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IMPROVING LITERACY IN NEW YORK CITY PUBLIC SCHOOLS

Prepared for: Advocates for Children of New York

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Advocates for Children of New York
Protecting every child's right to learn

Disclaimer

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

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Honor Pledge

On my honor as a student at the University of Virginia, I have neither given nor received unauthorized aid on this assignment.

Glossary

Alphabetics

The ability to identify correlations between letters and units of sounds. Alphabetics may be judged by one's performance in decoding text (Part, 2016).

Comprehension

The ability to identify meaning from text (Part, 2016).

Decoding

The process of examining text and drawing connections between letters and sounds to pronounce the word aloud (Part, 2016).

Fluency

The ability to recognize known words, process that information quickly, and read text smoothly (Part, 2016).

Phonemic awareness

The ability to identify phonemes (individual sounds) and reorder and blend them (Part, 2016).

Phonics

The idea that letters in text correspond to units of sound. Individuals can connect words to text by mapping oral sounds to letters (Part, 2016).

Phonological awareness

The recognition that sounds in spoken language can be broken down and manipulated to form new words (Part, 2016).

Vocabulary

The extent of the individual's vocabulary – the range of the person's known words (Part, 2016).

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Executive Summary

Too few children are reading proficiently by the end of fourth grade in New York City (NYC) (National Association of Educational Progress, 2019). Poor reading ability has lifelong impacts on mental and physical health, criminal activity, and earning potential (Clark & Teravainen-Goff, 2018; Hernandez, 2011; Morgan, Farkas, & Wu, 2012). Education policy experts understand the linkage between poor literacy and poor long-term life outcomes. Still, reading achievement in NYC has remained stagnant over the last decade (National Association of Educational Progress, 2019).

The United States government has taken a stance on literacy education. In 2000, after reviewing more than 100,000 studies, the United States recommended a science-based approach. The government found that there are 5 critical principles of reading science. They recommended schools adopt these principles and use a phonics-based approach to literacy (National Reading Panel, 2000). However, schools across the United States never uniformly adopted these recommendations. Still today, most elementary school teacher preparation programs do not teach all 5 reading principles ("NCTQ," 2020).

Researchers and education organizations have used a wide variety of methods to improve reading. The literature on large-scale literacy interventions presents three primary approaches: legislative, programmatic, and professional development. This analysis considers the following alternatives:

1. Let present trends continue
2. Alternative 1: Mandatory universal reading screening for all public schools
3. Alternative 2: Addition of Literacy Express to the subsidized ELA curricula recommendations list
4. Alternative 3: Addition of a pre-kindergarten unit of the Universal Literacy Initiative

Each alternative is evaluated with respect to the following criteria: cost-effectiveness, equity, and administrative feasibility. Effectiveness is measured as the projected change in city-wide National Assessment of Education Progress (NAEP) scores. The analysis suggests that Alternative 2 is the most cost-effective and equitable approach. This report recommends Advocates for Children of New York (AFC) advocate for the new mayoral candidate to commit to recommending and subsidizing the pre-kindergarten curriculum, Literacy Express. This alternative is the most likely to improve reading scores effectively without negatively impacting vulnerable populations or straining NYC's current administrative capabilities.

Problem Statement

Only 27 percent of New York City schoolchildren are reading proficiently by the end of fourth grade – 7 percentage points fewer than the state average (National Association of Educational Progress, 2019). Children who are not proficient before fourth grade are more likely to struggle in school, develop worse self-image, and earn less in their lifetimes than their reading-proficient peers (Clark & Teravainen-Goff, 2018; Hernandez, 2011; Morgan et al., 2012).

Policy Context

Advocates for Children of New York (AFC) aims to combat discrimination in the New York City (NYC) school system. AFC typically affects policy through its legal team. They also participate in task forces, write policy reports, and give public testimony on education issues. Occasionally, they coordinate with the media on their concerns in NYC schools (Advocates for Children of New York, n.d.).

AFC is invested in improving literacy generally as well as ensuring that students with disabilities receive high-quality reading instruction. AFC is aware of the reading-science literature. AFC understands the guidelines issued by the National Reading Panel in 2000 (Sarah Part, 2020). This policy project aims to recommend an alternative that AFC could use to improve children's literacy city-wide. The ideal alternative will use practices that are proven effective for students with learning disabilities such as dyslexia.

In NYC, the mayor controls the Department of Education (DOE) (Amin, 2019). The current mayor, Bill de Blasio, cannot run for re-election in 2021. AFC may be able to influence the education policy commitments of the new mayor during the campaign process (Sarah Part, 2020). The mayoral election creates a unique window of opportunity to affect the agenda of the mayor's office.

Background

The Reading Wars

Historically, there were two dominant styles of literacy instruction: phonics and whole-language. The media and literacy researchers dubbed the conflict between proponents of these styles as the Reading Wars (Castles, Rastle, & Nation, 2018). Phonics represents the school of

thought that letters in text correspond to individual units of sound. A phonics-based approach systematically and explicitly teaches students how to connect sounds to letters. Students then decode the elements of written text to match spoken language (Part, 2016). In contrast, whole-language approaches emphasize using context and creating a literacy-rich environment to foster interest in the material (Castles et al., 2018). This school of thought is in line with the idea that students can learn to read like they learn to speak.

In the past few decades, an immense body of literature proved that children do not learn to read in the same way they learn to speak. In 1997, Congress implored the National Institute of Child Health and Development (NICHD) to create the National Reading Panel. In 2000, the National Reading Panel published their findings after reviewing more than 100,000 studies. They found that there are five essential components to reading: phonics, phonemic awareness, vocabulary, fluency, and comprehension. This report emphasized the importance of starting instruction from a young age and creating explicit and systematic curricula (National Reading Panel, 2000). Adherence to reading curricula that are explicit, intensive, and systematic is more effective for all students, but this adherence especially helps students with reading disabilities (Ritchey, 2011).

Explicit instruction in the letter-sound relationship dates back to at least the 16th century. It was a widespread practice in the 18th and 19th centuries. Over 200 years ago, Horace Mann gave voice to a faction that took issue with phonics instruction. He and other critics believed that the teaching style did not foster interest in reading. Over time, the critics of phonics gained more support. The work of Dr. Kenneth Goodman in the 1960s facilitated the wave of whole-language support in the mid-twentieth century (Castles et al., 2018). Whole-language methods, supported by Goodman's research, came to dominate literacy instruction education by the 1980s (Sawchuk, 2020).

Whole-language approaches are appealing. They advocate a student-centered approach that feels intuitive to teachers. These methods require very little understanding of reading science (Moats, 2000). This is appealing because many instructors never accessed the early research on reading science. The early reading science was published in neuroscience journals rather than education or literacy journals (Worthy et al., 2016). Whole-language methods can feel more approachable.

After the National Reading Panel published their findings in 2000, many programs and instructional material changed from whole-language to "balanced literacy." Balanced literacy claims to combine the positive aspects of both whole-language methods and phonics. In

practice, balanced literacy is a method that incorporates basic phonics but does not craft an explicit and systematic phonics curriculum (Moats, 2000). This approach typically fails to meet the standards described by the National Reading Panel.

Teacher training today

Balanced literacy is the preferred method of literacy instruction among elementary school teachers. A nationally representative survey of elementary special education teachers found that 75 percent of respondents worked at schools that used balanced literacy. Most respondents supported the use of balanced literacy (Harwin, 2020).

Some teachers acknowledge that reading science is generally important for reading success. However, many of those teachers lack the knowledge or willingness to implement systematic and explicit instruction. The same survey found that although 86 percent of teachers reported modeling phonics for their students, only 55 percent could correctly identify all 5 components of reading (Harwin, 2020). Even among teachers with an understanding of the benefit of science-based education, many lack the knowledge to fully implement this science. Other research supports the existence of a long-standing knowledge gap among educators (Joshi et al., 2009; Meeks, Stephenson, Kemp, & Madelaine, 2016).

Most teaching certification programs do not teach teachers enough reading science for them to implement phonics-based instruction. The National Council on Teacher Quality (NCTQ) annually evaluates the rigor of teacher preparation programs with respect to reading science principles. In 2020, only 12 percent of elementary teacher programs in the state of New York taught future-teachers all 5 components of reading science. In contrast, 27 percent of national elementary instructor programs taught all of the reading science components ("NCTQ," 2020). When teachers do not learn reading science, they tend to give worse literacy instruction to students (Binks-Cantrell, Washburn, Joshi, & Hougen, 2012). Even when they know about science-based approaches and view them favorably, they may lack the necessary knowledge to implement these practices correctly (Meeks et al., 2016). Students graduating from New York teaching programs are underprepared to teach students to read.

In the past few years, recognition of the importance of phonics-based instruction among teachers has grown. The number of programs nationally with at least a B rating from the NCTQ has grown by more than 50 percent since 2013 ("NCTQ," 2020). This trend will likely continue in the future. However, better teacher education will not directly solve the current issue in reading. Even if undergraduate and graduate programs shift radically and prepare students to teach reading effectively, many existing cohorts of teachers do not have this knowledge.

Cohorts of teachers who graduated from programs that taught whole-language and balanced literacy will continue to teach this way for decades.

Literature Review

Consequences

Literacy is a vital skill in the modern United States. There are immediate and long-lasting negative impacts on children who struggle to read that affect mental health, long-term earning opportunities, and adult physical health.

Children who struggle to read can begin to experience poor mental health in elementary school. Morgan et al. (2012) use longitudinal data following approximately 2,700 students who self-reported their feelings of worth. After controlling for child, family, school, and community-level confounds, they find that children who struggle to learn to read in third grade are more likely to report that they are angry, lonely, sad, and unpopular in fifth grade compared to their reading-proficient peers. Other research using longitudinal data supports these findings (Clark & Teravainen-Goff, 2018; Livingston, Siegel, & Ribary, 2018).

Poor reading in early elementary school is also associated with future academic difficulties. After most children attain basic or proficient reading skills, school curricula begin to use text to facilitate student learning. Students who still struggle to read are at risk of falling behind in all subjects that require learning from text. According to a 2011 study, 1 in 6 children who could not read proficiently in third grade did not complete high school on time. In contrast, only 4 percent of those reading proficiently in third grade did not complete high school on time (Hernandez, 2011).

The consequences of low reading ability persist throughout an individual's lifetime. Poor literacy skills are associated with higher high school dropout rates (Hernandez, 2011). This alone lowers the average lifetime earning potential. Dropping out is also associated with higher rates of substance abuse, adult mental health issues, and participation in crime (Maynard, Salas-Wright, & Vaughn, 2015). The Department of Education (DOE) reports that the average cost of dropping out of high school is $272,000 over the student's lifetime (McFarland, Cui, Holmes, & Wang, 2020). Higher reliance on government services and higher rates of criminal activity accumulates over time to contribute to the societal cost. Finally, those that struggle to read tend to struggle to process vital health information. They are less likely to comprehend prescription medication instructions than their peers (Davis et al., 2006; Wolf, Davis, Tilson, Bass, & Parker, 2006). Lower earning potential, worse health outcomes, and long-term issues with self-esteem all lower the quality of one's life.

Literacy interventions

Many small-scale studies evaluate the effect of literacy interventions. The following review highlights findings within three broad intervention strategies: professional development, programmatic approaches, and legislative approaches.

Professional development

Teaching programs are improving over time; however, most active teachers lack high-quality education in reading science (Joshi et al., 2009). Professional development programming could address this issue. Even teachers who have some literacy science knowledge tend to struggle to implement appropriate techniques (Neuman & Cunningham, 2009). Professional development programs could teach educators in the workforce how to apply the practices that develop early literacy in their classrooms.

Literacy-based professional development programs exist. The MyTeachingPartner program is a web-based course that provides pre-kindergarten literacy lesson guides, lesson implementation example videos, and in some cases, one-on-one virtual consultations. A randomized controlled trial (RCT) covering 161 pre-kindergarten programs found that this program, when accompanied by the video examples, substantially improved early literacy measures (Downer et al., 2011). Another RCT found that professional development alone did not improve the integration of science-based practices into the classroom. However, professional development paired with coaching sessions from a literacy expert improved teachers' literacy instruction techniques, despite not changing teacher knowledge (Neuman & Cunningham, 2009). This suggests educators need examples of practical implementation of reading techniques. These findings are supported by additional RCTs (Carlisle, Cortina, & Katz, 2011; Kraft, Blazar, & Hogan, 2018; Piasta et al., 2010).

These studies used RCTs and therefore are unlikely to be biased. However, the relatively small sample sizes and researcher-controlled environments may make results less generalizable to NYC. Kraft et al. (2018) conduct a meta-analysis on 60 papers that analyze the causal relationship between teacher coaching and effects on instruction and achievement. The paper reinforces that coaching—professional development programs where a coach observes teacher action and provides feedback—does improve classroom learning. However, scalability is limited. The largest effects are concentrated in small RCTs and tend to diminish in large-scale programs.

One study found success in a large-scale professional development program that took place in a realistic policy setting. In 2006, England piloted and then rolled out a program designed to

teach existing teachers how to teach early readers using synthetic phonics.[1] School districts received money to hire teaching consultants. These consultants assessed the state of literacy education, designed an implementation plan, and then modeled activities which teachers were instructed to adopt. After the initial lessons, they provided further education and worked with individual teachers who needed additional assistance. Researchers used a difference-in-differences design to detect changes in literacy trends between early-adopting and late-adopting districts. Researchers found that the program led to strong initial effects. Over time, effects dissipated for all but those who were at risk for falling behind in reading. Disadvantaged students continued to see effects at age 11 (Machin et al., 2018).

There is little research on how to get the returns of small interventions in large-scale initiatives. The England program has limited generalizability to NYC. Literacy was poor in England before the intervention but the intervention had strong support from the central government and there was a government mandate to switch to synthetic phonics (Machin, McNally, & Viarengo, 2018). Additionally, though this intervention was more successful than most other large interventions, the effect size of the England program was substantially lower than the strong effects found in small-scale, tightly-controlled professional development coaching experiments.

Programmatic approaches

The Institute of Education Sciences under the Department of Education regularly evaluates the evidence available for specific literacy programs. They only consider RCTs that fit a strict set of inclusion criteria. There are many reading programs with strong evidence supporting their effect on literacy. The following section highlights those with the strongest evidence and the largest scope.

Most successful programs that target beginner readers explicitly teach children the connections between sound segments and words, how to use sounds to make different words, how to sequence words, and how to associate sounds with letters. Children learn to recognize that words can break into small segments and that these segments can be added in different orders to create new words. This builds the foundation of literacy (National Reading Panel, 2000). Private programs such as Literacy Express, Reading Recovery, and SpellRead use techniques such as rhyming games and exercises that break words into sounds to cultivate this skill in young children. These programs have all demonstrated through one or more RCTs that they have positive effects on phonemic awareness and/or phonics (Institute of Education Sciences,

[1] Synthetic phonics is a specific type of phonics instruction that requires sounds are first mapped to letters in isolation, without additional context. Another prominent style of phonics, analytic phonics, does not recommend the study of sound-letter relationships in isolation (Machin, McNally, & Viarengo, 2018).

2006; Institute of Education Sciences, 2007a; Institute of Education Sciences, 2010a; Institute of Education Sciences, 2013).

Other programs target older children in elementary school to improve alphabetics, fluency, comprehension, and general performance. There are a wide variety of effective private programs schools may implement. Programs such as Read 180, SpellRead, and Start Making a Reader Today (SMART) serve students who are already struggling. RCTs have proven that two of these programs increase alphabetics and all of them improve fluency and comprehension (Institute of Education Sciences, 2007a; Institute of Education Sciences, 2007b; Institute of Education Sciences, 2016).

Legislative approaches

Mandatory dyslexia screening laws have the potential to identify those who struggle to learn to read at an early age. When coupled with appropriate interventions, schools have the potential to help students hit their reading milestones as soon as they start falling behind. Some New York legislators have already supported bills to create a universal screening pilot program for public schools (Brooks, 2019).

Overall, academic literature finds that screening, in particular environments, can be associated with better reading outcomes (VanDerHeyden, Burns, & Bonifay, 2018). Early detection of the risk of falling behind, when paired with effective interventions, can reduce the future risk of struggling to read by 5 to 20 percent (Fletcher, Francis, Foorman, & Schatschneider, 2020). Some specific interventions that were tested using RCTs have found positive effects on early reading (Institute of Education Sciences, 2010b). However, screening can only be effective if screening tools are accurate.

Various screening tests may identify different kinds of students in need. Philips and Odegard (2017) use data for nearly 8,000 second-graders in 126 schools spread over two states that use a screening tool. After the screening tool, teachers use their discretion to identify struggling students. The researchers use conservative dyslexic population estimates and the actual test scores to estimate the true dyslexic population in the schools they examined. They find that universal screening underestimates the number of students with dyslexia. They believe this is likely due to the overreliance of their tool on comprehension which can sometimes allow accuracy issues to go unnoticed. Furthermore, some screening tools better identify White students. In Philips and Odegard (2017), minority students and students at majority-minority schools were most often overlooked for dyslexia by the screening process (Phillips & Odegard, 2017). This is supported by a fixed-effects study that used approximately 180,000 student-level

observations of ability and disability diagnosis. While not causal, the study supports the idea that schools regularly under-identify minority students as having a disability (Morgan, Farkas, Hillemeier, & Maczuga, 2017).

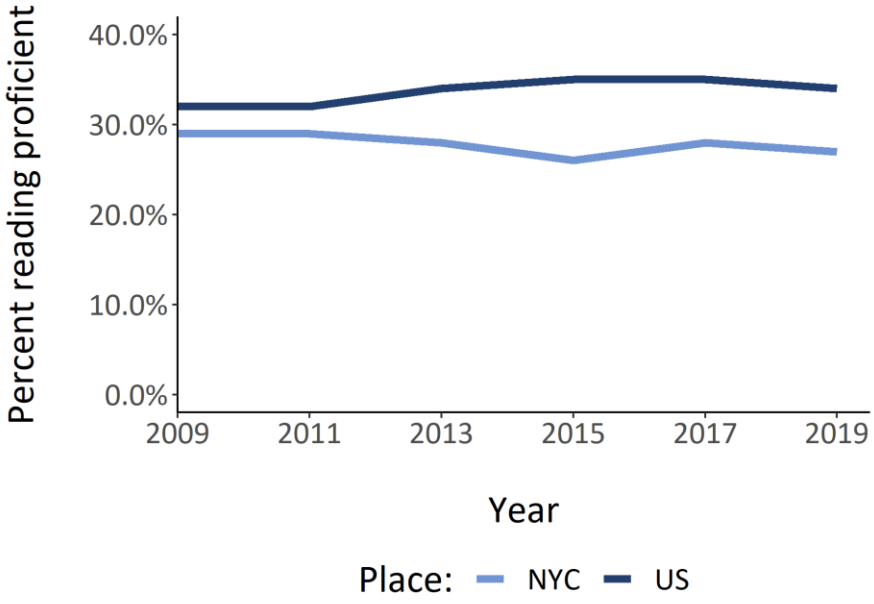
Universal screening measures may better identify students who are struggling to read. However, identifying students with dyslexia or students who are otherwise struggling with reading is not enough to meet their needs. If NYC uses effective and accurate screening tools, NYC could better target its existing reading interventions. However, the effect on reading outcomes for those students is dependent upon the ability to accurately and equitably design and implement effective individualized education plans.

Literacy in New York City

Overall, only a quarter of fourth-grade children in New York City (NYC) are proficient in reading, according to the National Assessment of Educational Progress (NAEP) standards. Achievement has remained stagnant over time. Figure 1 plots the change in NAEP proficiency levels over the past decade for students in NYC and students across the United States. Reading scores have improved slightly over time for the United States as a whole. They have decreased slightly in NYC. However, both of these changes are insignificant. In both the United States and in NYC, overall reading proficiency remains less than 35 percent at the end of fourth grade (National Association of Educational Progress, 2019).

Figure 1: Percentage Meeting NAEP Proficiency Standards over Time

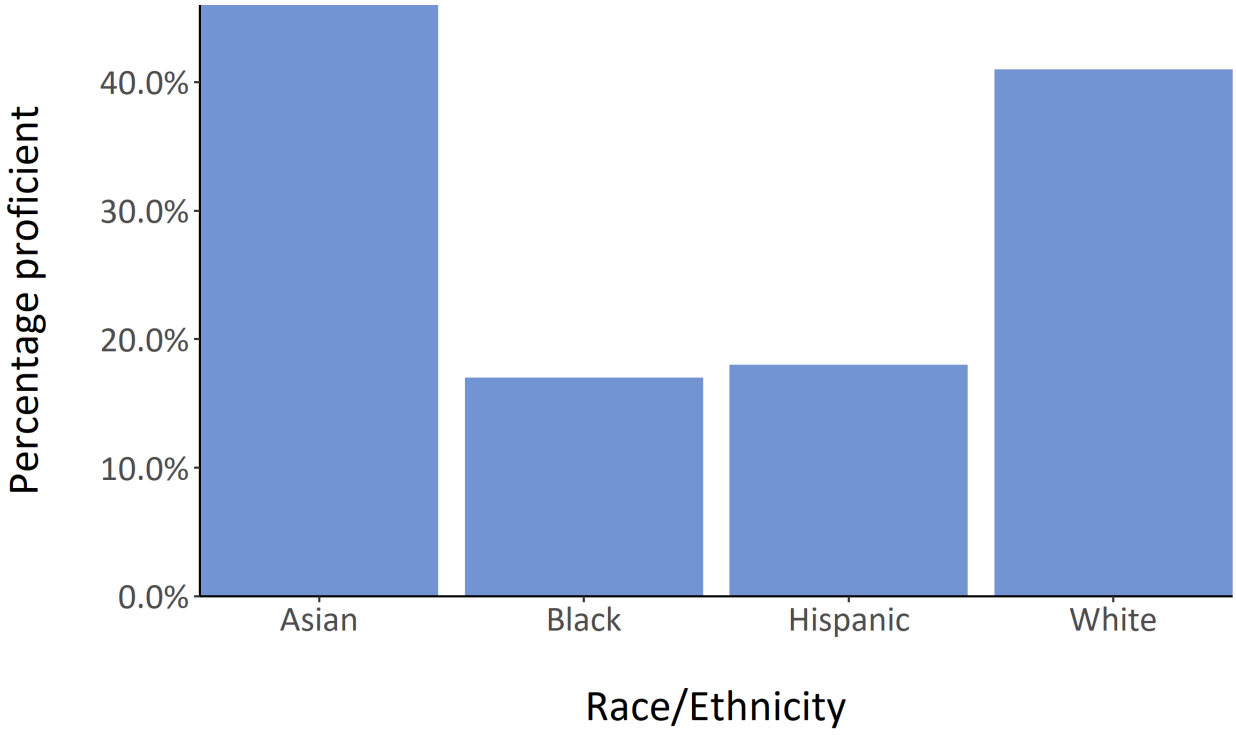
(*NAEP Reading: District Achievement-Level Results*, 2019)



There are substantial differences in literacy proficiency across race and ethnicity. Figure 2 plots literacy proficiency status for Black, White, Asian, and Hispanic students.[2] Black and Hispanic students have the lowest levels of basic literacy skills. They also have the lowest levels of proficient and advanced scores. Both perform at least 20 percentage points below White and Asian students in reading proficiency (National Association of Educational Progress, 2019). The data suggests that in NYC, there are clear discrepancies in literacy across racial and ethnic categories.

Figure 2: Proficiency by Race/Ethnicity in 2019

(*NAEP Reading: District Achievement-Level Results*, 2019)



These NYC proficiency results can be disaggregated further. Reading proficiency is lower in low-income students, students with disabilities, and students who are learning English. The NAEP tracks data on the child's National School Lunch Program (NSLP) eligibility status. This status can approximate low-income status. In 2019, only 20 percent of NSLP-eligible children met the standards of proficiency. In contrast, 47 percent of NSLP-ineligible students were proficient.

[2] The Asian, Black, and White race categories do not include those who identify as Hispanic (National Association of Educational Progress, 2020).

Students with disabilities also score substantially worse than their non-disabled peers. Seven percent of students with disabilities read at a proficient level. The same year, English language learners (ELLs) also performed below non-ELL students. Twelve percent of ELL children met the threshold for basic literacy. Only 1 percent met the threshold for literacy proficiency. (National Association of Educational Progress, 2020). Low-income status, disability, and ELL status are all negatively correlated with proficiency.

Advocates for Children of New York (AFC) is especially concerned about dyslexic students. Dyslexic children struggle to connect letters to sounds more than non-dyslexic students. They benefit the most from explicit phonics instruction that begins at a young age (Ritchey, 2011). Despite a 2017 bill mandating the commissioner of education issue guidance on meeting the educational needs of dyslexic children, some parents report that not enough is being done. In interviews, parents reported that the current school curriculum still did not meet the needs of their children. Some parents with economic means have gone as far as enrolling their children in private education or creating dyslexia-specific charter schools (Zimmerman & Gonen, 2019).

Evaluative Criteria

Policy alternatives are evaluated according to the following criteria: cost-effectiveness, equity, and administrative feasibility.

Cost-effectiveness

Cost-effectiveness is calculated by summing the total cost of the alternative and dividing that by the anticipated change in National Assessment of Educational Progress (NAEP) scores across New York City (NYC). The NAEP is a survey that measures general reading comprehension at the end of fourth grade (National Center for Education Statistics, n.d.). NAEP projections are calculated using data on the relationships between specific reading skills and general reading achievement. The cost-effectiveness analysis assumes general reading achievement maps directly to achievement on the NAEP test.

Equity

Equity is evaluated as a series of 5 binary indicators that reflect aspects of inequality that currently exist in reading outcomes:

1. The alternative should have an effect on Black and Hispanic children that matches or exceeds those of White children. An alternative may meet this criterion if the literature used to inform the alternative finds statistically significant and positive effects on

reading, at least equal to the effects on White students. Alternatively, the criterion is met if the alternative outlines specific procedures that will feasibly decrease the reading gaps along racial and ethnic categories.

2. The alternative must feasibly affect low-income families and low-resource schools. An alternative meets the criterion when the alternative will not disproportionally benefit families and schools that already have the resources to pursue private literacy interventions. Either all families and schools must benefit equally or low-income families and low-income schools must benefit more than high-resource families and schools.
3. The intervention must feasibly improve literacy outcomes for students with dyslexia.
4. The intervention must not burden children and families with work or activities that need to be completed outside of school hours. An ideal alternative will not pose any additional financial or time burden.
5. Due to the high percentage of English language learners (ELLs) in NYC schools, equitable alternatives will benefit ELLs as well as native English speakers. An ideal alternative is informed by literature that finds positive and statistically significant effects on literacy outcomes for ELLs. This criterion is also met by an alternative that details a feasible plan to reduce the literacy proficiency gap between ELLs and native English speakers.

Administrative feasibility

Effective alternatives must be achievable. Some alternatives may require extensive training and time to adopt new practices. Given the negative lifelong outcomes associated with poor early reading ability, an effective alternative has the potential to go into effect quickly. An ideal alternative will be simple enough that upper-level administrators and teachers could correctly and promptly adopt the alternative. Administrative feasibility is measured as the estimated annual administrative time required to implement the alternative.

Alternatives

Let present trends continue

New York City (NYC) has already developed several literacy initiatives. Notably, the Universal Literacy Initiative is a professional development program with literacy coaches. This program provides learning opportunities for elementary school teachers. It also deploys reading coaches to schools to help teachers learn how to apply reading science to their lessons. Initial evaluations of this program, while not methodologically strong, are positive (Research and Policy Support Group, 2018). However, due to the pandemic, most reading coaches were sent

back to the classroom and the Universal Literacy Initiative was paused in 2020 (Elsen-Rooney, 2020).

Before the pandemic, the city planned to scale up the Universal Literacy Initiative, as well as other literacy programs. They may resume after the pandemic. National Assessment of Educational Progress (NAEP) reading scores could improve with no further action from Advocates for Children of New York (AFC) or the Department of Education (DOE).

This alternative proposes AFC advocate for a return to the pre-pandemic status quo. AFC would emphasize the importance of returning to the Universal Literacy Initiative in all education briefs they publish throughout the remainder of the mayoral election. These briefs would emphasize the literature on literacy coaching programs that find positive effects on literacy. Additionally, they would specifically call for the return of the literacy coaches to their coaching positions.

Under this alternative, AFC would also design informational briefs for key stakeholders who may operate without a deep understanding of the issues surrounding literacy. They would design a brief aimed at school principals on the basics of reading science and the lack of implementation at many schools. AFC would coordinate with NYC-based education news outlets such as Chalkbeat to convey the following points: too few children in NYC can read proficiently, research finds substantial gains with science-based reading programs, and that research finds that balanced reading methods are not effective for many readers.

Finally, under this alternative, AFC would prepare a parent-centric report around the prevalence of dyslexia, the lack of curriculum coordination in the city, and the potential gains to science-based approaches. Specifically, they would inform parents that science-based recommendations were issued by the United States government 21 years ago and that the city still does not have a cohesive science-based curriculum at all schools (National Reading Panel, 2000). They should inform all parents that only 27 percent of NYC children are reading proficiently by the end of fourth grade (National Association of Educational Progress, 2019). Parents will likely be unhappy. Those who have the time and resources may put pressure on schools to commit to revamping their literacy practices. AFC could accomplish this by establishing a relationship with PTAlink, an NYC organization designed to disseminate information across all parent-teacher associations (PTAs) in the city. According to PTAlink's website, a common issue in PTAs is not having information about effective learning strategies in school (PTAlink, 2021). AFC could create a report on the research about reading science and PTAlink could distribute that information.

Alternative 1: Mandatory universal reading screening for all public schools

New York State and NYC do not mandate universal reading disability screening in public schools ("New York: State Education Agency (SEA) Dyslexia Legislation," 2020). Schools in NYC are allowed to make their own decisions regarding screening, curriculum, and reading interventions. Schools that screen all children may better identify those who are at risk of not learning to read proficiently.

Currently, two Brooklyn schools are piloting a universal screening initiative. In these schools, instructors use the Shaywitz DyslexiaScreen tool (Gonen, 2020). This tool can be used in grades K-3. Teachers evaluate students by answering questions about their classroom behavior. This tool requires the teacher to spend a few minutes reflecting on each student. It reports false-positive rates between 0 and 30 percent and false-negative rates between 12 and 29 percent across the four grade levels (Pearson's Clinical Assessment Group, n.d.). This indicates that up to 30 percent of students will be misidentified as high-risk while up to 29 percent of high-risk students will be classified as low-risk. Notably, there are better screening measures. This screening tool is easier, quicker, and relatively less costly than other more accurate tools. The Predictive Assessment of Reading (PAR) tends to have false negative and false positive rates both around 10 percent. The Shaywitz tool also requires teachers make inferences about their students' abilities. Teachers are not effective evaluators and their assessment of student abilities can often be wrong (Martin & Shapiro, 2011). PAR requires children to demonstrate their skills in a 15-minute test. This minimizes the risk of teachers' perceptions of students biasing the results.

Under this alternative, AFC would advocate for a commitment to instituting a universal screening mandate. AFC would release an educational brief to inform mayoral candidates on the advantages of universal screening. There are two schools already piloting the Shaywitz tool which indicates that there is at least some interest in this alternative. AFC would construct and present a plan within the brief to use a more accurate tool such as PAR. This would be framed as a crucial step towards preparing NYC to adopt a Response-to-Intervention (RTI) framework for reading. This framework is a school-wide, multi-tiered method of detecting reading risk and pairing students with appropriate interventions. AFC views an RTI framework as a long-run goal in public schools (Part, 2016). NYC currently lacks the resources to implement this framework. The brief should frame universal screening as a first step to an RTI model and emphasize the fact that universal screening mandates have already been adopted by many other states (Eide, 2019).

Alternative 2: Addition of Literacy Express to the subsidized ELA curricula recommendations list

In NYC, principals may select the curriculum they use at their school. The NYC DOE identifies purchasable curricula they recommend. In elementary school, NYC recommends Wilson Language Training or the ReadyGEN curricula for English language arts (ELA). Both show potential to improve reading outcomes generally, though ReadyGEN has a stronger design (EdReports, 2016; EdReports, 2012; Institute of Education Sciences, 2007c). These programs are designed for children in elementary school. NYC could add a recommended program to this list that is designed for children who have not yet attended kindergarten. An early foundation in reading can help prepare children to read effectively before they enter elementary school.

AFC could center early reading as a key education focus before the mayoral election. Under this alternative, they would write a brief highlighting the benefits of developing phonemic awareness at a young age. Specifically, AFC would recommend the Literacy Express program. The Institute of Education Sciences (IES) evaluated three randomized controlled trials (RCTs) of Literacy Express and found significant improvements in phonemic awareness and oral languages (Institute of Education Sciences, 2010a). AFC would recommend the mayoral candidates commit to recommending Literacy Express in the same way that the DOE already incentivizes similar programs for older grades.

Alternative 3: Addition of a pre-kindergarten unit of the Universal Literacy Initiative

The IES evaluates the academic literature on reading interventions. Phonological awareness training describes a set of practices that help children identify sounds in words. The practice helps students understand sounds individually and recognize that they can mix sounds to create new words. The IES identifies positive effects of phonological awareness training on word processing and communication. The IES finds that these positive effects exist for children with learning disabilities as well (Institute of Education Sciences, 2006; Institute of Education Sciences, 2012).

AFC could advocate that the mayoral candidates commit to developing an expansion to the Universal Literacy Initiative. This expansion would recruit reading coaches to work with public pre-kindergarten programs. AFC would write an initial proposal for the NYC DOE to devote more resources to the Universal Literacy Initiative to create a pre-kindergarten unit. Reading coaches would instruct pre-kindergarten teachers on using phonological awareness training. They would model best practices to incorporate into phonological awareness instruction. This awareness would develop one of the key components of literacy education, phonemic awareness.

AFC would draft a proposal that detailed the findings in the literature that support the use of literacy coaches. This proposal would also detail the benefits of phonemic awareness in young children. The report would advocate that the DOE give the Universal Literacy Initiative the funds to extend operations and create a pre-kindergarten branch. This branch would design a pilot program that randomly assigned reading coaches and professional development opportunities to a subset of the public preschools. If successful, the initiative would eventually spread to all other public preschools.

Evaluation of Alternatives

Let present trends continue

Cost-effectiveness

The cost-effectiveness of this alternative is -$74 billion per 1 point increase in National Assessment of Educational Progress (NAEP) scores.

Advocates for Children of New York (AFC) would create resources tailored to parents as well as school leaders. This is not expected to affect reading proficiency. AFC would expend no extra resources beyond their normal reports.

Without additional intervention, future NAEP scores are unlikely to improve. Due to the pandemic, the best-case scenario would be that reading trends continue on their current trajectory. Since 2009, scores have declined by an average of 0.46 points per year. In 2021, New York City (NYC) budgeted $34 billion to devote to education (New York City Department of Education, 2021a). Due to the expected decline in NAEP scores, the cost-effectiveness ratio is -$74 billion per 1-point decrease in NAEP scores.[3]

Equity

This alternative scores 1 out of 5 in equity.

This alternative is unlikely to improve racial and ethnic disparities in reading. It is also unlikely to improve socioeconomic disparities or outcomes for dyslexic students. Additionally, reading achievement for English language learners (ELLs) is unlikely to improve. However, this alternative will not pose any additional burden to low-resource schools or households.

Administrative feasibility

This alternative requires minimal work for AFC and no additional work for the Department of Education (DOE). AFC frequently writes policy briefs. This alternative will require up to a day of

[3] See the appendix for a detailed assessment of the cost-effectiveness of each criterion.

work to write the two briefs. Then, AFC may require a few more hours to reach out to the suggested media contacts to propose a partnership. There will be no additional administrative burden on the NYC government. This will require upwards of 20 hours of work.

Alternative 1: Mandatory universal reading screening for all public schools

Cost-effectiveness

The cost-effectiveness ratio of this alternative is $414.2 million per 1-point increase on the NAEP assessment.

This alternative will require schools to purchase the Predictive Assessment of Reading (PAR) tool for each student. Teachers will require access to the software used to collect and record student assessment results. Schools could also opt to purchase training resources; however, PAR's sales team claims that most schools do not find that necessary (Varela, 2021).

Schools vary in their approach to intervening with students with reading difficulties. The effectiveness estimate assumes that screening will identify students as needing an Individualized Education Plan (IEP). In NYC, there is a wide range of interventions students receive once they get an IEP. Approximately 84 percent of students with an IEP never receive all of the services to which they are entitled (New York City Department of Education, 2019). Others receive intense and costly interventions such as the city funding a student's private school attendance (Zimmerman & Gonen, 2019). To estimate the effect of getting an IEP, this analysis assumes that on average, the effect of an IEP for a dyslexic student amounts to more individualized attention and more specialized curricula.

Equity

This alternative scores 4 out of 5 in equity.

The PAR is shown to be effective in randomized controlled trials (RCTs) that use substantial subsamples of Black and Latino children. The validity is the same across racial and ethnic groups. These studies also used substantial numbers of low-income children and find that the tool works consistently. The PAR is 90 percent accurate and, if used correctly, will improve dyslexia identification at a young age. Due to the improved identification, this alternative has the potential to improve outcomes for dyslexic students. Finally, PAR also comes with a Spanish supplement that helps educators distinguish between Spanish-speaking children who are struggling to read and Spanish-speaking children who are struggling with English (Wood, 2013).

While the PAR tool is equitable, the interventions that follow may not provide children with the same quality of instruction. PAR does nothing to address current programming and resources available for students with dyslexia. Low-income families may still struggle to access their full

IEP services or understand their options once their child is diagnosed (New York City Department of Education, 2019; Zimmerman & Gonen, 2019).

Administrative feasibility

The administration of this alternative will require 182,740.5 hours of administrative labor annually.

The PAR comes with aides to learn how to utilize the tool. These aides include pamphlets, online tutorials, and paid professional development seminars. Professional development seminars are often not necessary (Varela, 2021). As such, the DOE will likely opt out of purchasing professional development seminars. Teachers will reference the online resources as needed. The primary administrative burden occurs during the screening process.

Screening occurs three times a year and requires 15 minutes per child (Annenberg Institute, n.d.; Varela, 2021). There are 243,654 students in grades K-3 ("NYC Public Schools Enrollment Data (2018 - 19)," n.d.). As such, the total time required for administration will be 182,740.5 hours per year.

Alternative 2: Addition of Literacy Express to the subsidized ELA curricula recommendations list

Cost-effectiveness

The cost-effectiveness ratio is approximately $24.1 million per 1-point increase in NAEP scores.

The DOE would suggest public pre-kindergarten programs adopt Literacy Express. This program cost $2,300 in 2010 per classroom (Institute of Education Sciences, 2010a). There are approximately 4,088 universal pre-kindergarten locations as of 2019 (Calgary, n.d.). Assuming the adoption rates are similar to the adoption rates of the recommended elementary school English language arts (ELA) curricula, 55.1 percent of public preschools will adopt the curriculum (E. Henry, personal communication, March 16, 2021).

Equity

This alternative scores 5 out of 5 in equity.

The Institute of Education Sciences evaluated three RCTs to inform their report on the effectiveness of Literacy Express. Of the three studies they compiled, two had samples that were more than 50 percent Black. In one of those studies, more than 30 percent of students were Hispanic. This intervention shows consistent positive effects across racial and ethnic categories. Furthermore, this alternative has the potential to benefit low-income children and low-resource schools. The DOE will subsidize Literacy Express, thereby making it more affordable than other curricula for low-resource schools. The curriculum is used during class

time and it may be used in both part-day and full-day programs (Institute of Education Sciences, 2010a). There is no additional burden on low-income families to spend time outside of preschool on literacy development.

The evidence supports this program as the curriculum that would aid dyslexic students. The intervention has demonstrated positive effects on phonological processing which is a skill many dyslexic students struggle to learn and retain into adulthood (Bruck, 1992; Fawcett & Nicolson, 1995). Early development of this skill is likely to be especially beneficial for dyslexic students. Furthermore, this alternative has the potential to aid ELLs. The Institute of Education Sciences evaluated two rigorous studies that included large samples of ELLs. One of these studies used a sample of predominately Spanish-speaking students (Farver, Lonigan, & Eppe, 2009). Another conducted an experiment in which half of the students at the 30 California schools used in the experiment spoke Spanish (Lonigan, Farver, Phillips, & Clancy-Menchetti, 2011). Both studies found promising results with Spanish-speaking children (Institute of Education Sciences, 2010a).

Administrative feasibility

The administration of this alternative will require 54,071.5 hours of administrative labor annually.

The primary administrative burden is in learning how to use the curriculum. The time spent teaching the curriculum is not considered because it simply replaces the previous curricula. The Literacy Express program requires teachers to take three full-day professional development workshops. Two are at the beginning of the school year and the third is during the year. The third can also be delivered as two half-day events (Institute of Education Sciences, 2010a). In total, assuming a full day is 8 hours, each pre-kindergarten teacher will spend 24 hours annually on the program. NYC generally requires that preschools do not exceed a student-teacher ratio of 18 students to 1 teacher and 1 paraprofessional (NYC Department of Education, 2018). There are approximately 73,600 students enrolled in public preschools ("NYC Public Schools Enrollment Data (2018 - 19)," n.d.). Only the main teacher will need to attend the professional development programs. Assuming 55.1 percent of public preschool programs will adopt, this creates a burden of 54,071.5 hours annually.

Alternative 3: Addition of a pre-kindergarten unit of the Universal Literacy Initiative

Cost-effectiveness

The cost-effectiveness ratio of this alternative is $95.8 million per 1-point increase in NAEP scores.

This alternative creates a unit of the Universal Literacy Initiative that deploys reading coaches to work with pre-kindergarten teachers. Given the most recent coach-to-teacher ratio, the

program will ultimately need 249 reading coaches to serve public pre-kindergarten classrooms. On average, the Universal Literacy Initiative spends $97,638 per coach (Research and Policy Support Group, 2018).

In a meta-study, researchers evaluated 60 studies on professional development programs with teachers of young children. These studies found moderate effects on the reading achievement of the children in small studies. However, large-scale programs are shown to have smaller effects on general reading achievement (Kraft et al., 2018). This assessment uses the Kraft et al. (2018) estimate of large-scale coaching program effects on reading achievement of 0.18 standard deviations to estimate a cost-effectiveness ratio of $95.8 million per 1-point increase in NAEP scores.

Equity

This alternative scores 4 out of 5 in equity.

The literature on professional development programs and literacy coaching includes many studies with racially and ethnically diverse samples. Additionally, researchers find phonological awareness training has positive effects in samples with racially and ethnically diverse children (Blachman, Tangel, Ball, Black, & McGraw, 1999). The Universal Literacy Initiative already serves districts with high economic needs (Research and Policy Support Group, 2018). The extension of the Universal Literacy Initiative would serve similar public preschools with high levels of economic need. The reading coaches work directly with teachers. There is no additional burden placed on low-income households to work on literacy outside of school.

Phonological awareness training would help students with learning disabilities. Studies indicate that phonological awareness training can improve communication among disabled children (Institute of Education Sciences, 2012). Phonological awareness training is one of the few interventions reviewed by the Institute of Education Sciences that demonstrates positive effects for those with disabilities (Ritchey, 2011).

Finally, the Universal Literacy Initiative does not provide any specific instruction on ELL student needs. The meta-study on coaching and professional development does not include any ELL-specific results and the studies on phonological awareness training did not include samples with high proportions of ELL students (Institute of Education Sciences, 2012). It is unclear how this alternative would affect ELLs.

Administrative feasibility

The administration of this alternative will require 498,000 hours of administrative labor annually.

The administrative burden can be captured by the labor directed towards the initiative by the reading coaches. Given the Universal Literacy Initiative's ability to serve approximately 70,000 K-2 students with 236 coaches, the full program will need 249 coaches to serve the approximately 73,600 students in pre-kindergarten ("NYC Public Schools Enrollment Data (2018 - 19)," n.d.; Research and Policy Support Group, 2018). These coaching positions are full-time jobs and coaches will likely work 40 hours a week for 50 weeks a year. This amounts to a total of 498,000 additional administrative hours a year.

Recommendation

Based on the criteria, I recommend Advocates for Children of New York (AFC) pursue Alternative 2. AFC should advocate for the Department of Education (DOE) to recommend public pre-kindergarten programs adopt Literacy Express. The DOE should subsidize the purchase of Literacy Express, just as they do with the recommended elementary English language arts (ELA) curricula. Table 1 summarizes the evaluation of the alternatives with respect to the criteria. This alternative is the most equitable and it is, by far, the most cost-effective. Relative to the other alternatives, this action is also administratively feasible. Given the current pandemic-related constraints on the city, Alternative 2 is the most feasible city-wide action for which AFC could advocate.

Table 1: Outcomes Matrix

	Cost-effectiveness ratio	Equity	Administrative feasibility
Let present trends continue + informational briefs	-$74,057.9 million	1/5	20 hours
Universal screening	$414.2 million	4/5	182,740.5 hours
Pre-kindergarten NYC DOE-sponsored curriculum	$24.1 million	5/5	45,240 hours
Pre-kindergarten wing of the universal literacy initiative	$95.8 million	4/5	498,000 hours

Implementation

Advocates for Children of New York (AFC) view this mayoral election as an opportunity to influence the education agenda of the mayoral candidates (Part, 2021). This mayoral election is

atypical. There is no incumbent candidate, there are dozens of candidates, the country is still experiencing a pandemic, and this is the first mayoral election that will use ranked-choice voting (Durkin, 2019; Spivack, 2021). According to early opinion polls, Andrew Yang, Eric Adams, Maya Wiley, and Scott Stringer appear to be the top four contenders (Core Decision Analytics & Fontas Advisors, 2021; Goldenberg, 2021). The race is still competitive: only half have decided on a candidate to support. Additionally, as the competition increases, candidates will pay more attention to education. A March 24 poll finds that 88 percent of respondents rated improving education as "very" or "extremely" important (Core Decision Analytics & Fontas Advisors, 2021). Despite this, the front-runners still have underdeveloped literacy education platforms.

> *Andrew Yang:* Andrew Yang's campaign website celebrates the implementation of Universal Pre-K under the de Blasio administration. He advocates for the expansion of 3-K, an extension of Universal Pre-K to three-year-old children (Yang for New York, 2021).
>
> *Eric Adams:* Eric Adams's campaign website states that to improve the education system, New York must "focus much more on how [students] learn—not just what they learn." He focuses on fixing the problems brought on by remote learning, changing the school calendar structure, and desegregating schools, though the manner is unclear (Eric Adams for Mayor, 2021).
>
> *Maya Wiley:* Maya Wiley's campaign website does not have a detailed education plan. She expresses a desire to address structural inequality through transformative policies. Specifically, she advocates universal broadband, increased virtual options post-pandemic, and using vacant buildings to create more educational spaces (Maya Wiley for Mayor, 2021).
>
> *Scott Stringer:* Scott Stringer's campaign website discusses his record advocating for smaller class sizes and increasing funds for the arts as well as aspirations to cultivate talented teachers, extend broadband access, and increase diversity in schools (Stringer for Mayor, 2021).

None of these candidates have committed to any reading intervention nor have they commented on New York City's (NYC) low levels of reading proficiency. Each of them is aware that education is a major issue but there is no indication that any are either aware of or interested in NYC's literacy issue.

Unknowns

The rate at which elementary classrooms adopted the recommended elementary school English language arts (ELA) curriculum is unknown. The information on the adoption rate of the recommended elementary curricula is not public knowledge. I received the current adoption information in an email from a member of the Panel for Education Policy in the Department of Education with no additional information about take-up trends (E. Henry, personal communication, March 16, 2021). The current rate of adoption, approximately 55 percent, was achieved after the issuance of these recommendations in 2013 (Cramer, 2013). Pre-kindergarten classes will likely reach similar proportions of curriculum adoption but the rate at which this will occur is also unknown.

Additionally, the state of the United States is evolving rapidly due to the pandemic. The full impact of the pandemic on education will not be known for years to come. It is unclear to what extent politicians will be willing to devote time spent on education to something other than COVID-19 relief.

Final Strategy

First, AFC needs to get the attention of mayoral candidates. AFC has already published its recommendations for the next mayor (Advocates for Children of New York, 2021). AFC should use the information about literacy within this policy analysis and within the content of this project to create an issue brief. They must highlight information about the low levels of reading proficiency, the existence of a large collection of literature on how to teach literacy, and the incongruence between these two ideas. They should then create a separate brief that is more technical. This brief should advocate for the adoption of Literacy Express as a recommended pre-kindergarten curriculum option. This brief would be posted on AFC's website.

There is nothing to indicate that the candidates will not respond to the low levels of reading achievement in NYC. They are all toting education plans and are incentivized to appear the most prepared to deal with the impact of COVID-19 on families. This is evidenced by the fact that each dedicated space on their websites for education recovery. They are likely unaware of the extent of the literacy issue.

AFC should not reach out to any of these campaigns individually. AFC is strictly nonpartisan and avoids showing favor to any candidates (Part, 2021). Instead, AFC should use their contact at Chalkbeat to publish a piece on literacy during the pandemic. This piece should highlight the lack of public commitment to a specific literacy strategy from any of the leading candidates. This method might not reach the candidates as it is primarily geared towards educators.

To address the difficulty of getting this information in front of the candidates, AFC should try to also increase issue salience among the constituents. They should propose pieces to the New York Post, the New York Times, and Newsday. These are all popular publications with broader appeal than Chalkbeat. Finally, they should contact PTAlink, an organization designed to distribute information across NYC school parents (PTAlink, 2021). Doing this may not bring the information directly to the candidate but it could increase issue salience among enough of their constituents that it causes candidates to pay attention. The candidate can then navigate to AFC's website. On the website, the campaign teams will find AFC's policy recommendations which outline the plan to adopt Literacy Express as a recommended curriculum.

Conclusion

Literacy among New York City (NYC) school children is poor and unlikely to improve without future intervention. Children must learn how to read. Poor literacy is associated with worse mental and physical health, lower educational attainment, and lower lifetime earnings (Clark & Teravainen-Goff, 2018; Hernandez, 2011; Morgan et al., 2012).

The United States developed a position on reading education in 2000. The government advises that schools follow a scientific approach to teaching literacy. This entails systematically teaching children the relationships between sounds and letters so that they learn how text is translated to language (National Reading Panel, 2000). Many schools and educators never adopted these recommendations (Harwin, 2020; "NCTQ," 2020).

Advocates for Children of New York (AFC) is in a unique position to advance education policy. There is currently a highly competitive mayoral election happening in NYC. AFC has the opportunity to influence the education agendas of the top candidates. The new mayor will have the opportunity to control the policies of the NYC Department of Education (Amin, 2019). AFC should advocate that the new mayor commits to adding Literacy Express to the subsidized English language arts curriculum list. This program could develop phonemic awareness, one of the five principles of reading science, in preschool-aged children. This would bring NYC closer to fully adopting the recommendations of the National Reading Panel in 2000.

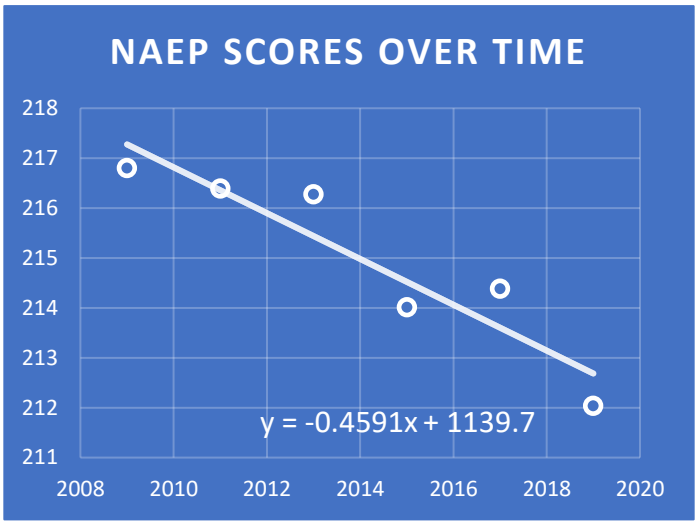
Appendix

The cost-effectiveness estimates required the use of many assumptions. This appendix outlines those assumptions, their sources, and the calculations used to arrive at the final estimates.

Let present trends continue

National Assessment of Educational Progress (NAEP) scores in New York City (NYC) have declined in the past decade (National Association of Educational Progress, 2019). Figure 1 plots this decline. The cost-effectiveness analysis uses this trendline to estimate the future change in NAEP scores. Figure 1 suggests that there is an annual decline in NAEP scores of 0.46 points.

Figure 1: NYC NAEP Scores Over Time



Costs are estimated using the 2020-2021 education budget. This year, the budget was $34 billion (New York City Department of Education, 2021a).

Given a cost of $34 billion on education spending and the projected decline in NAEP scores of 0.46 points on average, the cost-effectiveness ratio equals:

$$\frac{\$34{,}000{,}000{,}000}{-0.4591} = -\$74{,}057{,}939{,}446.74$$

Alternative 1: Mandatory universal reading screening for all public schools

To calculate the cost-effectiveness ratio for Alternative 1, this analysis makes the assumptions outlined in Table 2.

This alternative would begin screening children in grades K-3. The improvement in city-wide average NAEP scores should come shortly after children are screened and connected with services. The improvement in NAEP scores will represent a level shift. Assuming NYC does not change its interventions, there will be no cumulative benefits.

To calculate the cost, I multiplied the number of students in K-3 by the PAR subscription cost per student. I then added the product of the cost of teacher packets to the number of K-3 classrooms.

To calculate the effectiveness, I assume that the average effect of receiving an individualized education plan (IEP) would equal the effects of a better curriculum and individualized attention. To approximate that effect, I used the effect estimates on reading achievement found in small randomized controlled trials (RCTs) of the existing recommended program, Wilson's Reading System. I multiplied the effect of Wilson's Reading System on phonics (in standard deviations) by the effect of phonics on reading achievement. I then multiplied that estimate by the standard error of the 2019 NAEP average score. This resulted in an estimate of an average 0.22-point improvement for those connected with IEPs as a result of the screening.

To calculate the city-wide average effect, I estimated the number of K-3 students that are likely dyslexic. Assuming 8 percent of the population is dyslexic, approximately 19,500 students in grades K-3 are dyslexic. I multiplied that number by the accuracy of PAR to determine the number of students who would be identified by PAR as dyslexic. I then subtracted that by the current number of students identified as dyslexic. The resulting value is the number of students who would only be identified as dyslexic due to the intervention. I converted this to the percentage of all students who would be newly identified under this alternative. I then adjusted the estimate to account for approximately 80 percent compliance with screening procedures and approximately 85 percent compliance with connection to IEP services. I found that approximately 2.2 percent of students would be affected by this alternative. I multiplied the estimated effect of the intervention for students would get IEPs by the percentage of students affected to get the final city-wide effectiveness estimate of 0.0047 points.

Finally, I calculate the cost-effectiveness ratio by dividing the cost in year 1 by the estimated increase in city-wide NAEP scores. I find a cost-effectiveness estimate of 414.2 million per 1-unit increase in NAEP scores per cohort of students.

In this alternative, universal screening would only apply to grades K-3. Most of the assumptions come from data that is cited in the source column. However, two assumptions are not pulled directly from another paper. First, I assume there is 80 percent compliance in screening practices. This is based on the idea that full compliance is unlikely. To test the sensitivity of this assumption, I have calculated the cost-effectiveness under 1, 25, 50, 80, and 100 percent compliance. In the scenario in which there is 100 percent compliance, the cost-effectiveness ratio is 323.2 million. In the worst-case scenario, with only 1 percent compliance, the cost-effectiveness ratio is approximately $32 billion. Regardless of compliance, this alternative is ranked third in cost-effectiveness.

The other assumption that is not pulled directly from the literature is the assumption of the true percentage of dyslexics in the population. Estimates of dyslexia range from 5 to 20 percent

(Siegel, 2006; Yale Center for Dyslexia and Creativity, n.d.). Eight percent is a reasonable estimate within this range. In sensitivity tests, I calculate the cost-effectiveness ratio with an estimate of 5, 15, and 20 percent of true dyslexia prevalence. If the prevalence of dyslexia is truly 5 percent, the cost-effectiveness ratio is $2.4 billion. If the prevalence is 20 percent, the cost-effectiveness ratio is $93.1 million. This cost-effectiveness ratio would put Alternative 1 as the second-best alternative with respect to cost-effectiveness. However, it only surpasses Alternative 3 once the prevalence of dyslexia is approximately 19.7 percent. This is the highest end of the population estimates of dyslexia and is unlikely to represent the true value in NYC schools.

Table 2: Alternative 1 Assumptions

ASSUMPTIONS		SOURCE
SCHOOL CHARACTERISTICS:		
GRADES SCREENED	K-3	
TOTAL NUMBER OF STUDENTS IN K-3	243,654	("NYC Public Schools Enrollment Data (2018 - 19)," n.d.)
TOTAL K-3 CLASSROOMS	10,271	(New York City Department of Education, 2020)
DYSLEXIA INFORMATION:		
ACCURACY OF PAR	90%	(Wood, 2013)
TRUE PERCENTAGE WITH DYSLEXIA	8%	Used to inform imputation: (Siegel, 2006)
TOTAL NUMBER WITH SPECIFIC LEARNING DISABILITIES (SLDS)	12,076	(New York City Department of Education, 2019)
PERCENTAGE OF DYSLEXICS AMONG SLDS	80%	(Pearson's Clinical Assessment Group, n.d.)
NAEP SCORES:		
NYC 2019 READING AVERAGE	212.03	(National Association of Educational Progress, 2019)
NYC 2019 READING AVERAGE STANDARD ERROR	1.491	(National Association of Educational Progress, 2019)
EFFECT OF WILSON'S READING SYSTEM ON PHONICS	0.33	(Institute of Education Sciences, 2007c)
EFFECT OF 1 STANDARD DEVIATION IMPROVEMENT IN PHONICS ON READING GENERALLY	0.44	(National Reading Panel, 2000)
LIKELY PERCENTAGE THAT FULLY IMPLEMENTS SCREENING	80%	[Assumption]
PERCENTAGE OF IEP STUDENTS WHO GET IEP	84%	(New York City Department of Education, 2019)
SCREENING INFORMATION:		
COST OF TEACHER PACKET (PER CLASSROOM)	$50.00	Varela, E. (2021, March 9). Interview with PAR Sales Representative [Phone].
COST OF PAR TOOL PER STUDENT	$6.00	Varela, E. (2021, March 9). Interview with PAR Sales Representative [Phone].

Table 3: Cost-Effectiveness of Alternative 1

Year (Year 0 = 2021)	Discount rate	Inflation index	Costs (Inflation-adjusted & discounted) Screening Costs (PAR)	Units of effectiveness
0	3%	1.00	$0.00	
1	3%	1.02	$1,956,294.64	
2	3%	1.04	$1,937,301.49	0.004723246
TOTAL			$3,893,596.13	0.004723246

Alternative 2: Addition of Literacy Express to the subsidized ELA curricula recommendations list

To calculate the cost-effectiveness ratio for Alternative 2, the analysis makes the assumptions outlined in Table 4.

To calculate costs, I adjust the Literacy Express cost per classroom from 2010 USD to 2021 USD using the consumer price index. I cost of providing Literacy Express by multiplying the estimated number of classrooms by the 2021 cost of Literacy Express per classroom. I then adjust this figure to account for approximately 55.1 percent adoption.

To calculate effectiveness, I multiply the effects of Literacy Express (in standard deviations) on phonological processing, print knowledge, and oral language by the effects of those skills on general reading achievement. I sum those estimates and multiply the result by the standard error of the 2019 average NAEP score. I find a maximum average effect of a 0.53-point increase in NAEP scores for those who use Literacy Express. To calculate the city-wide effect, I adjust the effect to account for the estimated 55.1 percent take-up rate. I also adjust for the estimated 9 percent of public elementary school students who may take the NAEP assessment but did not attend a public preschool. I estimate that Alternative 2 is associated with a city-wide 0.26-point increase in average NAEP scores.

Table 5 shows the cost-effectiveness calculations. The costs begin to occur this year because implementation will be relatively simple. The impact on NAEP scores does not occur until year 5 because that is the year that the first cohort of pre-kindergarten students will be in fourth grade. Only then will they be eligible to take the NAEP assessment. The cost-effectiveness ratio per cohort of students is the first year of costs divided by the estimated effect on NAEP scores.

Table 4: Alternative 2 Assumptions

ASSUMPTIONS		SOURCES
PRE-K INFORMATION:		
NUMBER OF UNIVERSAL PRE-K LOCATIONS	1,885	(Calgary, n.d.)
PERCENTAGE OF K-5 SCHOOLS THAT USE WILSON'S FUNDATIONS (CITY-RECOMMENDED)	32.66%	(E. Henry, personal communication, March 16, 2021)
PERCENTAGE OF K-5 SCHOOLS THAT USE READYGEN (CITY-RECOMMENDED)	22.44%	(E. Henry, personal communication, March 16, 2021)
PERCENTAGE OF PRE-K LOCATIONS THAT WOULD ADOPT RECOMMENDATIONS	55.10%	Combination of percentages using ReadyGEN and Wilson's Fundations
NUMBER ENROLLED IN PRE-K (HALF DAY) IN 2018-2019	2,101	("NYC Public Schools Enrollment Data (2018 - 19)," n.d.)
NUMBER ENROLLED IN PRE-K (FULL DAY) IN 2018-2019	71,481	("NYC Public Schools Enrollment Data (2018 - 19)," n.d.)
NUMBER IN PRE-K IN 2018-2019	73,582	
NUMBER IN 4TH GRADE IN 2018-2019	80,923	("NYC Public Schools Enrollment Data (2018 - 19)," n.d.)
APPROXIMATE % IN UNIVERSAL PRE-K LOCATIONS	90.93%	Number in Pre-K divided by the number in 4th grade
AVERAGE MAXIMUM PRE-K CLASS SIZE	18	(NYC Department of Education, 2018)
MINIMUM NUMBER OF CLASSROOMS	4,088	Number of pre-K students divided by the average maximum pre-K class size
EFFECTS OF LITERACY EXPRESS (STANDARD DEVIATION):		
PHONOLOGICAL PROCESSING	0.33	(Institute of Education Sciences, 2010a)
PRINT KNOWLEDGE	0.38	(Institute of Education Sciences, 2010a)
ORAL LANGUAGE	0.33	(Institute of Education Sciences, 2010a)
EFFECTS OF CONCEPTS ON READING COMPREHENSION (STANDARD DEVIATIONS):		
PHONOLOGICAL PROCESSING	0.7	(Bus & van IJzendoorn, 1991)
PRINT KNOWLEDGE	0.32	(National Reading Panel, 2000)
ORAL LANGUAGE	0	(Elleman, Lindo, Morphy, & Compton, 2009)
COST:		
COST PER CLASSROOM IN 2010	$2,300	(Institute of Education Sciences, 2010a)
CPI JAN 2021	270.025	(U.S. Bureau of Labor Statistics, 2021)
CPI JAN 2010	220.633	(U.S. Bureau of Labor Statistics, 2021)
NAEP SCORES:		
NYC 2019 READING AVERAGE	212.03	(National Association of Educational Progress, 2019)
NYC 2019 READING AVERAGE STANDARD ERROR	1.491	(National Association of Educational Progress, 2019)

Table 5: Cost-Effectiveness of Alternative 2

Year (Year 0 = 2021)	Discount rate	Inflation index	Costs (Inflation-adjusted, discounted)	Unit of effectiveness
0	3%	1.00	$2,923,642.68	0
1	3%	1.02	$2,895,257.80	0
2	3%	1.04	$2,839,312.11	0
3	3%	1.06	$2,757,414.00	0
4	3%	1.08	$2,651,879.37	0
5	3%	1.10	$2,525,622.86	0.263397206
TOTAL			$8,491,983.92	0.263397206

Alternative 3: Addition of a pre-kindergarten unit of the Universal Literacy Initiative

To calculate the cost-effectiveness ratio for Alternative 3, the analysis makes the assumptions outlined in Table 6.

To calculate costs, I estimate the average spending per coach by dividing the Universal Literacy Initiative yearly spending by the number of coaches in each year. The cost in 2016 was abnormally low because it was the first year of the program. I take the average cost per coach in 2017, 2018, and 2019 to estimate spending per literacy coach. I also estimate the number of coaches that will be needed for the full program. I calculate the coach-to-student ratio in 2017-2018. I then divide the total number of students in public pre-kindergarten programs in 2018-2019 by the coach-to-student ratio to find the total number of coaches needed for the full program.

I estimate both the cost of the pilot program and the cost of full implementation. Assuming that a pilot will require approximately 10 percent of public preschool locations to participate, 189 facilities will participate in the pilot. Twenty-five coaches will be needed. To calculate the cost, I multiply the average cost per coach by the number of coaches needed. I do the same process to calculate the total cost of the full program.

To calculate the effectiveness, I use the Kraft et al. (2018) estimate of the effect of large-scale coaching programs on reading achievement. I multiply this estimate by the standard error of the 2019 NAEP average score. I adjust my estimate to reflect that approximately 91 percent of students who are eligible to take the NAEP assessment attend public pre-kindergarten. I estimate that this program will lead to an average increase of 0.27-points in city-wide NAEP scores.

Table 7 shows the cost-effectiveness calculations. The expansion of the Universal Literacy Initiative is likely to cause a level shift in NAEP scores rather than cumulative gains. The per-cohort cost-effectiveness ratio is estimated by dividing the cost of the fully implemented program in year 4 by the estimated city-wide change in NAEP scores in year 9. The city-wide effect of the pilot program is not considered in this calculation as it is expected to be marginal.

Table 6: Alternative 3 Assumptions

ASSUMPTIONS		SOURCES
NAEP SCORES:		
NYC 2019 READING AVERAGE	212.03	(National Association of Educational Progress, 2019)
NYC 2019 READING AVERAGE STANDARD ERROR	1.491	(National Association of Educational Progress, 2019)
SPENDING ON ULIT:		
SPENDING 2019	$59,240,000	(New York City Independent Budget Office, 2016)
SPENDING 2018	$41,960,000	(New York City Independent Budget Office, 2016)
SPENDING 2017	$16,410,000	(New York City Independent Budget Office, 2016)
SPENDING 2016	$1,380,000	(New York City Independent Budget Office, 2016)
NUMBER OF READING COACHES:		
2019	500	(New York City Department of Education, 2021b)
2018	400	(Research and Policy Support Group, 2018)
2017	236	(Research and Policy Support Group, 2018)
2016	86	(Research and Policy Support Group, 2018)
PLANNING:		
NUMBER ENROLLED IN PRE-K (HALF DAY) IN 2018-2019	2,101	("NYC Public Schools Enrollment Data (2018 - 19)," n.d.)
NUMBER ENROLLED IN PRE-K (FULL DAY) IN 2018-2019	71,481	("NYC Public Schools Enrollment Data (2018 - 19)," n.d.)
NUMBER IN PRE-K IN 2018 (UPDATED 2020)	73,582	
NUMBER OF K-2 STUDENTS SERVED BY 2017-18 ULIT PROGRAM	70,000	(Research and Policy Support Group, 2018)
COACH-TO-STUDENT RATIO (USING 2017-18 DATA)	296.6101695	
NUMBER OF PRE-K LOCATIONS	1,885	(Calgary, n.d.)
TOTAL NUMBER OF COACHES NEEDED	249	Number of pre-K students divided by coach-to-student ratio
PILOT: NUMBER OF CLASSROOMS	189	10 percent of the number of pre-K establishments
NUMBER OF COACHES NEEDED FOR PILOT	25	10 percent of total reading coaches needed
EFFECT SIZE:		
EFFECT SIZE OF COACHING PROGRAMS ON GENERAL ACHIEVEMENT	0.18	(Kraft et al., 2018)

Table 7: Cost-Effectiveness of Alternative 3

Year (Year 0 = 2021)	Discount rate	Inflation index	Costs (Inflation-adjusted, discounted)		Unit of effectiveness
			Pilot	Full Implementation	
0	3%	1.00	$0.00	$0.00	0
1	3%	1.02	$2,417,250.62	$0.00	0
2	3%	1.04	$2,370,541.56	$0.00	0
3	3%	1.06	$2,302,164.83	$0.00	0
4	3%	1.08	$0.00	$23,381,364.88	0
5	3%	1.10	$0.00	$23,154,361.34	0
6	3%	1.13	$0.00	$22,929,561.71	0.024403368
7	3%	1.15	$0.00	$22,706,944.61	0
8	3%	1.17	$0.00	$22,486,488.84	0
9	3%	1.10	$0.00	$20,572,350.15	0.219630308
TOTAL			$7,089,957.01	$135,231,071.52	0.244033676

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