richmond, I identify three alternative actions that the division might take in pursuit of this goal:

1. **Status Quo**: Allow present trends to continue and implement new approach to EIRI intervention.
2. **Summer Books Program**: Implement a program that would provide ten books to students identified as below benchmark on the kindergarten PALS assessment for three summers.
3. **Pilot Professional Development (PD) Program in Targeted Schools**: Offer PD focused on evidence-based instructional practices at three targeted schools in RPS.

In order to assess the relative merits of each of these alternative approaches to literacy in the division, I consider whether each option is (a) cost effective, (b) politically and logistically feasible, and (c) equitable. The analyses conducted in this report suggest that **offering a pilot professional development program at three targeted schools** represents the most promising option of those considered.

Importantly, the pilot professional development program would be implemented in conjunction with the "status quo" alternative. This approach ensures that while RPS works to further improve instructional practices within the division, those students who are struggling the most with regards to reading will continue to receive intensive intervention. The combination of evidence-based PD and academic intervention will serve to increase the share of students in RPS who successfully make the transition from "learning to read" to "reading to learn" by the end of 3rd grade.

Defining the Problem

Background: The Importance of Early Literacy

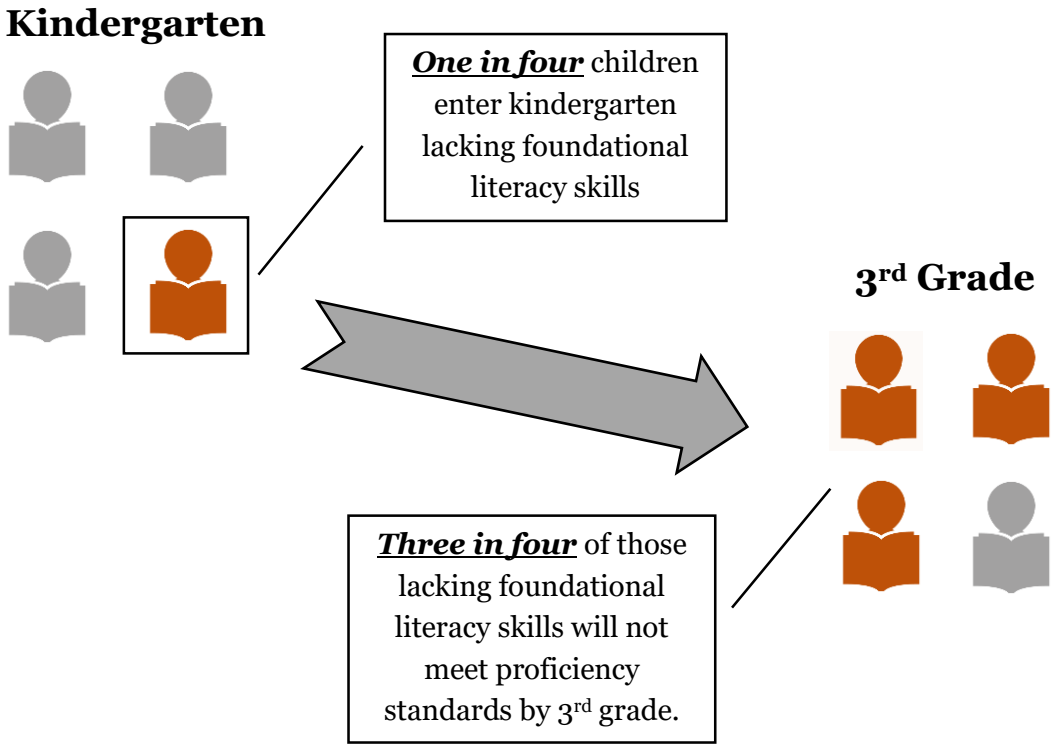
Scholars have long held that children's early learning environments are critically important in laying the foundation upon which future learning will build. Economists, for example, hold that interventions early in students' lives are more efficient in promoting their long-term success than academic investments later in their educational careers (see for example Cunha & Heckman, 2007). Contemporary work in education further suggests that students learn at the highest rate prior to 3rd grade (Cameron, Grimm, Steele, Castro-Schilo & Grissmer, 2014; Pianta et al., 2008) and that high-quality early learning environments are positively correlated with long-term outcomes like college matriculation and adult wages (Chetty et al., 2011; Reynolds, Temple, Ou, Arteaga & White, 2011). In considering students' literacy development, pundits often point to 3rd grade as a critical turning point at which students make the transition from "learning to read" to "reading to learn" (Annie E. Casey Foundation, 2010).

The well-documented importance of children's early learning has led policymakers to invest substantial resources into prekindergarten programs designed to ensure that all students enter kindergarten on equal academic footing. Over the last 15 years, enrollment and investment in public prekindergarten programs has tripled in Virginia (Barnett et al., 2003; Barnett et al., 2018). Research suggests that, at least on a national level, these investments in prekindergarten may be paying dividends. Bassok and Latham (2017), for example, use a large, nationally representative sample of two cohorts of kindergarten students to demonstrate that teachers in 2010 perceived their kindergarten students to be significantly better prepared than did teachers in 1998. Other authors have used the same data to show that gaps in reading and math performance at kindergarten entry between high- and low-income students have narrowed over the same time period (Reardon & Portilla, 2016).

In spite of these gains, however, strong experimental evidence suggests that the academic boost that children receive during preschool might "fade out" during the early elementary grades (Lipsey, Farran & Durkin, 2018; Puma et al., 2012). Further, though gaps in students' skills at school entry have narrowed at the national level, these gaps persist and may even expand during the early elementary grades (Claessens & Engel, 2013; Reardon & Portilla, 2016). A number of authors suggest that both the phenomenon of fade out and the persistence of achievement gaps in elementary school may simply result from the fact that non-white and disadvantaged students attend schools that are of lower quality than the schools that their white and wealthier counterparts attend (Ansari & Pianta, 2018; Fryer & Levitt, 2004; Hanushek & Rivkin, 2006). On aggregate, this evidence points to a critical role of the early elementary grades in ensuring that students possess the foundational skills necessary for future success.

Problem Statement

Leaders at Richmond Public Schools (RPS) are acutely aware of the importance of early literacy and the struggles that many of their students face in acquiring these critical skills during grades K through 2. The 26 elementary campuses in the RPS system serve a diverse and largely disadvantaged student population. City-wide, nearly 40% of children under 6 years old live in poverty, including more than half of Black children. More than one in four children enter kindergarten in RPS without foundational literacy skills, a figure that has grown in each of the past five years.[1] Given the importance of early skills in supporting students' future achievement, it is perhaps not surprising that 75% of these struggling students will not meet proficiency standards on the Virginia Standards of Learning (SOL) reading assessment at the end of 3rd grade.[2] *Put quite simply: too few students in Richmond enter third grade with the literacy skills necessary to make the transition from "learning to read" to "reading to learn" in 3rd grade.* As part of the school division's new strategic plan, RPS has ambitiously set out to ensure that all 3rd graders in the division are reading at grade level by 3rd grade (RPS, 2018). This report aims to identify and outline an approach RPS might take to work toward this goal.



[1] The figures for child poverty and literacy skills are provided through the Kids Count Data Center accessed at https://datacenter.kidscount.org/

[2] Based on data provided through a contract with the Virginia Department of Education. This data is described in greater detail later in this report.

Literature Review

Improving Early Literacy Outcomes: What Does the Research Say?

A growing body of work has sought to identify practices and programs that may bolster student learning and help narrow achievement gaps in the early elementary grades. Below I highlight four potential mechanisms by which schools might improve students' literacy skills between kindergarten and 3rd grade and outline the body of scholarship surrounding each strategy.

Recruiting Highly Effective Teachers

Among the school-based factors that might contribute to students' academic growth in the early grades, a large body of research suggests that teachers contribute most to student achievement (Chetty, Friedman & Rockoff, 2014; Kane & Staiger, 2008; Rivkin, Hanushek & Kain, 2005; Rockoff 2004). Though much of this work is based on analyses of student outcomes in grades 3 through 8, there is reason to believe that teachers may be even more influential in the early elementary grades relative to later grades. For example, elementary classrooms tend to be "self-contained", meaning that students spend the vast majority of their school day with one teacher. This would suggest that the benefits associated with being assigned a highly-effective teacher (and the penalties of being assigned a less-effective teacher) are more pronounced in the early elementary grades than in the middle grades in which teachers spend less time per day with their students (Phillips, 2010).

There are a number of ways that division leaders might be able to improve the effectiveness of teachers in elementary school. Perhaps most obviously, schools and school divisions can find means of ensuring that the strongest teachers are incentivized to teach in classrooms most in need of high-quality educators. There is some research that suggests that large financial incentives can encourage new teachers to accept jobs in low-performing schools (Steele, Murnane & Willett, 2010). Glazerman and colleagues (2013) also found that the Talent Transfer Initiative (TTI), a program that offered financial bonuses to effective teachers who opted to transfer to low-performing schools, incentivized some highly-effective educators to move to struggling campuses. Notably, the impact of TTI was strongest in the elementary grades. However, Steele et al. (2010) and Glazerman et al. (2013) evaluated programs that each offered an exceptionally large $20,000 bonus to participating teachers. It is less clear whether smaller financial bonuses are sufficient to entice teachers to move to lower-performing schools.

Strategic Staffing

School leaders might also increase the quality of teachers in the critical early elementary years through the use of strategic staffing decisions in their schools. There is a growing body of academic work that suggests that accountability pressures exerted by federal education legislation such as the Every Student Succeeds Act and its predecessor No Child Left Behind have led school leaders to move their most effective teachers out of the early elementary grades. For example, Grissom, Kalogrides and Loeb (2017) showed that teachers who were moved from a "high-stakes" classroom in grades 3 and 4 (i.e. classrooms that are subject to standardized tests) to a "low-stakes" classroom in grades K through 2 tended to be less effective than those who remained in tested classrooms. This suggests that elementary school leaders tend to move their less-effective teachers to

classrooms in grades K through 2. Given that research shows that building early skills makes students more likely to succeed in later grades (e.g. Claessens, Duncan & Engel, 2009), school leadership might be able to improve literacy outcomes in 3rd grade by strategically moving their most effective teachers into (not out of) these untested early elementary classrooms. It should be noted, though, that it is not guaranteed that the characteristics that make a teacher effective in the upper elementary grades will also make them effective in grades K through 2.

Instructional Strategies

For decades, literacy experts in the United States have debated what instructional strategies are most effective in teaching children to read. Colloquially, this debate is known as "the reading wars" and pits advocates of "whole language" instruction against pundits of phonics instruction (Strauss, 2018). Broadly speaking, the whole language approach to literacy development maintains that children's reading skills develop through discovery in a "literacy-rich" environment while phonics emphasizes direct instruction focused on the individual sounds (or phonemes) that words are composed of (Castles, Rastle & Nation, 2018).

In recent years, scholars have called for an end to the reading wars in hopes of reaching a more nuanced understanding of reading instruction (Castles, Rastle & Nation, 2018). Instead of debating the merits of whole language and phonics teaching techniques, these authors argue for an evidence-based approach to teaching children to read that is grounded in the science of language acquisition. Such effective literacy instruction likely involves elements of both phonics and whole language approaches. In perhaps the most comprehensive effort to date aimed at identifying such evidence-based instructional strategies in literacy, the National Center for Education Evaluation and Regional Assistance (NCEE, a center affiliated with the U.S. Department of Education) published a "practice guide" designed to provide educators working with students from kindergarten to 3rd grade with practical recommendations of literacy instructional approaches (Foorman et al., 2016). The NCEE report includes summaries of the research base supporting each recommended strategy in addition to sample instructional activities relating to each strategy.

While calling for the implementation of evidence-based instructional strategies in the classroom may seem self-evident, scholars suggest that teachers may not be exposed to these proven practices during their pre-service training (Castles, Rastle & Nation, 2018; Joshi et al., 2009). Given that many teachers are not introduced to the evidence based strategies like those outlined in the NCEE report, it stands to reason that improving teachers' instruction through professional development (PD) may yield positive results in the early elementary grades. However, a 2015 New Teacher Project report cautions that PD that meaningfully impacts teacher effectiveness is elusive and costly (The New Teacher Project, 2015).

Literacy Intervention

Lastly, stakeholders might turn to targeted academic interventions to bolster literacy attainment in the early elementary grades. Contemporary work suggests that such intervention can be effective in improving students' literacy skills. For example, a recent evaluation of the "Success for All" (SFA) school reform model showed that students in

participating schools tended to display higher basic literacy skills, on average, than students in control schools, although both treated and control students performed at the same levels on assessments of higher-order reading comprehension skills (Quint et al., 2014). Similarly, a rigorous four-year evaluation of the intensive Reading Recovery intervention and tutoring program found that participating students saw large gains in literacy relative to students who did not participate (Sirinides, Gray & May, 2018). Both studies highlighted above were based on strong empirical designs. It should be noted, however, that while both SFA and Reading Recovery convincingly improved students' reading performance, both models require substantial investment and buy-in from school sites or divisions that wish to implement them.

Less-intensive intervention models such as summer reading programs have also been shown to improve literacy skills among participants. Perhaps the strongest contemporary evidence of the efficacy of summer reading programs stems from a randomized control trial conducted by Allington et al. (2010) which meets rigorous evidence guidelines outlined by the Institute of Education Science's "What Works Clearinghouse". These authors randomly selected a group of students from high-poverty schools in Florida to receive twelve free books each summer between 1st and 4th grade. Importantly, children in the treatment group were allowed to self-select the books that they would receive, ensuring that the books would be on topics of interest to the child. The authors showed that, after three summers, students who had been selected to receive books scored higher on an assessment of literacy than their counterparts who had not received the books. Adding to this evidence, Kim and Quinn (2013) conducted a metaanalysis of 41 classroom- and home-based summer reading intervention programs targeted at elementary students and found that programs which employed research-based instructional practices had a positive impact on students' literacy skills. Importantly, the authors' analysis also revealed that low-income students benefitted more from participating in the intervention programs relative to their higher-income peers.

Takeaways: What Moves the Needle on Children's Early Literacy Skills

The literature reviewed here suggests two alternative means by which school and division leaders in RPS can raise the bar of early literacy in the division. First, RPS could look to teacher effectiveness to improve results for students in the early elementary grades. This might be accomplished by offering financial incentives to effective teachers, strategically placing the most effective teachers in the early grades, or improving instructional practices through PD.

Alternatively, division leadership could look to academic intervention to support struggling students in the early grades. These interventions can be intensive and "high-touch" like the Reading Recovery program analyzed by Sirinides, Gray and May (2018) or "low-touch" interventions like the summer books program described by Allington et al. (2010).

In order to discern which of these approaches will be most effective in RPS, it is important to understand the specific context in the division. In the next section, I highlight political, demographic, and academic considerations at play in Richmond that stakeholders ought to take under consideration as the division forges its new approach to early literacy.

Policy Context

Policy Context in RPS

Leadership Priorities

In November 2017, the RPS school board named Jason Kamras, formerly the Chief of Human Capital at District of Columbia Public Schools, as superintendent of the division. Shortly after assuming the superintendent role, Kamras and RPS leadership published a new five-year strategic plan designed to guide the division from 2018 to 2023. The plan highlights five strategic priorities for the division: (1) Exciting and Rigorous Teaching and Learning; (2) Skilled and Supported Staff; (3) Safe and Loving School Cultures; (4) Deep Partnership with Families and Community; and (5) Modern Systems and Infrastructure (RPS, 2018).

In the strategic plan, RPS leadership identify early literacy as a particular area of focus under Priority 1 ("Exciting and Rigorous Teaching and Learning"). Specifically, the strategic plan calls for the development of an "innovative, research-based, equity-focused, 'do whatever it takes' literacy plan to ensure that ALL third graders are reading at or above grade level," (RPS, 2018). This ambitious goal both suggests that there is substantial momentum for literacy reform in RPS and also hints at several of division leaderships' priorities in pursuing such reforms (i.e. innovative, research-based and equity-focused). These priorities and the others listed in the strategic plan are important to keep in mind when considering the viability of potential policy solutions in this report.

RPS's strategic plan has also garnered the support of city leadership, most notably Mayor Levar Stoney. In 2017, Mayor Stoney released a proposal to establish an "Education Compact" between the Mayor's office, Richmond City Council, and the Board of RPS. The compact is intended to ensure that both city and RPS leaders are aligned in their commitment to collaboration in pursuing "transformational improvement in academic progress" for children in Richmond (Stoney, 2017). The compact provides further evidence of the substantial political momentum behind RPS's strategic plan, including its early literacy component.

Existing Literacy Initiatives

In 1997, the Virginia General Assembly established the Early Intervention Reading Initiative (EIRI) in an effort to reduce the number of young children who struggle with reading in the early grades. In addition to providing teachers with a tool to assess students' literacy skills (the PALS assessment), the program also allocates funding to school divisions based on the number of students identified by the PALS as "below benchmark". The legislation requires that these funds be spent on reading intervention for these struggling students, though divisions are given discretion as to what exact intervention they elect to employ. School divisions must match the state contribution to EIRI based on the Composite Index of Local Ability-to-Pay which is calculated using local property value, tax revenue, and population in the school division.[3] Originally available only to students in kindergarten and 1st grade, the initiative has since been expanded to include students between kindergarten and 3rd grade.

[3] For more information on the Composite Index, visit http://www.doe.virginia.gov/school_finance/budget/compositeindex_local_abilitypay/index.shtml

As part of the division's renewed emphasis on early literacy, RPS has revamped its approach to EIRI intervention during the 2018-2019 school year in an effort to make the intervention as effective as possible for students in Richmond. EIRI tutors now go through an extensive training program and the division is working to ensure that all eligible students receive an equal dosage of intervention (T Harrison, personal communication, March 2019). EIRI will continue to be an important aspect of the division's early literacy approach moving forward.

Funding and Budget Debate

Like many school divisions throughout the state and country, RPS continues to suffer from reduced state spending on education resulting from the Great Recession (Mattingly, 2019). Indeed, in his most recent budget proposal Superintendent Kamras proposed $13 million in central office cuts to close a budget shortfall while following through on an earlier pledge to provide $2 million in teacher raises in RPS (Mattingly, 2019). Mayor Stoney recently released his own budget, which included a proposal to raise property and cigarette taxes in the city to provide RPS with $18 million to cover the budget shortfall, proposed teacher raises, a school crossing guard program, and transportation for after-school programs in the division (Avellino, 2019; NBC12, 2019). While Superintendent Kamras has publicly praised Mayor Stoney's proposed budget, a number of RPS board members have expressed concerns (Meagher, 2019).

With the ongoing debate surrounding Mayor Stoney's proposed budget, it is difficult to envision a scenario in which appropriations will be granted for a new academic program within RPS. Against this political and financial backdrop, it is important that any proposal considered in this report be feasible within the confines of RPS's current operating budget.

Demographics in RPS

In compiling this report, I utilize data from the Phonological Awareness Literacy Screening (PALS) assessment provided under a contract with VDOE. The PALS assessment measures children's knowledge of important literacy fundamentals such as phonological awareness, alphabet recognition, knowledge of letter sounds, and spelling. There is also a benchmark score associated with the exam that identifies students who are relatively behind in the acquisition of these fundamentals and thus qualify for EIRI intervention funds and services.

Nearly every elementary school student in all but one school division in Virginia takes the PALS screener.[4] In participating school divisions, all students are required to take the assessment during the fall and spring of their kindergarten year, as well as the spring of their 1st grade year. School divisions may offer assessments to students during other time points, though these are not required for all students.

My data consist of two cohorts of Virginia children who began kindergarten in the fall of 2013 and 2014 and completed the standard assessment of the PALS. The data contain each student's scores on the PALS assessments taken between kindergarten and 3rd grade as well as their score on the 3rd grade SOL standardized reading assessment.

[4] Fairfax County is the only division in the state that does not administer the PALS assessment.

Other variables include the student's race, economic disadvantaged status[5], English Language Learner (ELL) status, and gender. All told, my sample includes 6,006 students who were ever enrolled in a K-3 classroom in RPS, 2,566 of whom stayed in RPS from kindergarten entry through third grade during these two academic years.[6] For the analyses below, I leverage this smaller "fixed" sample of 2,566 students.[7] Appendix A of this report compares the demographics of this fixed sample to other possible student populations I could have leveraged in this analysis and finds few differences in the composition of these different choices of student sample. Table 1 below displays the demographics of this fixed sample of students relative to other students in the state.

Table 1: Summary Statistics

	RPS (All)	RPS (Below Benchmark)	Virginia (All)
Subgroup	**% Students**	**% Students**	**% Students**
White	11%	3%	50%
Black	69%	53%	25%
Hispanic	17%	43%	14%
Other	2%	1%	10%
ELL	15%	39%	8%
Female	50%	48%	49%
Disadvantaged	79%	97%	53%
Total Students	2,566	500	~196,000

Note: "Below benchmark" based on results from the PALS assessment at kindergarten entry. Includes 2013 and 2014 cohorts of kindergarteners.

The table reveals that students in Richmond are substantially more likely to be Black, Hispanic, ELL, or disadvantaged relative to students in the rest of the state. In this fixed sample, nearly one in five students were identified by the PALS assessment as lacking foundational literacy skills[8]. My data also show that nearly all students (~96%) that score below the benchmark on the PALS assessment in the fall of kindergarten are black or Hispanic and economically disadvantaged. This suggests that any policy intervention designed to improve literacy outcomes for students in RPS must be effective in improving outcomes for the most disadvantaged students in the school division.

[5] VDOE defines a student as "economically disadvantaged" if they are either (1) eligible for Free/Reduced meals, (2) receive TANF, and/or (3) are eligible for Medicaid.

[6] VDOE reports that 4,512 students enrolled in kindergarten in RPS in 2013-2014 and 2014-2015. My full dataset includes 4,300 (95%) of these students. The fixed sample, which includes only those students who were enrolled in a public school in RPS and who took the PALS exam through elementary school, contains roughly 60% of the students originally enrolled in RPS in kindergarten.

[7] I chose to use the fixed sample in order to most accurately consider how schools in Richmond contribute to their students' literacy development during the early elementary grades. This ensures that students who transferred out of Richmond are not considered in calculating the contributions of the division and its schools to student growth.

[8] It is worth noting here that this figure is lower than the one in four students identified as below benchmark by Child Trends (as was cited earlier in this report). The difference is likely a result of the fact that in this case I use a fixed sample of students who remain in RPS through the early grades where Child Trends looks at all students who entered kindergarten in RPS.

Trends in Literacy Development in Richmond

Literacy Skill Gaps in Elementary School

In an effort to better understand the challenge that RPS faces, I next aim to describe trends in literacy development in RPS and outline how these trends might vary by subgroup. Figure 1 below documents RPS students' standardized scores on the PALS assessment between Kindergarten and 2nd grade as well as their standardized score on the 3rd grade SOL assessment. For ease of comparison between different assessments over time, students' scores in the figures below have been standardized relative to students' performance on each assessment across the state. This is to say that a score of "-1" in Figure 1 implies that the subgroup within RPS scored, on average, one standard deviation (SD) lower than the average student in the state. It is also worth noting that the Hispanic subgroup has been divided into students who identify as Hispanic but who are not designated as ELL and those who are designated as ELL (roughly 95% of ELL students in this sample are Hispanic).

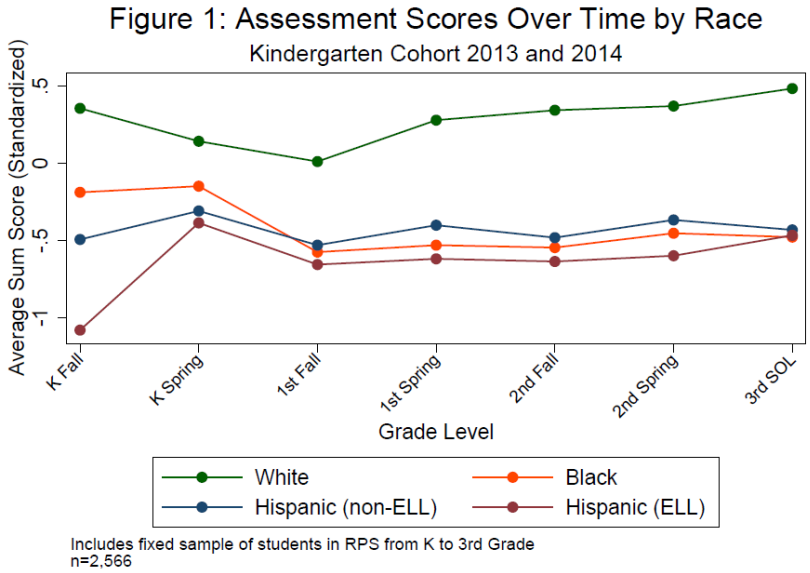
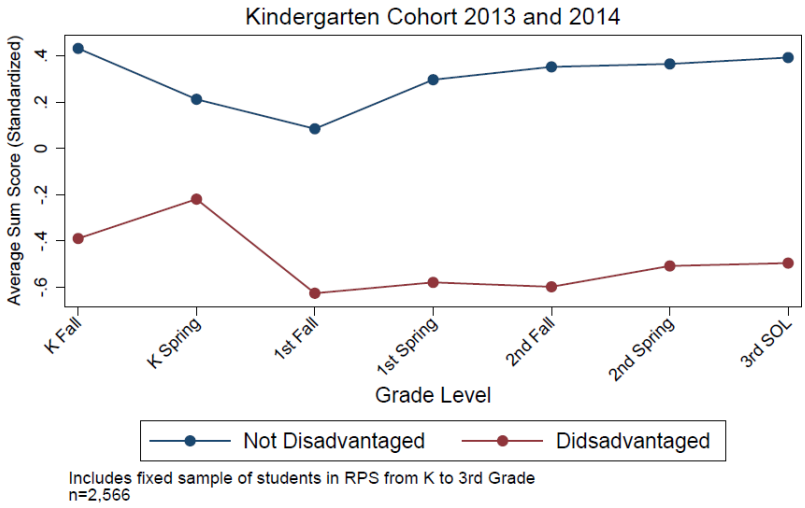


Figure 1 reveals substantial discrepancies in literacy skills at kindergarten entry between white students and their Black and Hispanic peers. Though these gaps appear to narrow modestly during kindergarten, they grow considerably between the spring of kindergarten and 3rd grade. Notably, Black and Hispanic students see a significant "dip" in their relative attainment on the PALS exam between the spring of kindergarten and the fall of 1st grade. This may suggest a form of "summer slide" that impacts students from minority backgrounds to a greater extent than white students in Richmond.

Figure 2 suggests that similar (and even more pronounced) gaps in literacy skills exist along lines of economic disadvantage. As was the case in Figure 1, there is also a substantial "summer slide" effect for economically disadvantaged students between kindergarten and 1st grade.

Figure 2: Assessment Scores Over Time
by Disadvantaged Status



These findings are consistent with literature on summer slide which suggests that the achievement gaps that researchers observe along lines of socio-economic status in high school are largely explained by differential opportunities to learn in the elementary grades (Alexander, Entwisle & Olson, 2007). This phenomenon has led many scholars to suggest that the summer may mark a critical period in which the achievement gap can be combatted in the early grades.

Gaps in the Likelihood of 3rd Grade Success

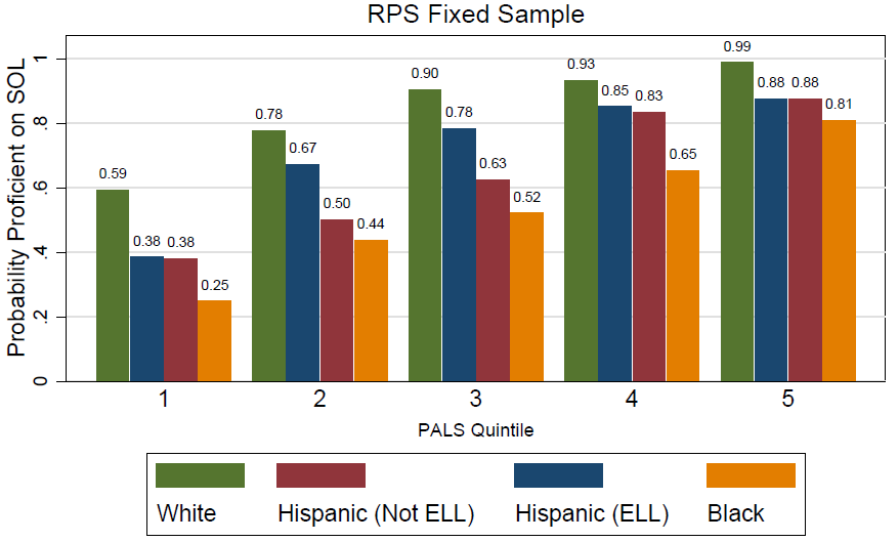
Another way one might think about these gaps in literacy skills during the early elementary grades involves the relationship between students' skills at kindergarten entry and their likelihood of being proficient on the reading SOL exam in 3rd grade. Are non-white and economically disadvantaged students as likely to be proficient in reading by 3rd grade as their white and wealthier peers who enter kindergarten with comparable literacy skills?

To consider this, I divide students into 5 quintiles based on their score on the PALS exam at kindergarten entry. Students in the first quintile, for example, enter kindergarten with literacy skills lower than 80% of students in the state. I next calculate the likelihood that a student will meet proficiency standards on the third grade SOL given what quintile of literacy skills they enter kindergarten with for different subgroups of students. I use the probability of being proficient on the 3rd grade SOL assessment as the relevant outcome in this case because this represents the closest approximation of reading at grade level available in my data and because this outcome is policy relevant as it is tied to school accountability metrics.

The results of this exercise are staggering. Figures 3 and 4 show that among students entering kindergarten with the lowest literacy skills, white students in RPS are more than two times as likely to "recover" to meet proficiency standards by 3rd grade relative to Black students (59% of white students versus only 25% of Black students). Perhaps as concerning, even among students who enter kindergarten with skills in the top 20 percentile in the state, Black and economically disadvantaged students are still

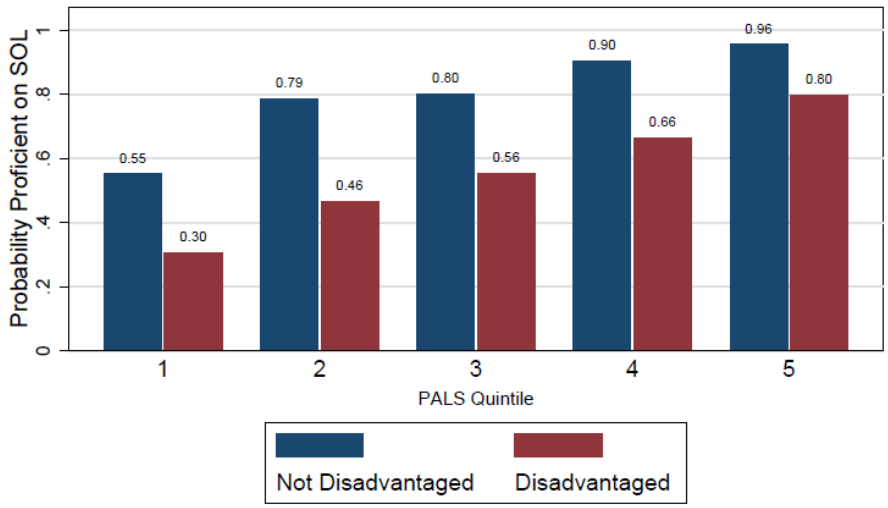
substantially less likely to meet proficiency standards by 3rd grade than their white and economically advantaged peers. As an illustrative example, figure 4 shows that an economically disadvantaged student who enters kindergarten with literacy skills in the top 20 percent of their class (Quintile 5) is just as likely to be proficient in reading by 3rd grade as a more advantaged student who enters kindergarten with reading skills in the 40th to 60th percentile (Quintile 3).

Figure 3: Probability of Passing SOL by PALS Quintile



Including students who remained in RPS from K through 3rd grade
n=2566

Figure 4: Probability of Passing SOL by PALS Quintile



Including students who remained in RPS from K through 3rd grade
n=2566

The patterns observed in Figure 3 and Figure 4 are not unique to RPS. Statewide, non-white and economically disadvantaged students are substantially less likely to be proficient on their 3rd grade reading exam relative to their white and wealthier counterparts who enter kindergarten with the same literacy skills. This suggests that

non-white and low-income students are in particular need of literacy support in the early grades relative to their peers. As the division begins to design its early literacy plan, it is imperative that leadership devote particular attention to these underserved student populations.

Potential Responses and Evaluative Criteria

Identifying Alternatives

The literature highlighted in this report suggests two general approaches to improving students' literacy skills in the early elementary grades that RPS leadership ought to consider as they develop their comprehensive literacy plan.

Academic Intervention

The first approach involves implementing intensive academic intervention programs targeted at students' with particularly low literacy skills in these early grades. Such programs are designed to get these struggling readers "back on track" by the time they enter 3rd grade. These interventions could take the form of intensive, one-on-one tutoring programs or "lighter touch" programs such as the summer reading intervention highlighted by Allington et al. (2010).

Importantly, academic intervention is already a critical part of RPS's approach to early literacy. EIRI provides funding to school divisions based on the number of students that fall below the benchmark score on the PALS exam. This funding is earmarked to provide intervention services to these struggling readers, though RPS is granted considerable autonomy in determining the exact nature of that intervention. Richmond has implemented EIRI intervention for years, and during the 2018-2019 school year the division revamped this intervention program as part of its new approach to literacy. RPS's current approach to EIRI involves intensive tutoring with students scoring below benchmark. RPS's tutors receive targeted training to ensure that the approach to tutoring across the division is both consistent and high-quality.

Because RPS already possesses the funding and infrastructure to deliver intervention services, such academic interventions represent a promising means by which RPS might improve literacy outcomes for struggling students in the division.

Instructional Quality

The second approach to literacy growth involves further developing teachers' instructional capacity in the early elementary grades. Research suggests that, because the early elementary grades are not subject to high-stakes standardized tests, students in these early grades may be assigned less experienced educators. It stands to reason, then, that improving the quality of instruction in elementary classroom may pay substantial dividends in both the short and long term.

As outlined in the literature review section of this report, there are at least three means by which RPS leaders could theoretically impact instructional quality in the early grades. First, the division could implement financial incentives aimed at recruiting and keeping high-quality teachers in schools and classrooms that are most in need of such educators. Second, principals might exercise strategic staffing practices within their school to place that the most experienced and effective educators are placed in the early grades to ensure that more students enter 3rd grade reading on grade level. Lastly, the division could offer training around evidenced-based instructional practices to improve the quality of instruction in these early classrooms.

While there is some evidence that suggests that teacher recruitment and retention incentives or strategic staffing practices within an individual school may move the

needle on instructional quality, both of these alternatives present political and practical issues. The financial incentives necessary to recruit or retain teachers in low-performing schools are large and would require RPS to make a substantial investment that is impractical at this time. Even setting aside these financial considerations, implementing such an incentive system would require substantial political will. Such policies require RPS to define what makes an "effective" educator, a topic that has been the subject of intense debate for decades. Superintendent Kamras, who was instrumental in implementing a teacher incentive and evaluation system in Washington, D.C. prior to joining RPS, has also said that he does not intend at this time to bring such a system to Richmond (Mattingly, 2018).

Proposed Alternatives

Based on these considerations from the literature and taking into account the context of early literacy in RPS, Table 2 highlights three promising alternatives that would lead to improved literacy outcomes in RPS. The first two alternatives take an intervention approach to literacy improvement, while the final alternative focuses on improving instructional quality in the division through PD. A more detailed description of each alternative is offered in the following section of this report.

Table 2: Description of Alternatives

Alternative	Description
Status Quo	RPS will continue implementing its revamped approach to EIRI intervention and work toward building a revised literacy plan for the division.
Summer Books Program	Based on the results of Allington et al. (2010), this intervention would use a portion of EIRI funding to provide summer books for students identified as in need of intervention.
Pilot PD Program at Targeted Schools	Provide a pilot PD program centered on evidence-based instructional practices in literacy at 3 targeted schools in RPS.

Evaluative Criteria

In evaluating the alternative approaches that RPS leadership might employ to improve literacy skills among students in the early elementary grades, I will use the following criteria:

1. **Cost Effectiveness.** One of the main goals of RPS's comprehensive literacy plan is to ensure that more students exit 3rd grade in Richmond prepared to make the transition from "learning to read" to "reading to learn". As such, any proposed policy alternative must first and foremost improve students' literacy skills in the early elementary grades and increase the share of students who are reading at grade level by the end of 3rd grade.

In measuring the overall effectiveness of an alternative, I consider the impact that the elected policy would be expected to have on the percentage of students that meet proficiency standards on the 3rd grade reading SOL. To do this, I obtain estimates from relevant experimental research that quantifies the potential impact of each alternative on student achievement. I next apply these gains to the RPS students in my data to estimate students' literacy skill levels if the policy were put into effect. Based on these projected outcomes, I then predict the proportion of students who would score above the proficiency benchmark on their 3rd grade SOL assessment and compare this figure to what would have been expected if the policy had not been implemented. This process yields the estimated percentage point difference in SOL proficiency rate that RPS could expect if they implemented the alternative. A more thorough description of my methodology as well as results from this empirical exercise can be found in Appendix B of this report.

Because RPS is limited in its financial capacity, it is important to consider the costs associated with a given intervention in addition to the projected gains in student performance. In an effort to weigh the potential impact of each alternative on student achievement against its cost, I retrieve cost estimates for each alternative from a number of sources. To produce a metric for cost-effectiveness, I take these cost estimates and divide them by the estimated percentage point increase in students meeting proficiency standards on the 3rd grade SOL exam. This figure can be thought of as the investment necessary to yield a 1-percentage-point increase in proficiency rates on the 3rd grade SOL through the proposed alternative. Alternatives with lower values of cost effectiveness are preferred. A more detailed breakdown of cost-effectiveness estimates is provided in Appendix C.

Though I took considerable care to make these analyses as precise as possible, the cost-effectiveness figures reported here should be interpreted only as representing the cost-effectiveness of one alternative relative to others rather than a precise estimate of the cost of increasing student performance through the chosen intervention alternative.

2. **Feasibility.** A policy alternative is not viable if it is not possible to implement in the first place. As such, I also assess the practical and political feasibility of each alternative. From a practical perspective, the alternative must be within RPS's current human capital capacity. As is the case with any organization, RPS has a finite amount of labor and resources to devote to new initiatives. In addition to

practical feasibility, I also consider the political viability of the proposed alternatives. Even if a proposal is within RPS's current capacity, it must also be acceptable to division and city leadership within the present political climate in Richmond.

Whether a given alternative is practical or politically tenable is, of course, challenging to quantify. As such, in an effort to operationalize these considerations around feasibility, I employ a binary measure indicating whether the alternative has "low" feasibility or "high" feasibility. "Low" feasibility alternatives are likely to meet at least one practical or political roadblock. "High" feasibility options are those that are unlikely to meet such resistance based on my research and conversations with RPS staff.

3. **Equity.** Lastly, it is critical that the alternatives considered serve RPS's disadvantaged student populations in an equitable fashion. Equity is a critical part of the division's new strategic plan (RPS, 2018) and has been a point of emphasis for Superintendent Kamras since he assumed that role in 2017 (Mattingly, 2018).

   These concerns regarding equity in RPS are backed by empirical data. RPS serves a student population that is overwhelmingly disadvantaged and non-white. My data also suggests that these non-white and economically disadvantaged students in RPS (and across the state) are less likely to recover from early reading struggles than their white and wealthier peers who enter kindergarten with equally low literacy skills. As such, any alternative implemented must serve these disadvantaged student populations to ensure that all students in RPS exit 3rd grade reading at grade level regardless of their race or economic standing.

   In order to quantify equity for the purpose of this report, I estimate the proportion of disadvantaged or non-white students that the alternative is projected to serve in the division. Policy alternatives that serve a greater proportion of non-white or economically disadvantaged students are preferred.

Evaluating Alternatives

Option 1: Maintain the Status Quo

Description

RPS could operate under the status quo and allow present trends to continue. The division has made literacy a priority under their new strategic plan, and it could be the case that this increased emphasis on literacy development alone might improve outcomes for students in Richmond at little to no direct cost to the division. Further, RPS leadership have taken steps to centralize and streamline the division's approach to EIRI intervention. The division plans to train all EIRI tutors and staff at the division level to ensure consistency in the delivery of literacy intervention across school sites. This new approach to intervention for the division's struggling readers might be sufficient to bolster literacy outcomes in the division.

Cost Effectiveness

In order to generate an approximation of the impact of the EIRI tutoring interventions, I pull estimates from Sirinides et al.'s 2018 evaluation of the Reading Recovery intervention program. This intervention, like EIRI, involves intensive tutoring targeted at struggling readers. Their results suggest that Reading Recovery increased participating students' literacy skills by between 0.37 and 0.48 standard deviations (depending on the outcome measure of interest).

To generate a conservative estimate of the cost effectiveness of such intervention, I employ the lower bound estimate of 0.37 standard deviations in this analysis. Plugging this value into my model shown in Appendix B yields an expected increase in the proportion of students meeting proficiency standards on the 3rd grade SOL of 1.4 percentage points (see Appendix B).

I estimate the cost of the intervention based on the average number of kindergarten students per year identified as below benchmark in my data (250 students). Note that this figure does not reflect the total number of students identified on the PALS assessment in Richmond as my sample includes only students who remain in Richmond from Kindergarten through 3rd grade. Based on this figure, I estimate the total cost of providing intervention to these students to be $167,130[9]. Dividing this figure by my estimated effect size of 1.4 percentage points yields a cost effectiveness estimate of roughly $119,000 per 1 percentage point increase in SOL proficiency rates in 3rd grade.

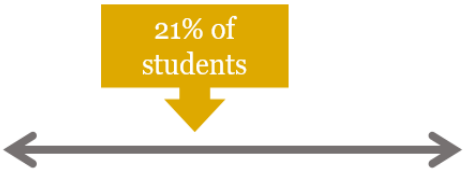
[9] Note that this figure was obtained using a relatively complex funding formula provided by officials at the Virginia Department of Education (VDOE) which is provided in Appendix C.

Feasibility

The status quo option is practically feasible. The division has both the financial and logistical resources in place to execute EIRI intervention effectively and has been doing so for years. RPS staff have already begun implementing the new approach to EIRI during the 2018-2019 school year.

This option is also politically feasible. Superintendent Kamras and RPS leadership have made it quite clear that literacy in the early years is a priority for the division and has already implemented the new approach to EIRI in the division. There is no sign that either state lawmakers or division leadership are wavering in their commitment to EIRI intervention for students identified as struggling readers in elementary school.

Equity



The new approach to EIRI intervention targets only those students who were identified as being below benchmark on the PALS assessments during kindergarten. Nearly all of these students are non-white or economically disadvantaged. In my data, I find that, on average, roughly 250 non-white and economically disadvantaged kindergarteners per year would benefit from the division's new approach to EIRI intervention. In the fixed sample leveraged for this analysis, RPS serves roughly 1,170 kindergarteners who are non-white or economically disadvantaged each year. Thus, the status quo intervention will reach roughly 21% of disadvantaged students in the division.

Option 2: Summer Books Program

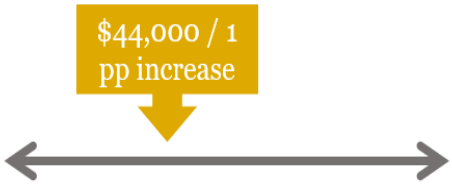
Description

Through EIRI, Virginia already provides funding to RPS based on the number of students who fall below the benchmark score on the PALS assessment in kindergarten. This funding is intended to provide these students with interventions to improve their literacy skills, but divisions are given discretion in terms of the exact nature of the intervention they choose to employ. Given that my data show substantial "slide" occurring over the summer, investing in a summer books program for struggling students could be an effective way to improve literacy outcomes in the division.

Allington et al.'s (2010) rigorous evaluation of a summer book program provides a compelling template for this approach to literacy intervention in RPS. These authors randomly chose a group of students from high-poverty schools in Florida to select twelve free books each summer between 1st and 4th grade. After three summers, the authors showed that students who had received the free books scored significantly higher on a high stakes standardized reading assessment. This evidence serves as convincing proof that a light touch intervention can produce positive literacy outcomes, especially for the largely disadvantaged population of students served by RPS.

Following the example of Allington et al. (2010), the proposed alternative would establish a summer book program under which students identified as below benchmark based on their kindergarten PALS assessment would be provided ten books during the summer months for three summers (from kindergarten through 2nd grade). Funding for this book program would be taken from the division's EIRI budget provided by the state. RPS central staff would be responsible for administering the program, including ordering books, coordinating with teachers of identified students, and distributing the books to target students prior to the end of the school year.

Cost Effectiveness



The aforementioned research on summer reading programs provides convincing evidence that even an intervention as simple as providing books to disadvantaged elementary students can lead to substantial gains in reading. Allington et al. (2010) suggest that, after three years of receiving free books during the summer, disadvantaged students demonstrated reading skills 0.15 standard deviations greater than what would have been expected had they not received the intervention. My predictions suggest that, if the summer reading program indeed increased EIRI-eligible students' literacy skills by the estimated 0.15 standard deviations, RPS could expect a

0.6 percentage point increase in the proportion of students meeting proficiency standards on the 3rd grade SOL (see Appendix B).

In estimating the potential cost of such an intervention, I turned to a pre-existing summer book program (see Appendix C). The program offers ten books to students (roughly the same number of books granted to students in Allington et al.'s study) at a price of $30. I use this figure as the basis for my cost estimate and conclude that it would cost RPS roughly $22,500 to provide books to students for 3 summers (the dosage recommended in Allington et al.'s study). However, the clerical costs associated with the program (i.e. staff time spent ordering, coordinating, and delivering the books for the summer program) also must be considered. This in turn increases the total cost to $26,460, yielding a cost effectiveness estimate of roughly $44,000 per one percentage point increase in student achievement in the division.

Importantly, the group of students that EIRI is intended to serve are not only socio-economically disadvantaged, but are also identified as students with exceptionally low literacy skills in kindergarten. Further, the estimate here does not take into account the impact of diverting resources from the "status quo" EIRI intervention to the summer reading program. This being the case, the impact estimated here may overstate the potential impact of this policy alternative overall.

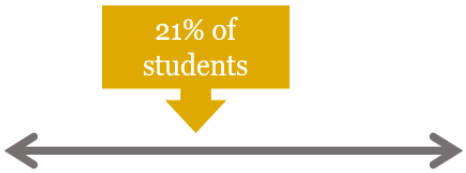
Feasibility

In terms of practical feasibility this option likely presents several challenges. Implementing a summer reading program would require RPS staff to devote time and resources to find a partner organization from which to purchase books for students. These books would also need to be delivered to schools and disseminated to target students, requiring more logistical resources. Even if a temporary employee were brought on to coordinate the program, hiring such an employee would require Human Resources staff time to identify, hire, and onboard the employee. The summer reading program thus presents logistical hurdles not present under the status quo.

Additionally, diverting EIRI funding toward a new intervention is likely to be politically controversial. Division leadership has already outlined a new approach to EIRI funding that they have only just begun to implement during the 2018-2019 academic year. As such, the prospect of diverting some of these resources to an alternative intervention is likely to be met with resistance from RPS leadership. Lastly, the optics of some students receiving books during the summer while other students do not receive such books may

raise concerns among students who are not eligible for EIRI intervention and their families. This could further complicate the roll out of such a program.

Equity



As in the case of Option 1, the summer books intervention program would target only those students that fall below benchmark on the PALS assessment. As such, roughly 250 disadvantaged or non-white students would benefit from this intervention each year (representing 21% of the total disadvantaged and non-white population in the division).

Option 3: Pilot Professional Development Program in Targeted Schools

Professional development around effective instruction represents an intriguing means by which instructional quality might be raised for all students in RPS. Researchers have identified a number of instructional strategies that have been scientifically shown to improve students' reading skills during the early grades (Foorman et al, 2016). However, a number of scholars suggest that many teaching candidates are not exposed to such evidence-based strategies during their pre-service training experiences (Castles, Rastle & Nation, 2018; Joshi et al., 2009). It may behoove RPS, its teachers, and its students to offer PD around these promising instructional practices in schools identified as needing additional support. If teachers employ these instructional techniques more frequently and effectively in the classroom, literacy skills may improve in the division.

Under this alternative, RPS would offer a pilot PD around evidence-based instructional practices in literacy to elementary teachers at 3 targeted elementary campuses in the division. While rolling this professional development out at all elementary schools might be theorized to have a greater impact, the pilot program carries with it several advantages. First, piloting the program at a few select schools will allow RPS leadership a chance to evaluate and adjust the program based on teacher and school leader feedback from the initial roll out. This allows the pilot program to serve as a "proof of concept" for the approach to PD before leadership elects to offer the training division wide. Second, the small scale of the pilot program ensures that administrative costs of this alternative are kept relatively low in the short term.

For the purposes of the following analysis, I select 3 elementary schools in the division that have relatively low proficiency rates on the 3rd grade reading SOL as the sites of the pilot PD program. Should this alternative be enacted, RPS should leverage both quantitative data and their qualitative understanding of school contexts to select the most appropriate pilot sites.

Cost Effectiveness

There is a wealth of literature from both economics and education that suggests that teaching quality is the most important in-school driver of student achievement. The literature surrounding the effectiveness of PD, however, is decidedly more mixed.

Here I pull impact estimates from a meta-analysis of teacher professional development studies conducted by REL Southwest (Yoon, Duncan, Lee, Scarloss & Shapley, 2007). Regarding professional development centered on fundamental phonics and literacy

skills like those taught in the early elementary grades, Yoon and colleagues find estimates ranging from 0.12 standard deviations to 0.69 standard deviations. In order to provide a conservative estimate of the effectiveness of the program, I use the 0.12 SD figure to estimate the impact of the PD option on student achievement.

The model in Appendix B of this report suggests that, relative to what would be expected in the absence of professional development, providing teachers at target schools with PD focused on evidenced-based instructional strategies would increase the proportion of students meeting proficiency standards on the 3rd grade SOL by 0.4 percentage points.

As outlined in Appendix C, I estimate the overall cost of the pilot PD to be $7,260 based on RPS's budget allotment for professional development. Dividing this by the estimated effect size of 0.4 yields a cost effectiveness estimate of roughly $18,000 per one percentage point increase in student proficiency.

Feasibility

From a practical perspective, professional development also represents an entirely feasible option. RPS schools already set time aside for teacher training, and these sessions could be incorporated into this allotted time. Additionally, the division already budgets for funding devoted to professional development that could be used to facilitate such trainings.

PD is likely politically feasible within the present climate in RPS. Division leadership is committed to improving literacy outcomes in the division, and targeting PD to address issues of literacy development in the early grades is likely to be well received and garner support from RPS leadership and site principals. The PD approach to literacy aligns well with two of the five areas of focus highlighted in the division's new strategic plan. By promising to increase teachers' use of effective instructional practices, the pilot PD program serves the goal of promoting the "Exciting and Rigorous Teaching and Learning" highlighted under Priority 1. Further, PD is explicitly mentioned as an area of emphasis under Priority 2 "Skilled and Supported Staff" (RPS, 2018). These considerations suggest that a PD approach to literacy is likely to garner strong support from division leadership.

Equity

The PD program will initially be offered at just 3 campuses. The schools I have selected as possible sites for the program based on my data serve 206

students who are either non-white or economically disadvantaged each year. This represents roughly 18% of the non-white and disadvantaged students in the division.

Though it is not taken into account in the 18% figure shown above, it is worth noting that although this alternative will serve a relatively smaller proportion of the disadvantaged population in the short term, the PD approach has the potential to reach all of the division's disadvantaged and non-white student if the program is eventually rolled out division-wide.

Recommendation and Implementation

Recommendation

Table 3: Alternative Outcome Matrix			
	Cost Effectiveness	**Feasibility**	**Equity**
Option 1: Status Quo	$119,000/1 pp increase	High	21% of students
Option 2: Reading Intervention	$44,000/1 pp increase	Low	21% of students
Option 3: Pilot PD Program	$18,000/1 pp increase	High	18% of students

Table 3 summarizes the relative merits of the three proposed alternatives under each evaluative criterion. This matrix ultimately suggests that **offering a pilot professional development program around evidence-based instructional practices** represents the most promising means by which the division might improve literacy outcomes for students in the division for a number of reasons. First, even under a three school pilot approach, it represents the most cost-effective alternative of those presented. Second, RPS leadership's renewed focus on early literacy ensures that the alternative is politically and practically feasible. Lastly, though in its pilot form this professional development might reach fewer non-white and economically disadvantaged students than other alternatives, it has the potential to serve substantially more non-white and disadvantaged students in the future if the PD program spreads to other campuses in the division.

It is also important to note here that the professional development option would be implemented in tandem with the "status quo" alternative. The state will continue to provide EIRI funding to RPS and the division will continue to implement its new approach to this intervention. This arrangement further eases concerns regarding the equity of the professional development pilot program as those disadvantaged students served by EIRI would continue to receive intensive intervention.

To approximate the projected impact of implementing both the pilot PD program and RPS's new approach to EIRI intervention, I again leverage the model in Appendix B as if both of these alternatives were implemented simultaneously. The results suggest that RPS could expect a 1.8 percentage point increase in the proportion of students reaching proficiency by 3rd grade. As an additional exercise, I also run the model assuming that the PD program is effective and is rolled out to all elementary schools in the division. These results suggest that implementing effective PD division wide while continuing to

provide intensive one-on-one tutoring through EIRI would increase the proportion of students reaching proficiency standards in 3rd grade by 3.4 percentage points.

Though summer reading programs like the one highlighted by Allington et al. (2010) hold promise as low-cost options to improve literacy outcomes for disadvantaged students, they are not optimal in this case for at least two reasons. First, as highlighted above, it is unlikely that diverting funding from intensive EIRI intervention would be politically feasible, particularly at a time when the division is implementing thoughtful changes to its approach to EIRI. Second, though the intervention is relatively low-cost, the absolute impact of the summer intervention on student proficiency by 3rd grade would be quite small. Students eligible for EIRI are in need of intensive intervention like the tutoring provided by RPS's new approach to EIRI in order to get back on track. The summer reading program is unlikely to provide a sufficient "boost" for these struggling readers to move the needle on third grade proficiency.

Implementation Considerations

The professional development approach to instructional improvement will only be successful if implemented effectively. It is important to acknowledge here too that the research exploring the effect of professional development on student outcomes is largely mixed, though some best practices have emerged from prior work (Desimone & Garet, 2015). Below I highlight several key factors that RPS ought to consider in rolling out a pilot professional development program at the three target schools in order for the PD to have maximal impact.

Focus on Specific Teacher Practices

Literature and theory suggest that professional development targeted at specific teacher actions (e.g. allowing for more student-driven instructional time) is generally more successful than training that aims to increase teacher content knowledge or use of complex instructional behaviors (Desimone & Garet, 2015). As a specific example of the efficacy of professional development in improving specific teacher instructional practices in early literacy, Piasta et al. (2010) demonstrate that PD focused on increasing preschool teachers' references to text during "read-aloud" activities did indeed meaningfully change teachers' instructional approach in the long term. In order for the pilot PD program to be most impactful, it ought to focus on specific, evidence-based instructional practices like those highlighted in Foorman et al.'s (2016) IES practice guide.

Ensure Instructional Coach Involvement

Research has also shown that professional development alone may not be sufficient to bolster teachers' instructional practices. Neuman and Cunningham (2009), for example, demonstrate that professional development only had a significant impact on literacy instructional practices when supplemented by ongoing instructional coaching. Indeed, teacher coaching is the subject of a growing body of research suggesting that coaching models have positive impacts on both teacher practice and student outcomes (see for example a recent meta-analysis by Kraft, Blazar and Hogan, 2018).

In RPS, one division-level literacy instructional specialist supports the 26 elementary campuses. In addition, each Title I school has a Title I reading teacher who may serve as an instructional coach at the principal's discretion (A Nabors, personal communication, April 2019). Given the importance of ongoing coaching in sustaining the impact of PD, it is critical that these personnel be included in the professional development at the target schools.

Leverage Strategic Partnerships[10]

RPS also has the opportunity to leverage partnerships with third parties to deliver highly effective professional development. The PALS office at UVA represents one promising organization that division leadership might partner with. The PALS office has a long tradition of engaging with divisions around the state for trainings and through the provision of a variety of instructional resources such as guided lesson plans and suggestions for activities related to different developmental areas as assessed on the PALS exam.

Recently, the PALS office has begun to develop a systematic approach to PD outreach. This new approach emphasizes three strands of PD: (1) fidelity of assessment procedures and other assessment tools, (2) enhancing PALS data-use across a year for instructional planning and improvement, and (3) contextualizing PALS in a broader developmental context for deeper understanding. The PALS office aims to engage with a small number of divisions to partner with as they pilot this new approach to PD prior to taking the model statewide.

As an example, the PALS office is currently looking for division partners who are interested in implementing a 6-part training on PALS data-use with K-2 teachers that has already been piloted in two rural divisions in Virginia. Consistent with prior research, the pilot revealed that instructional coaches' involvement in such professional development was critical. The hope for this partnership is to implement both the teacher-focused PD and a new coach's tools with a division who is interested in this

[10] I am grateful to Anita McGinty for her assistance in completing this section.

content and who has the right infrastructure in place to support such a PD program. RPS represents an exciting possible partner for the PALS office at the University of Virginia as they continue to expand and further develop this PD model, particularly given that the division emphasizes partnerships with universities as part of its new strategic plan (RPS, 2018).

Continue to Offer Intensive Intervention Through EIRI

Lastly, while improving instructional quality across the district will improve outcomes for students on the whole, there are still consistently struggling readers who will need additional supports. As the National Research Council asserted in a 1998 report "Even with excellent instruction in the early grades, some children fail to make satisfactory progress in reading. Such children will require supplementary services." As such, it is critical that in addition to implementing this professional development, RPS continues to bolster its EIRI intervention strategies and ensure that they are effectively serving students identified as struggling readers.

Next Steps

As RPS considers how to further improve literacy instruction in the division, it is first important to consider what instructional practices are already in use at schools throughout the division. I had originally intended to include results from teacher surveys and focus groups at three schools that my data identify as positive outliers in this analysis in an effort to better understand the current state of literacy instruction in the division. Though I was not able to conduct these analyses on this project's short time frame as a result of logistical and legal constraints, identifying the practices, policies, and programs in place at these successful campuses in RPS still represents a promising area for future inquiry. This "positive deviance" approach is described in greater detail in Appendix D of this report.

Having piloted this literacy instructional survey and focus group protocol in these target schools, it would next behoove RPS to offer the survey division-wide to better understand literacy instructional practices across the division. These data could be used to target the professional development activities recommended in this report at campuses that could most stand to benefit from such training based on their survey responses. Desimone and Garet (2015) assert that the most effective PD is calibrated based on teacher's specific needs and experiences, and this division-wide instructional practices survey would provide RPS staff with the data necessary to conduct such calibration.

Lastly, the division should continue to evaluate and refine its approach to intervention through EIRI. The intensive EIRI intervention is necessary to help the division's lowest performing and most disadvantaged students recover to become successful readers by 3rd grade. This approach, in tandem with thoughtful professional development around literacy instruction, promises to raise the bar for literacy in RPS.

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Appendices

Appendix A: Student Sample Comparisons

The analyses in this report employ a "fixed" sample of 2,566 students who remain in RPS from kindergarten through 3rd grade. The table below compares the demographics of this fixed sample to the population of students who began kindergarten in RPS (but may have moved to another division before 3rd grade) and the population of students that was ever enrolled in RPS between kindergarten and 3rd grade.

Table A1: Sample Comparison

	RPS (Fixed Sample)	RPS (Kindergarten Cohort)	RPS (Ever Enrolled K-3)
Subgroup	**% Students**	**% Students**	**% Students**
White	11%	12%	12%
Black	69%	69%	67%
Hispanic	17%	16%	18%
Other	2%	3%	3%
ELL	15%	13%	10%
Female	50%	50%	50%
Disadvantaged	79%	85%	82%
Total Students	2,566	4,300	6,006

The table suggests that the students in our fixed sample who attend school in RPS each year between kindergarten and 3rd grade do not differ markedly from students in these alternative samples. Fixed sample students are slightly more likely to be ELL and slightly less likely to be disadvantaged than these other populations of students, but not to the extent that I might worry the analyses I conduct in this report could not be applied to all students enrolled in RPS. In short, this table provides evidence that the "fixed" sample of students is generally representative of students that attend RPS in any given year.

Appendix B: Estimating Alternative Effect Size

Step 1: Identifying Impact Estimates

In order to estimate the effectiveness of a proposed policy alternative, I first identified the estimated impact (in standard deviation terms) of the proposed policy. I sought research that examined programs that closely approximated those proposed in the policy alternatives outlined in this report. I privileged studies that employed a randomized control trial (RCT) design, widely considered to be the gold standard in quantitative research. If multiple impact estimates are provided in the study, I elect to use the lowest estimate in an effort to produce a conservative projection of the proposed alternative's impact.

Step 2: Translating Impact to PALS Points

Once I identified an estimate for the impact of the proposed alternative on student literacy skills, I next translate the projected impact from standard deviation terms to points on the 1st grade PALS exam. To do so, I calculate the standard deviation on the 1st grade PALS exam from my data and multiply this figure by the estimated impact of the intervention. For example, if the intervention is estimated to lead to a 0.1 standard deviation increase in literacy skills, I multiply this figure by the standard deviation on the 1st grade fall PALS exam (25 points) to yield an estimated impact on the PALS exam of 2.5 points for students exposed to the intervention. Note that I use the 1st grade PALS exam as the predictor of SOL proficiency to account for the fact that the proposed interventions would take place during kindergarten, suggesting that the increases in achievement would be realized during the following school year.[11]

Step 3: Predicting Proficiency Rates Under Status Quo

I next estimate the probability that a student passes the reading SOL exam in 3rd grade based on their PALS score in the fall of 1st grade and other student characteristics. To accomplish this, I run the following logit regression model[12]:

$$(A1)\ ProficiencySOL_{id} = \beta PALS\_1Fall_{\ id} + \gamma' Race_{id} + \delta Disadvantaged_{id}$$
$$+\mu Female_{id} + \theta ELL_{id} + \eta_d + \varepsilon_{id}$$

Where *PALS_1Fall* indicates a student's score on the PALS exam in the fall of first grade, *Race* represents a vector of indicator variables for the student's race, *Disadvantaged* is set equal to one if the student is economically disadvantaged, *Female* indicates whether the student identifies as female, and *ELL* indicates whether the

[11] It is worth noting here that not all students take the PALS exam during the fall of 1st grade because this is not a required testing window. This implies that that not all students in my data are included in the regression models estimating the probability of being proficient on the 3rd grade SOL. While this may be of concern, roughly 80% of students do take the PALS exam in the fall of 1st grade which may ease concerns that the model is biased by the sample limitation.

[12] On a basic level, logit regressions are employed for models with binary outcomes (such as the SOL Proficiency outcome used in this model) to ensure that no observation has a projected outcome greater than 1 (in this case, are predicted to have a more than 100% chance of passing the SOL).

student was classified as an ELL in kindergarten. η_d represents a division fixed effect that captures division-level factors that might influence student proficiency on the SOL.

I next predict each student's probability of passing the SOL by plugging in the true value of their PALS score into the equation above. By averaging these values, I attain the projected proficiency rate on the 3rd grade SOL in the absence of intervention.

Step 4: Predicting Proficiency Rates Under Policy Alternative

I then apply the estimated boost in PALS score associated with the policy alternative to all student scores in the division. With these new PALS scores, I again predict the probability that each student will pass the SOL in 3rd grade. Averaging these values gives me the projected proficiency rate on the 3rd grade SOL under the proposed intervention.

Step 5: Estimating Increase in Proficiency Expected Under Policy Alternative

Lastly, I subtract the baseline estimate of the 3rd grade proficiency rate from the proficiency rate estimated under the policy alternative to obtain the projected increase in the proportion of students meeting proficiency standards under that alternative.

Model Output

Based on the regression model employed in equation A1 above, I estimated the following 3rd grade proficiency rates under each alternative:

Table B1: Effect Estimates for Alternatives Based on Model A1

	Predicted Proficiency Rate	Effect Relative to No Intervention
No Intervention	61.0%	
EIRI Status Quo	62.4%	1.4 pp
Summer Reading	61.6%	0.6 pp
Pilot PD Program	61.4%	0.4 pp
Pilot PD & Status Quo	62.8%	1.8 pp
All School PD & Status Quo	64.4%	3.4 pp

Robustness Check

In order to assess the sensitivity of these results to model specifications, I look at the results from an alternative model that introduces a quadratic term for the first grade PALS score:

$$(A2) ProficiencySOL_{id} = \beta_1 PALS\_1Fall_{id} + \beta_2 (PALS\_1Fall_{id})^2 + \gamma' Race_{id}$$
$$+\delta Disadvantaged_{id} + \mu Female_{id} + \theta ELL_{id} + \eta_d + \varepsilon_{id}$$

The results of these projections are shown in Table A2 below. This alternative model specification predicts intervention effect sizes that are modestly lower across all intervention types. This said, these results do not substantially differ from those in the

linear specification shown in equation A1. Though using these results would change the magnitude of the effect estimates in absolute terms, they do not change the relative effectiveness of each alternative compared to the others. As such, I use the results from equation A1 as my preferred results in this report for the sake of simplicity.

Table B2: Effect Estimates for Alternatives Based on Model A2		
	Predicted Proficiency Rate	**Effect Relative to No Intervention**
No Intervention	60.7%	
EIRI Status Quo	61.7%	1.0 pp
Summer Reading	61.1%	0.4 pp
Pilot PD Program	60.0%	0.3 pp
Pilot PD & Status Quo	62.1%	1.4 pp
All School PD & Status Quo	63.8%	3.1 pp

Appendix C: Alternative Cost Effectiveness Calculations

Option 1: Status Quo

Cost Estimate

Cost estimates here were determined on the EIRI funding formula provided during a conversation with representatives from VDOE. The formula is roughly written as follows:

$$\text{EIRI Funding} = \frac{n}{5} * 2.5 * 36 * \text{Elem\_Rate}$$

Where *n* represents the number of students identified as below benchmark on the PALS assessment and *Elem_Rate* represents the prevailing hourly rate for elementary school teachers (currently $37.14 per hour). The 2.5 value in the equation represents the number of hours of intervention that students identified as below benchmark should receive each week. 36 represents the number of weeks out of the year that this intervention will be delivered.

In my "fixed sample" of data, roughly 250 students per year are identified as below benchmark in RPS. Plugging in this value for *n* in the equation above yields an overall cost estimate of $167,130 per year for the status quo option.

Impact Estimate

The status quo alternative is projected to increase the share of students who reach proficiency standards in 3rd grade by 1.4 percentage points (from 61.0% to 62.4%).

Cost Effectiveness Estimate

$$\frac{\$167{,}130}{1.4 \text{ pp increase}} = \mathbf{\$119{,}378 \text{ per 1 percentage point increase in 3rd grade proficiency}}$$

Option 2: Summer Books Program

Cost Estimate

The summer reading program involves two major cost considerations: the cost of the books themselves and the administrative costs of ordering books, coordinating with school sites, and delivering the books to targeted students. Regarding the price of books, I use an estimate based on a preexisting summer book program provided by an organization called Reading Warehouse. This program offers a set of ten age-

appropriate books to students for $30.[13] I elect to estimate the cost based on the ten book plan because this figure is close to the same dosage that Allington et al. (2010) provided students in their study. I calculate the total cost of these books as follows:

$$\text{Cost of Books} = \$30 * 250 \text{ students} * 3 \text{ summers} = \$22{,}500$$

In considering the administrative costs of the book program, I assume that the program will take roughly 3 weeks of full time administrative work at the prevailing rate for temporary administrative work in RPS of $11 per hour.[14] This yields the following equation estimating the administrative cost of the program:

$$\text{Administrative Costs} = \$11 * 40 \text{ hours} * 3 \text{ weeks} * 3 \text{ summers} = \$3{,}960$$

Adding these values together, the total cost of the books program is estimated to be $26,460.

Impact Estimate

The summer reading program is projected to increase the share of students who reach proficiency standards in 3rd grade by 0.6 percentage points (from 61.0% to 61.6%).

Cost Effectiveness Estimate

$$\frac{\$26{,}460}{0.6 \text{ pp increase}} = \mathbf{\$44{,}100 \text{ per 1 percentage point increase in 3rd grade proficiency}}$$

Option 3: Pilot PD Program

Cost Estimate

Cost estimates for the professional development program are based on RPS's budget allotment for professional development. To obtain a cost estimate for the professional development option, I use the dollar amount budgeted for professional development in 2017 in RPS ($363,056). I assume this value is divided evenly between elementary, middle, and high schools, suggesting that RPS elementary schools are allotted roughly $121,000 for professional development. Dividing this amount by the 25 elementary campuses in RPS, each school is budgeted roughly $4,840. I assume that half of these funds will be spent on reading professional development (versus all other subjects), and so I estimate that each campus spends roughly $2,420 on ELA professional

[13] These figures retrieved from The Reading Warehouse. https://thereadingwarehouse.com/summer_reading_loss_prevention_landing.php
[14] This figure obtained from RPS's FY18 salary schedule document found at https://www.rvaschools.net/cms/lib/VA02208089/Centricity/Domain/822/RPS%20Salary%20Schedule%20FY18.pdf

development. Because this PD will be piloted at 3 campuses, I estimate that the overall cost of this PD is roughly $7,260.

Impact Estimate

The pilot PD program is projected to increase the share of students who reach proficiency standards in 3rd grade by 0.4 percentage points (from 61.0% to 61.4%).

Cost Effectiveness Estimate

$$\frac{\$7{,}260}{0.4 \text{ pp increase}} = \mathbf{\$18{,}150 \text{ per 1 percentage point increase in 3rd grade proficiency}}$$

Appendix D: Positive Deviance Approach Outline

What Works in Richmond: A Positive Deviance Approach

As the research in the literature review section of this report suggests, there are a number of means by which one might envision improving literacy outcomes for children. In attempting to identify which of these approaches might prove most fruitful for RPS's leadership, this report takes a "positive deviance" approach. The concept of positive deviance is predicated on the idea that, even if a community is struggling in some respect, there are undoubtedly entities within the community that are experiencing favorable outcomes. By identifying these outliers (or "deviants"), researchers may be able to better understand what practices or characteristics they share in common that could be leveraged to improve outcomes for all of those in the community. What is perhaps most appealing about the positive deviance approach to problem solving is that the solutions revealed through such analysis inherently stem from members of the community itself and thus avoid being stigmatized as "imported" solutions by other community members (see Chapter 2 of Heath and Heath's *Switch* for an in depth discussion of this approach). This approach has been widely employed in analyses of health and nutrition education (see for example Marsh, Schroeder, Dearden, Sternin & Sternin, 2004), though to my knowledge it has not been used widely in education.

Within the positive deviance framework, I would take a two-step approach to identifying promising practices and programs that might bolster early literacy in RPS. In the first stage, I aim to identify "outlier" school sites within RPS whose students appear to experience substantial gains in literacy (at least relative to other schools in the division) between kindergarten and third grade. After identifying these schools, I endeavor to more deeply understand what practices or programs they share in common in the second stage of the analysis. Through a survey and interviews with teachers and site leaders, I hope to shed light on what specific approaches to literacy these "positive deviant" campuses employ that might assist in driving educational attainment at other campuses in the division. Below, I highlight the specific data and analytical approach I would leverage in such an analysis.

Identifying Exceptional Schools in Richmond

In an effort to identify practices that might begin to narrow the gaps displayed in Figures 1 and 2 of this report through a positive deviance approach, I first set out to ascertain which elementary campuses within RPS seemed to contribute most to their students' learning during the early elementary grades. To do so, I employ an Ordinary Least Squares (OLS) regression of the following form:

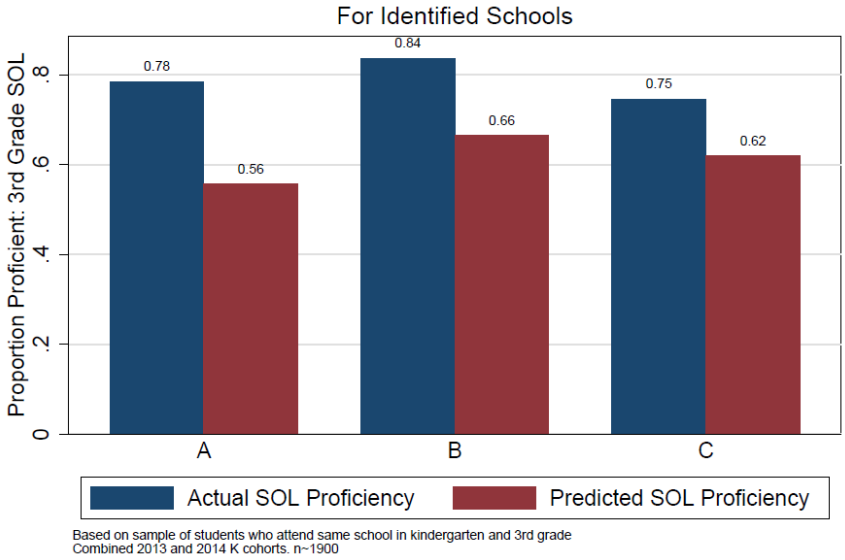
$$ProficiencySOL_{is} = \beta PALS_{is} + \gamma' Race_{is} + \delta Disadvantaged_{is} + \mu Female_{is} + \theta EL_{is} + \eta_s$$

Where i designates an individual student and s designates a school. $ProficiencySOL$ is a binary variable indicating whether the student met proficiency standards on the 3rd grade reading SOL exam. $PALS$ is a continuous variable indicating the student's performance on the PALS screener in the fall of kindergarten. $Race$ represents a vector of binary covariates indicating the student's race. $Disadvantaged$ is a binary variable

indicating whether the student was identified as economically disadvantaged. *Female* is a binary variable indicating whether the student identified as female. *EL* indicates whether the student was identified as an English Language Learner in kindergarten. Lastly, η_s represents a vector of indicator variables for each school in my dataset. Importantly, I restrict my analysis to include only students who are in the same school in both kindergarten and 3rd grade. This decision was made so that student growth between kindergarten and 3rd grade could be completely attributed to the school they attended and not to another school in the division that they transferred to or from.

In a general sense, the coefficient of η_s indicates the increase or decrease in probability of passing the SOL in 3rd grade associated with an individual school when controlling for a students' skill level at kindergarten entry, race, disadvantaged status, and gender. In other words, the "school effect" suggests the extent to which a school influences a student's probability of passing the SOL exam in 3rd grade relative to the average student with the same characteristics in the state. This analysis identifies 3 schools that seem to contribute most to their students' success during the early elementary grades. It is worth noting here that I cannot guarantee that my regression model above represents the correct functional form of my covariates and their influence on a student's probability of passing the SOL exam in 3rd grade. As a robustness check, I will seek RPS leadership's qualitative input regarding the three campuses identified by my model.[15]

Figure D1 Predicted vs. Actual SOL Proficiency



To make my measure of school quality more concrete, Figure D1 provides a visual representation of my quantitative model. The red bars in the figure represent the model's prediction of the proportion of students at each school that would be proficient on the 3rd grade SOL exam based on the characteristics of students that attend that school included in the equation above. The blue bars display the actual proportion of students at each school that reached proficiency. School A, for example, was predicted to have 56% of their students reach proficiency based on students' prior skills and

[15] I also ran a version of the equation with a quadratic term for the PALS scores to look for non-linearities in the relationship between kindergarten skills and future achievement and found very similar results.

characteristics. School A's true passage rate was 78%, meaning that students were 22 percentage points more likely to be proficient on the SOL than was predicted. The three school sites displayed in Figure 3 represent those with the largest differences between predicted and actual proficiency rates on the SOL and as such are deemed to contribute most to student progress during the early elementary grades.

Table D1 provides demographic information regarding the three schools identified by my model as contributing most to student's probability of success in third grade conditioning on other student characteristics. Notably, students at these three schools are more likely to be disadvantaged and non-white than students at other schools within the division. This is suggestive evidence that the population served by these schools is not markedly more advantaged than the population of other schools in the division, although I also note that, at two of the schools, students are less likely to enter kindergarten scoring below the benchmark score on the PALS exam than other students in RPS. This said, because my model controls for student's skills at kindergarten entry, these campuses still appear to contribute to student success in a way that is above and beyond what would be expected given their literacy skills at kindergarten entry.

Table D1: Demographics of Target Schools

	% of Students
White	2%
Black	72%
Hispanic	23%
Disadvantaged	89%
ELL	19%
%Below Bench.	17%

In the second stage of the analysis, I aim to survey and interview teachers on each campus in an effort to better understand what practices and programs were in place at these successful campuses that might be contributing to student growth. This phase of analysis would employ qualitative analytical techniques to identify trends in approach to literacy that all three campuses appear to share in common.