A MIXED METHODS EVALUATION OF THE UTILIZATION OF ANALOGICAL
REASONING TO REDUCE OPPORTUNITY GAPS IN UNIVERSAL SCREENING FOR
GIFTED EDUCATION

By
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Abstract

Gifted identification measures in the U.S. have persistently failed to achieve proportionate representation across racial and socioeconomic strata due opportunity gaps perpetuated within education systems (Campbell, 2012; Ford, Grantham, & Whiting, 2008; Ladson-Billings, 2006; Milner, 2012; Peters, Gentry, Whiting, & McBee, 2019). This mixed methods evaluation of one urban, mid-sized district’s intervention to incorporate lessons in analogical reasoning and providing technology access to PreK students prior to universal screening with the NNAT found that this use of frontloading can result significantly increased identification of gifted students in Title I qualifying schools.

Keywords: gifted identification, universal screening, opportunity gaps, Critical Race Theory, mixed methods, evaluation, digital divide, analogical reasoning, prekindergarten, kindergarten

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Dedication

To the millions of gifted African American students with endless potential who deserve to be seen, uplifted, and affirmed in their educational experiences.
Acknowledgements

I would first and foremost like to acknowledge the scholars of color who shaped my thinking and beliefs about race and how this construct influences education policies, practices, and experiences. In particular, I would like to acknowledge Dr. Gloria Ladson-Billings, Dr. Donna Ford, Dr. Gilman Whiting, Dr. James Moore III, Dr. Richard Milner, Dr. William Tate, Dr. Pedro Noguera, and Dr. Tarek Grantham whose works shaped the theoretical framework of this dissertation and continually influence how researchers discuss and analyze race in U.S. education systems. Without their scholarly contributions, this study would not have been possible.

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Chapter 1: Opportunity Gaps in Gifted Education

Gifted education programs across the United States have struggled to equitably identify gifted students across racial and socioeconomic strata (Campbell, 2012; Ford, Grantham, & Whiting, 2008; Ladson-Billings, 2006; Peters & Engerrand, 2016; Peters, Gentry, Whiting, & McBe, 2019). This dissertation focuses on one mid-sized, urban school district in the Mid-Atlantic region of the United States, hereby referred to as the District. The District’s Gifted and Talented (GT) Office has been operating for eight years and in this time has successfully established gifted education services in all of their schools, 63 of which qualify for Title I, but they have not yet established gifted identification procedures that result in representative equity (Lymer & Jutras, 2019). As a result, the District, similar to others nationally, is exploring opportunities to more accurately identify gifted students, including employing interventions that may increase identification of gifted students of color and students living in concentrated areas of poverty.

Literature Review

Gifted African American students, as well as students living in communities that have been historically under-resourced, are consistently underrepresented and underserved in gifted programs across the United States (Ford et al., 2008; Peters et al., 2019). Many barriers to equity in gifted identification exist including rigid identification measures, lack of teacher development, opportunity gaps, and the absence of rigorous, multicultural curricula. However, they all are ultimately rooted in cultural biases and the systems that reinforce them (Ladson Billings & Tate, 1995; Nkomo & Ariss, 2014; Noguera & Alicea, 2020). All too often, it is assumed that education, data-informed decision-making, and assessments are race-neutral and thereby when outcomes disproportionately impact one group over another, it is the result of deficiencies rather
than structural inequality (Noguera & Alicea, 2020). However, educational systems have historically centered white students and their families in curricula, policy, and decision making, ignoring students of color and their families, resulting in disproportionate outcomes (Ladson-Billings & Tate, 1995). This dynamic has led to African American students being underrepresented in gifted programs by as much as 55% nationally, with only 11.5% of teachers recommending African American girls for advanced coursework (Campbell, 2012; Ford et al., 2008). As such a deeper investigation into structural inequalities must be conducted in order to fully contextualize this problem.

**Theoretical Framework**

To theorize the root of underrepresentation, one must first accept that educational settings are inherently racialized. As traditionally white institutions in the United States, schools embody “intersecting mechanisms that contribute to the reproduction of white privilege and power” (Moore, 2008, p. 14). This institutionalized reality limits the opportunities for students of color to achieve at an equitable level as their white peers, as students are often expected to display white, middle-class family values within educational settings, thus forcing many racial minorities, particularly those living in concentrated areas of poverty, to disassociate with their own culture to find academic success (Campbell, 2012; Ford et al., 2008; Ladson-Billings & Tate, 1995; Lee, Olszewski-Kubilius, & Peternel, 2009). This disassociation may also contribute to academic underachievement, resulting in mitigated opportunities for gifted identification in many districts (Ford et al., 2008). In the case of the District, students can only be identified as gifted if they have reached the 90th percentile on nationally normed achievement measures in math, reading, and nonverbal ability (Lymer & Jutras, 2019).
Ultimately, the racial history of the United States and the formation of its public services shed light on why gifted African American students are continually overlooked by school systems. There are three assertions of Critical Race Theory (CRT) that can be applied to analyzing discriminatory educational systems: race is a major factor of inequity, the United States is rooted in property rights, and the intersection of both race and property can be used to analyze educational inequalities (Ladson-Billings & Tate, 1995). When investigating the historical foundations of the United States, this makes sense, as it becomes clear that this country was built around understanding rights in relation to property (Ladson-Billings & Tate, 1995). The Constitution was written, in part, to enable the enslavement of Africans and African Americans, e.g. deem humans as property, which inherently created a better than, less than approach to understanding people on the basis of race (Ladson-Billings & Tate, 1995). Today, this manifests itself in a myriad of ways, though predominantly through the concept of property taxes; the more money one pays in taxes the more they feel they deserve to have better schools than those who pay less, thus reinforcing a racialized inequality between affluent white neighborhood schools and predominantly minority-majority populated schools that have been historically under-resourced (Ladson-Billings & Tate, 1995). Not surprisingly, this phenomenon varies very little from what Du Bois (1925/1995, pp.700-701) observed in the early 1900s: “White schoolhouses were the best in the community, and conspicuously placed, and cost anywhere from twice to ten times colored schools.”

Despite these realities, white teachers and administrators continually fail to identify how white ideals of success normalize whiteness in schools, fundamentally contributing to racism and white supremacy (Flynn, 2012). As Noguera and Alicea (2020) describe, systems in the U.S., including education, are often considered race-neutral. However, the utilization of data to make
decisions about school funding, school closures, and ways of interpreting student performance is inherently racialized (Noguera & Alicea, 2020). These decisions are often made in isolation without examining why the outcomes appear the way they do, resulting in the further perpetuation of structural racism (Noguera & Alicea, 2020).

As a result, students of color are continually expected to embrace white-normed measures of achievement, as are mandated by education systems, such as high test scores and grade-point averages determined by Euro-centric assessments and curricula, and adopting specific forms of speech, behavior, and style to be deemed successful by academic institutions and society (Chambers, Huggins, Locke, & Fowler, 2014, Noguera & Alicea, 2020). This contributes to double consciousness or the way African American students and other racial minorities have to continually see themselves through the lens of (white) others to measure their worth (Du Bois, 2004).

Du Bois’ (2004) theory of double consciousness is reinforced by the concept of Racial Opportunity Cost (ROC). Similar to understanding economics, students of color regularly are forced to exchange their racial identities for academic success, resulting in isolation and removal from their communities (Chambers et al., 2014). This is becoming increasingly common amongst gifted students of color, particularly those living in areas of concentrated poverty, as it is almost impossible to achieve without defying the stereotypes and deficit thinking embodied by many educators and counselors (Garza & Garza, 2010). The alternative for many students is to reject white normalized educational systems, which often leads to underachievement in white-centered educational spaces and ultimately contributes to the under-identification of gifted students of color (Ellison et al., 2000; Marryshow et al., 2005; Stambaugh & Ford, 2015).

Factors
Identification

Underrepresentation of gifted African American students, particularly those living in communities that have been historically under-resourced, can predominantly be attributed to identification, as it serves as the first barrier to participation in gifted programming. However, many program managers fail to look beyond their identification measures to investigate the root of the problem: cultural biases and opportunity gaps (Ford, 2015, Milner, 2012; Peters & Engerrand, 2016). As a result, racial prejudices within personnel and embedded within systems continue to dramatically hinder the identification and success of students of color through the use of rigid identification practices that prevent most students who do not prescribe to white-normed ideals of success from being identified as gifted, despite their abilities to excel in their areas of talent (Ford, 2015; Ford & Stambaugh, 2015; Marryshow et al., 2005).

Cultural Biases

Underrepresentation is rooted in cultural biases that bar students from being identified for and retained in gifted programs (Ford, 2015). These prejudices can be manifested in counselors, teachers, and administrators alike, creating a multitude of potential gatekeepers that contribute to under-identification (Campbell, 2012; Ellison et al., 2000; Ford, 2015; Marryshow et al., 2005; Gallagher & Harradine, 1997; Graham, & Anderson, 2008; West-Olatunji, Shure, Pringle, Adams, Lewis, & Cholewa, 2010; Whiting, 2009; Yerrick & Gilbert, 2011). In many cases, counselors fail to provide culturally responsive counseling, do not give suggestions for their students’ teachers about how to best support culturally diverse students, and continually underestimate student potential due to perceived cultural deficits (West-Olatunji et al., 2010). This model of deficit thinking can lead to ability grouped courses that consistently track African American students into remedial courses, resulting in lack of investment due to boredom, distrust.
of white teachers, social isolation, and distrust of administration (Chambers et al., 2014; Yerrick & Gilbert, 2011). Consequently, high ability African American students may begin to underachieve, making it even more challenging to identify them for gifted courses in the future (Yerrick & Gilbert, 2011).

Curiously, not everyone is able to acknowledge how deficit thinking leads to underrepresentation. In fact, most white teachers blame this problem on environmental factors such as poverty, safety of a community, and family structure, thereby separating themselves from the problem that they are inherently a part of (Hargrove & Seay, 2011). This philosophy directly contrasts with the sentiments of many educators of color, who acknowledge that the majority of the issues leading to underrepresentation are rooted in school-controlled factors such as teacher biases, culturally unresponsive curricula, and the emphasis placed on standardized testing (Hargrove & Seay, 2011).

This disconnect highlights a clear problem area: many white educators to continue to maintain their ignorance of their implicit and explicit cultural biases, how these biases manifest themselves in their classrooms, and how their perceptions of what success in school should look like can automatically close doors for students (Flynn, 2012; Henfield & Washington, 2012). By not examining one’s own contribution to the perpetuation of systemic racism, equity can never be achieved, as reinforced by evidence that three key factors contribute to more equitable representation in gifted programs: district-level staff understand and acknowledge that underrepresentation is a problem, there is an awareness and acknowledgement that classrooms that prioritize majority-centered cultural norms and values impacts student performance, and there is an established program of training and supporting teachers and program directors on multiculturalism and culturally affirming curricula (Briggs, Reis, & Sullivan, 2008). It becomes
next to impossible to establish these three characteristics if a large portion of educators deny their role in providing culturally inclusive instruction as means of creating an equitable learning environment that can lead to student success (Hargrove & Seay, 2011).

**Rigid Identification Measures**

Tied with cultural biases, the ultimate gatekeepers are the identification practices utilized by each institution that often intentionally or unintentionally designed to prevent equitable enrollment of gifted African American students, as well as those living in areas of concentrated poverty, in gifted programs. Many of these programs take an all or nothing approach by using rigid identification measures, reducing students to nationally normed achievement test scores despite differences in curricula, teacher referrals, and their grade point averages (Ford, 2015; Lymer & Jutras, 2019; National Association for Gifted Children, 2016; Oakland & Rossen; Peters & Gentry, 2012).

In the case of the District, nationally normed nonverbal, quantitative, and verbal test scores of the 90th percentile or above is required for formal identification of giftedness, despite the fact that the District’s schools regularly underperform on achievement tests (Lymer & Jutras, 2019). Consequently, a student’s gifted identification is hinged on outperforming national averages in all three categories, rather than reflecting their need to access curriculum above and beyond what is currently being offered in many of their schools (Ford, 2015; Oakland & Rossen, 2005; Peters & Gentry, 2012).

Utilizing these national norms assumes all students across the country have had the same educational experiences and opportunities as their same-age peers (Peters & Engerrand, 2016). Unfortunately, this assumption is flawed as educational experiences dramatically differ based on geography, access to programming, teacher experience, school resources, and access to
prekindergarten, to name a few (Peters & Engerrand, 2016; Ford, 2014; Ford et al., 2008; Rebell, Wolff, Kolben, & Holcomb, 2017). As a result, many cannot be surprised that even when utilizing universal screening, national norms will likely still identify more white, Asian, and students from affluent families than African American, Hispanic, and students with families living in poverty due to the significant differences in access to affirming and rigorous educational experiences, more commonly referred to as opportunity gaps (Giessman, Cambrell, & Stebbins, 2013; Milner, 2012; Peters & Engerrand, 2016). These rigid methods of identification negate the reality facing many gifted students of color and those from communities that are historically under-resourced, as many curricula and achievement tests are not culturally relevant and thus place barriers for these students to excel, impacting their grades, ability to compete at the national level, and teachers’ willingness to write referrals (Ford, 2015; Ford et al., 2008; Yerrick & Gilbert, 2011).

It is no wonder that with these rigid identification practices happening across the country that only four percent of teachers feel that current identification practices are sufficient for gifted students of color and those from families with limited income (De Wet & Gubbins, 2011). Consequently, it is critical that practitioners, policy makers, and researchers alike investigate further measures that can equitably identify historically underrepresented populations, such as problem-based learning, local norms, performance-based measures, opportunity gap reduction, early universal screening with localized norms, and nonverbal ability tests (Gallagher & Gallagher, 2013; Ford, 2015; Jordan, Bain, McCallum, & Bell, 2012; Lakin, 2016; Lohman, Korb, & Lakin, 2008; Peters & Gentry, 2012; Zhbanova, Rule, & Stichter, 2013).
Opportunity Gaps

As discussed above, many students, especially students of color enrolled in schools that serve communities that are historically under-resourced, have limited opportunities to learn in school contexts that are both culturally affirming and rigorous (Ford et al., 2008; Milner, 2012). Resulting discrepancies in achievement have often been labeled achievement gaps, but should instead be examined as opportunity gaps and educational debt (Ladson-Billings, 2006; Milner, 2012). Each of the barriers and challenges to equitable identification outlined in the subsequent sections are grounded in opportunities that are or are not afforded to students, predominantly on the basis of race.

As Ladson-Billings (2006) describes, the United States does not have an achievement gap issue, it has an education debt issue. There are significant discrepancies in school funding between schools that predominantly serve students of color and those who predominantly serve white students (Ladson-Billings, 1995; 2006). This inequitable distribution of resources, coupled with the egregious legal and social measures put in place to bar students of color from equitable education opportunities has created what is often characterized as the achievement gap (Ladson-Billings, 2006). When examining this education debt, it is clear that there was always an achievement gap in education because the country’s laws, policies, and social grounding was built upon students of color being less than white students (Ladson-Billings, 1995; 2006). At this point, one must ask that if the premise of the achievement gap was how the U.S. education system was designed, how can it be solved by further examining these differences in performance through the lens of it being an achievement gap?

For instance, often when examining score differentials amongst students of color and white students on normed assessments that lead to under-representation of students of color, the
framing of the problem norms white student achievement on assessments, rather than examining the context by which these scores come to be or questioning if an assessment accurately identifies different populations of students of color (Milner, 2012). These differences in scores are more closely related to systemic gaps in opportunity than in any student’s ability to perform and by not acknowledging them as such, the conversation continues to position students of color at a deficit (Peters & Engerrand, 2016, Milner, 2012; Noguera & Alicea, 2020).

**Digital Divide**

One of the many documented opportunity gaps is the digital divide (Irvine, 2010; Vidgor, Ladd, & Martinez, 2014). There are two levels to the digital divide, the first documenting unequal access to technology and the second outlining unequal digital literacy (Hargittai, 2002). When examining home computer access, there are significant divides both on the basis of race and the socioeconomic status of the family (Reynolds & Chiu, 2016; Vidgor, Ladd, & Martinez, 2014). White students are more likely to have computers at home when compared to African American students, a phenomenon that mirrors other systemic gaps in the allocation of resources (Ladson-Billings, 2006; Ladson-Billings & Tate, 1995; Vidgor et al., 2014).

Class also has an impact on the digital divide, with students more affluent families having higher digital literacy whether it be through home exposure or through learned skills in school (Reynolds & Chiu, 2015; Ritzhaupt, Liu, Dawson, & Barron, 2013). In fact, schools that serve under-resourced communities are less likely to utilize technology for producing original content, but instead to utilize drill-focused software, thus limiting student opportunities to learn how to use and manipulate technology for novel purposes (Ritzhaupt et al., 2013). As Dolan (2017) notes, students who attend under-resourced schools are often put in positions to be consumers of technology, simply doing tasks such as practice typing or doing online intervention programs for
different content areas. This push for technological consumerism limits the opportunity for students to become producers of original content using technology which in turn develops higher conceptual understandings of how to use technology as a tool (Dolan, 2017).

Considering many assessments used for gifted identification are computer based, barriers to digital literacy are likely to also impact student performance (Erickan, Asil, & Grover, 2018). Consequently, when examining the problem of under-representation of students of color and/or students from under-resourced communities in gifted identification it is critical to also examine potential opportunity gaps that serve as barriers to an accurate depiction of their capabilities on assessments.

**Teacher Development**

In order to address deficit thinking and rigid identification practices that bar gifted African American students from communities that have been historically under-resourced from participating in gifted programs, teachers must be trained in fostering anti-biased classroom environments and gifted instructional strategies (Ford, 2015). Unfortunately, schools are rarely held accountable for training their teachers, which results in adverse effects for students of color (National Association for Gifted Children, 2016).

As the primary conveyors of information, educators are expected to have a multitude of instructional strategies in their tool belts. Unfortunately, only one state, Nevada, requires teachers to take a course in gifted education before beginning their teaching careers (National Association for Gifted Children, 2016). This glaring lack of accountability paints a picture of underprepared educators teaching and identifying the gifted with limited knowledge on the diverse characteristics of these students, resulting in gatekeeping for gifted programs (Ford, 2015). This mirrors what Henfield and Washington (2012) found amongst white educators, who
often expressed that their personal and professional inexperience with race limited their abilities to confront issues related to racism within their instruction and classroom environments, signaling a need for further teacher development.

It is clear that despite this lack of accountability, teacher training should be high on the list of interventions to address the underrepresentation of gifted African American students. Not only do well-trained teachers yield higher achievement results for all students, but trained gifted education practitioners are more likely to have higher epistemological beliefs and learning-goal orientation, as well as structure their classrooms around student learning versus test preparation (Blumen-Pardo, 2002; Hong, Green, & Hartzell, 2011). This model of instruction moves away from white-normed ideals of success and has the potential to foster more inclusive learning communities.

Furthermore, the cultivation of strategies of learning that meet the needs of diverse gifted classrooms should be an inherent part of teacher training and development. Not only does this increase educator confidence and proficiency, but it also leads to gains in achievement for all learners, regardless of ability (Newman, Gregg, & Dantzler, 2009; Swanson, 2006). As Swanson (2006) found in her longitudinal study, teachers who received support in learning how to teach and adapt gifted curricula were able to foster academic gains, while also broadening their perspectives on who can be gifted, as many of their students of color and those from communities that have been historically under-resourced began achieving at remarkable levels. This training provided an opportunity for teachers to see their students as capable, maintain high expectations, and not expect that their learners conform to rigid cultural expectations of curricula, thus creating a pathway for students to perform at higher levels (Tomlinson & Jarvis, 2014).
Curriculum

As with teacher training, the curricular choices educators and schools make impact the success of students of color. Due to curricula frequently embodying white values of success, gifted African American students often put in positions to underachieve, making it incredibly challenging to identify them for gifted services, as well as to retain them in gifted programs post-identification (Stambaugh & Ford, 2015). Consequently, schools need to rework their approaches to education by embracing truly multicultural curricula and providing additional supports that are identity-affirming.

Unfortunately, coursework is often slowly paced, lacks compacting by removing previously learned concepts, focuses on memorization, and has a deficit of cultural inclusiveness, which leads to gifted students becoming bored and disinvested (Ellison et al., 2000; Marryshow et al., 2005; Gallagher & Harradine, 1997, Graham, & Anderson, 2008; Stambaugh & Ford, 2015). This boredom can then manifest itself as underachievement and behavioral concerns, which often masks ability and prevents teachers from identifying these students for gifted programs, especially when the teacher is already looking at their students of color from a deficit-thinking model (Graham, & Anderson, 2008, Stambaugh & Ford, 2015). Fortunately, there are promising curricular programs that can be utilized to address these issues.

The College of William and Mary created gifted curricula in English, science, and math that have been routinely tested and monitored within urban schools that predominantly serve students of color and those living in historically under-resourced communities (Robinson, Dailey, Hughes, & Cotabish, 2014; Swanson, 2006). In these studies, not only did ethnically diverse high ability learners from communities that have been historically under-resourced make significant gains in their achievement, but students from all levels made academic gains.
The high interest content, coupled with instructional strategies focused on differentiation, can increase student investment, leading to lower levels of underachievement, and thus allowing for more students’ abilities to be recognized (Robinson et al., 2014; Swanson, 2006). Unfortunately, not all of these units embody a true multicultural approach, creating the possibility that students have to weigh their ROC in order to decide if it is worth trying to meet curricular success (Chambers et al., 2014).

Another model, for both general curriculum and identifying gifted students of color and those from historically under-resourced communities, is problem-based learning. Gallagher and Gallagher (2013) found that high-minority, schools that have been historically under-resourced were able to address their problems of student underachievement by allowing students to create solutions to real-world problems that impacted their communities. Not only does this approach exemplify cultural responsiveness and the development of relevance, but also fosters a sense of investment that is often absent in white-normalized curricula. Due to the higher levels of buy-in, schools are able to identify more gifted students of color and students from historically under-resourced communities through their performance, rather than just rigid test scores (Gallagher & Gallagher, 2013).

**Mentoring**

Once students have been referred and ultimately identified for gifted services, it is crucial that they meet success within the program, both academically and socioemotionally, to ensure their retention. One of the key components to the success of gifted students of color and those from low income backgrounds is the presence of mentoring programs that help them address their ROC and double consciousness (Chambers et al., 2014; Du Bois, 2004; Ford, 2015; Whiting, 2009). Since many gifted African American students experience isolation due to deeply
ingrained racism within their schools, mentors who can acknowledge their struggle and help them navigate these highly racialized programs are imperative (Chambers et al., 2014; Ford, 2015; Whiting, 2009).

**Culture**

The culture of a school and classroom has profound effects on whether a student will perform to their highest potential. Unfortunately, most of these settings are so engrained in white-normalized models of teaching and achievement that gifted African American students are put in a position to either give up their racial and cultural identities or continually fail academically (Chambers et al., 2014; Ford, 2015). This unrelenting battle includes balancing peer pressure with that of their teachers, whom they often feel do not accept them as they are (Marryshow et al., 2005).

**Peer Acceptance**

An inherent component of the school experience is peer pressure, both positive and negative. In the past, the assumption has frequently been made that African American students reject academic achievement in the fear of their peers perceiving them to be acting white, thus abandoning their identities and cultures (Marryshow et al., 2005). However, it has become clear that African American students do not reject academic achievement; in fact, they support and lift up their high-achieving peers that embody their Afro-cultural values and attributes (Marryshow et al., 2005). Meaning, when students are able to achieve while maintaining their cultures, they hold a higher status amongst their peers. However, they often feel as though their teachers will not accept these same students (Marryshow et al., 2005). This phenomenon reinforces the presence of the cultural biases in the classroom, of which students are well-aware, and indicates
Running head: EFFECTS OF FRONTLOADING ON UNIVERSAL SCREENING

that gifted African American students will not feel safe to achieve in a way that honors their identities until those biases are mitigated.

Unfortunately, this clash of cultural identity also limits gifted African American students who achieve in a traditionally academic way, as they face the scrutiny of acting white (Ford et al., 2008; Henfield, Moore, & Wood, 2008; Marryshow et al., 2005). These students often are left to deal with the pressures of their peers, while simultaneously trying to manage stereotypes associated with being Black in America (Ford et al., 2008; Whiting, 2009). They regularly choose to highlight their “Blackness” by being outspoken, having a strong work ethic, and serving their community as a form of opposition to what they perceived to be the negative attributes of the majority of their ethnic community, therefore creating a complicated inner dialogue of being an acceptable type of Black person (Graham & Anderson, 2008).

Perhaps more pointedly, gifted African American students often associate whiteness with achievement and intellect, whereas they describe Blackness as having low intelligence and poor behaviors (Ford et al., 2008). This conflict represents a larger problem: the education system has continually shown students of color that they are less than and cannot achieve unless they exchange their identity for one that emulates that of white culture (Chambers et al., 2014).

Classroom Environments

Peer pressures are often reflective of the overall classroom environment. Unfortunately, African American students from under-resourced communities often do not see their cultural values regularly celebrated or present within their classes, fostering a sense of isolation, disinvestment, and distrust (Ellison et al., 2000; Hargrove & Seay, 2011; Marryshow et al., 2005; Stambaugh, & Ford, 2015). Without an innate infusion and acceptance of Afro-cultural values within the classroom environment, it becomes next to impossible to promote safe and positive
learning environments for most gifted African American students (Ellison et al., 2000). This acceptance becomes even more critical since teachers regularly serve as gatekeepers to gifted programs due to their racial and cultural biases, thus drawing an obvious conclusion: teachers who do not allow for students to achieve while also expressing their cultural identities are more likely to bar high ability gifted students of color from gifted programs (Hargrove & Seay, 2011).

**Implications**

Understanding that the under-identification of students of color is deeply rooted in systemic racism that creates opportunity gaps in identification, exposure to well-trained teachers, curriculum, and culturally affirming classrooms, further analysis needs to be done to determine which of these opportunity gaps exist within the District (Ellison et al., 2000; Ford et al., 2008; Henfield et al., 2008; Ladson-Billings, 1995; 2006; Marryshow et al., 2005; Milner, 2012; Stambaugh, & Ford, 2015). Attention should also be paid to the extent to which under-identification is occurring for different student groups and in what ways school contexts can shift to better serve them.
Chapter 2: Examining Gifted Identification in the District

As described in Chapter 1, research confirms that underrepresentation of gifted students of color and those from under-resourced communities is a national problem, pointing to reality that education systems are designed to create disproportionate outcomes on the basis of race and class (Campbell, 2012; Ellison et al., 2000; Ford et al., 2008; Ladson-Billings & Tate, 1995; Peters et al., 2019). In order to examine the extent to which gifted identification in District has resulted in proportionate or disproportionate outcomes by student groups, an analysis of current identification rates by student groups is necessary and should be contextualized with qualitative feedback.

Goals and Objectives

Understanding these national realities, a needs assessment was formulated to identify if these trends of underrepresentation can be observed within the District using two sets of de-identified data provided by the District: a spreadsheet of system-wide student data including demographic variables and GT teacher leader focus group notes highlighting their ideas on why disproportionate representation may be occurring in the District. The framework of the needs assessment is guided by these three research questions:

1. To what extent does the gifted, advanced, and talent development identified population mirror the total District’s student population?
2. To what extent does the gifted, advanced, and talent development identified population differ in Title I qualifying schools versus non-Title I qualifying schools?
3. What do teacher leaders identify as barriers to equitable gifted, advanced, and talent development identification in the District?
Methodology

Utilizing a sequential explanatory mixed-methods design, a quantitative analysis was conducted to compare the District’s student demographics with that of its identified gifted, advanced, and talent development population (Creswell & Clark, 2017). In order to further identify the nuances of the findings, a focus group of 30 District GT teacher leaders who serve as the GT leads for their schools was utilized to gather insights on the potential factors that influence gifted identification in the District.

Participants

The quantitative data utilized in this assessment documents the total student population of the District as of January 2, 2019. The total District population consists of 78,782 students of which 52,867 attend Title I qualifying schools. Further, 6.09% (n = 4,798) of the total student population is identified as gifted, advanced, or talent development, consistent with the national average of 6% to 10% (National Association of Gifted Children, n.d.). The data set provides the demographic variables of race, students with IEPs, students with 504s, students qualifying for ESOL services, grade, and gender. Due to direct certification, student SES and FARMS qualifications are not reported. In order to examine the impact socioeconomic status of a school community may or may not have in rates of identification, this data set also includes whether students are enrolled at Title I qualifying schools or not. Table 1 displays the demographic breakdown of the total population of the District and of those in grades K, 1, and 4 which were universally screened with the Naglieri Nonverbal Ability Test (NNAT) in the years 2016-2019.

Table 1

Demographics of the District
The focus group consisted of 30 teacher leaders, representing 30 schools. These teacher leaders serve as the GT Leads for their schools, meaning they regularly receive professional development, as well as support gifted instruction and program implementation at their schools. Of the 30 represented schools, 23 of them are identified as Title I, 19 serve PreK through 8th grade students, 10 serve PreK through 5th grade students, and 1 serves 6th through 8th grade students.

**Measures**

The most efficient means of gathering enough information about each of the research questions was to utilize existing de-identified data from the District, consisting of whole district demographic data and focus group notes documented by the GT office. The demographic data provided by the District was used to analyze current levels of representation across race, language learning status, and ability throughout the district and by schools’ qualification as Title I.
I versus non-Title I. These data points were then utilized by the GT Office to gain feedback from the focus group on potential barriers to equitable identification in order to highlight potential problem areas and opportunities for effective interventions.

The focus group answered two questions as a whole group: 1. What practices are the District currently utilizing to support equitable gifted, advanced, and talent development identification? and 2. What are the barriers to equitable gifted, advanced, and talent development identification in the District?

For the purposes of this study, multiple independent variables were examined. The independent variables consisted of race, gender, ability, Title I qualifying school enrollment, and grade level. Qualitative analysis of the focus group responses examined the dependent variables of student’s responses to universal testing and behaviors viewed during universal testing.

Data Analysis Methods

The student demographic dataset was analyzed using frequency and pivot tables, as well as Ford’s (2015) equity formula to determine whether or not the representation of gifted or advanced identified students was reflective of the total population of the district, as well as at schools qualifying as Title I versus non-Title I. This data was then further analyzed utilizing pivot and frequency tables to examine if grade levels that were universally screened using the Naglieri nonverbal ability assessment exhibited similar or different rates of gifted, advanced, or talent development identification as compared to the rest of the District. After this initial quantitative analysis, focus group responses were coded for themes.

Results

The results of this needs assessment unveiled multiple areas of underrepresentation across traditionally underrepresented populations, with the exception of English Learners (ELs)
and Hispanic students. As shown in Table 2, African American students, students with IEPs, students with 504s, and students who are enrolled at Title I qualifying schools are underrepresented within the tiers of gifted identification in the District based on Ford’s (2015) equity formula. Conversely, white and Asian students are well-represented, with the identified population exceeding three times the percentage of their representation within the general population. This phenomenon mirrors that of national trends which signify underrepresentation of African Americans and students from under-resourced communities in comparison to their white and Asian counterparts (Ellison, Boykin, Towns, & Stokes, 2000; Ford, 2014, 2015; Gallagher & Harradine, 1997; Graham & Anderson, 2008; Whiting, 2009; Yaluma & Tyner, 2018).

Table 2
GT Demographics in the District

<table>
<thead>
<tr>
<th></th>
<th>Total Population of the District (n = 78,782)</th>
<th>Minimum Level of Equitable Representation</th>
<th>Percentage of Students Identified as Gifted, Advanced, or Talent Development</th>
</tr>
</thead>
<tbody>
<tr>
<td>African American</td>
<td>78.26%</td>
<td>62.61%</td>
<td>56.39%</td>
</tr>
<tr>
<td>Hispanic</td>
<td>11.66%</td>
<td>9.33%</td>
<td>10.08%</td>
</tr>
<tr>
<td>White</td>
<td>7.75%</td>
<td>6.2%</td>
<td>27.24%</td>
</tr>
<tr>
<td>Asian</td>
<td>.94%</td>
<td>.76%</td>
<td>3.56%</td>
</tr>
<tr>
<td>Native Hawaiian/Pacific Islander American</td>
<td>.18%</td>
<td>.15%</td>
<td>.18%</td>
</tr>
<tr>
<td>Multiracial</td>
<td>.98%</td>
<td>.79%</td>
<td>2.10%</td>
</tr>
<tr>
<td>Students with IEPs</td>
<td>11.45%</td>
<td>9.16%</td>
<td>1.06%</td>
</tr>
<tr>
<td>Students with 504s</td>
<td>5.12%</td>
<td>4.10%</td>
<td>2.27%</td>
</tr>
<tr>
<td>English Learners</td>
<td>12.26%</td>
<td>9.81%</td>
<td>11.25%</td>
</tr>
<tr>
<td>Male</td>
<td>50.81%</td>
<td>40.65%</td>
<td>47.83%</td>
</tr>
<tr>
<td>Female</td>
<td>49.18%</td>
<td>39.35%</td>
<td>52.16%</td>
</tr>
<tr>
<td>Enrolled at a Title I Qualifying School</td>
<td>67.10%</td>
<td>53.68%</td>
<td>53.37%</td>
</tr>
</tbody>
</table>
Gifted, Advanced, and Talent Development Identification

In the District, students are identified as gifted if they score in the 90th percentile or greater on a nonverbal ability assessment (namely the NNAT), as well as a nationally-normed assessment in math or reading such as i-Ready or PARCC (Lymer & Jutras, 2019). Advanced students must meet the same qualifications except at the 80th percentile (Lymer & Jutras, 2019). The third category, Talent Development, requires students score at the 73rd percentile or greater on a nonverbal ability assessment but have not yet met achievement requirements in math and reading to support gifted or advanced identification (Lymer & Jutras, 2019).

Table 3 documents the current identification rates of gifted, advanced, and talent development students by demographic variables. Although white students have a 1:1 gifted identification ratio, they have close to a 3:1 ratio of being identified as advanced or talent development. African American students are consistently underrepresented across the three tiers of identification, by 24.47 percentage points in gifted identification, 16.68 percentage points in advanced identification, and 25.52 percentage points in talent development identification.

Further, the gifted identification rate in Title I qualifying schools versus non-Title I qualifying schools is staggering. While the Title I qualifying population makes up 67.10 percent of the total population, only 30.07 percent of the gifted identification population is enrolled in a Title I qualifying school. Further, the non-Title I qualifying population makes up only 32.89%...
percent of the total district population; however, 69.92 percent of the gifted identified population is enrolled at a non-Title I qualifying school.

Table 3

Demographic Disaggregation of Gifted, Advanced, and Talent Development Identified Students

<table>
<thead>
<tr>
<th></th>
<th>Total Population of the District (n = 78,782)</th>
<th>Gifted (n = 1,686)</th>
<th>Advanced (n = 1,783)</th>
<th>Talent Development (n = 1,329)</th>
</tr>
</thead>
<tbody>
<tr>
<td>African American</td>
<td>78.26%</td>
<td>53.79%</td>
<td>61.58%</td>
<td>52.74%</td>
</tr>
<tr>
<td>Hispanic</td>
<td>11.66%</td>
<td>5.63%</td>
<td>8.41%</td>
<td>17.98%</td>
</tr>
<tr>
<td>White</td>
<td>7.75%</td>
<td>7.75%</td>
<td>24.90%</td>
<td>22.12%</td>
</tr>
<tr>
<td>Asian</td>
<td>.94%</td>
<td>4.21%</td>
<td>3.02%</td>
<td>3.46%</td>
</tr>
<tr>
<td>English Learners</td>
<td>12.26%</td>
<td>7.82%</td>
<td>9.53%</td>
<td>17.90%</td>
</tr>
<tr>
<td>Enrolled at a Title I Qualifying School</td>
<td>67.10%</td>
<td>30.07%</td>
<td>63.15%</td>
<td>69.82%</td>
</tr>
<tr>
<td>Enrolled at a Non-Title I Qualifying School</td>
<td>32.89%</td>
<td>69.92%</td>
<td>36.84%</td>
<td>30.17%</td>
</tr>
</tbody>
</table>

The distinction between gifted identification rates of students attending Title I qualifying versus non-Title I qualifying schools, as well as African American students versus white and Asian students, signifies that the District is experiencing underrepresentation similarly to the rest of the nation (Ford, 2014, 2015; Yaluma & Tyner, 2018). Research has shown that students of color and those from under-resourced communities are often tracked into remedial courses, experience their culture as not valued in school, and are given work that is not relevant, resulting in poor test scores or grades (Ellison et al., 2000; Marryshow et al., 2005; Gallagher & Gallagher, 2013; Siegle et al., 2016; Yerrick & Gilbert, 2011). If the same were to be happening
in the District, this research would directly connect to students being overlooked for gifted identification since their achievement scores may not meet the required 90th percentile threshold.

**Universally Screened Grade Levels**

For the last three years, the District has utilized the NNAT to universally screen students in grade 2 (year one) and kindergarten (years two and three). Consequently, students in grades kindergarten, first, and fourth have all taken the NNAT. Table 4 documents the demographic disaggregation of the total District population and the universally screened population. While the two populations are nearly identical, the percentage of universally screened students exceeds that of the total population by 18.46 percentage points. This is namely due to the fact that high schools are not eligible for Title I qualifying status in the District, so with the universally screened populations existing in elementary schools, they have a greater likelihood of attending a Title I qualifying elementary school.

**Table 4**

*Student Demographics of the Whole District compared to Students in Universally Screened Grades*

<table>
<thead>
<tr>
<th></th>
<th>Total Population of the District (n = 78,782)</th>
<th>Total Population of Students who were Universally Screened: Grades K, 1, and 4 (n = 18,672)</th>
</tr>
</thead>
<tbody>
<tr>
<td>African American</td>
<td>78.26%</td>
<td>75.94%</td>
</tr>
<tr>
<td>Hispanic</td>
<td>11.66%</td>
<td>12.65%</td>
</tr>
<tr>
<td>White</td>
<td>7.75%</td>
<td>8.50%</td>
</tr>
<tr>
<td>Asian</td>
<td>.94%</td>
<td>.83%</td>
</tr>
<tr>
<td>English Learners</td>
<td>12.26%</td>
<td>12.46%</td>
</tr>
<tr>
<td>Enrolled at a Title I Qualifying School</td>
<td>67.10%</td>
<td>85.56%</td>
</tr>
<tr>
<td>Enrolled at a Non-Title I Qualifying School</td>
<td>32.89%</td>
<td>14.43%</td>
</tr>
</tbody>
</table>
Universal screening is designed to even the playing field by removing bias and lack of access, however, in the case of the District, universal screening is not a silver bullet (Giessman, Gambrell, and Stebbins, 2013). Overall, universal screening has identified 7 percent of the total population assessed, which falls into the six to ten percent national average identification rate (National Association of Gifted Children, n.d). Of the 7 percent, .48 percent are identified as gifted, 1.12 percent are identified as advanced, and 5.39 percent are identified as talent development. This skew in identification towards talent development is likely the result of kindergarten and first graders lacking nationally-normed assessments in both math and reading that would allow them to be identified as gifted or advanced, whereas students in grade 3 and higher have greater access to these assessments.

Table 5 shows that while the use of the NNAT universally positively benefited Hispanic and EL populations, it did not increase representation of African American students or those enrolled at Title I qualifying schools. A similar finding came from Giessman et al. (2013) analysis of grade-wide screening using the NNAT2 which indicated that the use of the NNAT2 did not equitably identify African American students as compared to their white peers.

However, in the case of Title I qualifying versus non-Title I qualifying schools, the percentages of students who are identified as gifted, advanced, and talent development almost perfectly contrasts each other. Although students enrolled in Title I qualifying schools make up over 85 percent of the total universally screened population, they only make up 29.67 percent of the gifted identified population, 51.42 percent of the advanced population, and 73.68 percent of the talent development population. Conversely, students enrolled at non-Title I qualifying schools make up 14.43 percent of the total universally screened population, but are then 70.32 percent of the gifted population, 48.57 percent of the advanced population, and 26.31 percent of
the talent development population. It is likely that this opposite pattern of identification across tiers indicates that students who attend non-Title I qualifying schools that score in the 75th percentile or higher on the NNAT are more likely to have achievement scores in the 80th or 90th percentiles in reading than their Title I qualifying peers, as indicated by the number of students identified as gifted and advanced based on the District’s criteria, signaling additional potential opportunity gaps in identification across the tiers.

Table 5

Demographic Disaggregation of Gifted, Advanced, and Talent Development Identified Students in Universally Screened Grades (K, 1, 4)

<table>
<thead>
<tr>
<th>Total Population of Students who were Universally Screened: Grades K, 1, and 4 (n = 18,672)</th>
<th>Gifted (n = 91)</th>
<th>Advanced (n = 210)</th>
<th>Talent Development (n = 1,007)</th>
<th>Total Identified (n=1,308)</th>
</tr>
</thead>
<tbody>
<tr>
<td>African American</td>
<td>75.94%</td>
<td>17.58%</td>
<td>36.66%</td>
<td>52.13%</td>
</tr>
<tr>
<td>Hispanic</td>
<td>12.65%</td>
<td>2.19%</td>
<td>16.19%</td>
<td>19.96%</td>
</tr>
<tr>
<td>White</td>
<td>8.50%</td>
<td>61.53%</td>
<td>38.09%</td>
<td>20.85%</td>
</tr>
<tr>
<td>Asian</td>
<td>.83%</td>
<td>12.08%</td>
<td>2.85%</td>
<td>3.07%</td>
</tr>
<tr>
<td>English Learners</td>
<td>12.46%</td>
<td>3.29%</td>
<td>14.76%</td>
<td>18.57%</td>
</tr>
<tr>
<td>Enrolled at a Title I Qualifying School</td>
<td>85.56%</td>
<td>29.67%</td>
<td>51.42%</td>
<td>73.68%</td>
</tr>
<tr>
<td>Enrolled at a Non-Title I Qualifying School</td>
<td>14.43%</td>
<td>70.32%</td>
<td>48.57%</td>
<td>26.31%</td>
</tr>
</tbody>
</table>

Title I Qualifying Schools
Students in Title I qualifying schools within the District have a 3.95 percent identification rate, while students in non-Title I qualifying schools have a 10.44 percent identification rate. These statistics indicate a further discussion of identification rates, be demographic variables, within each of these types of schools. Table 6 breaks down the gifted, advanced, and talent development populations within these two school categories.

Most notably, African Americans are equitably gifted and advanced identified within Title I qualifying schools, with African Americans making up 80.77 percent of the total Title I qualifying population and 75.14 percent and 72.45 percent of the gifted and advanced identified populations respectively. This data is not shared in schools that do not qualify for Title I, however. While 73.15 percent of the total non-title I qualifying population is African American, they make up only 44.61 percent of the gifted identified, 55.23 percent of the advanced identified, and 35.41 percent of the talent development identified populations.

Similar data is seen within the Hispanic and EL populations, which are highly correlated within the District, where they are equitably and well-represented in identification in schools that qualify as Title I but are under-represented in gifted and advanced populations and equitably represented in talent development identification in non-Title I qualifying schools. Further, white and Asian students are similarly disproportionately well-represented in comparison to their peers across other racial demographics in both Title I and non-Title I qualifying schools.

Table 6

Identification Rates in Title I and Non-Title I Qualifying Schools
The data in Table 6 reflects the entire district’s data, whereas in Table 7 a similar approach is taken to examine representation in universally screened grades at Title I and non-Title I qualifying schools. While the likelihood of these grade levels being identified as gifted or advanced is lower due to a lack of achievement data, as discussed above, there are significant trends in the data. Despite African Americans making up nearly 80 percent of the total Title I qualifying population, they account for only 29.62 percent of the gifted identified population, while their white peers who are only 4.68 percent of the total population make up 51.85 percent of the gifted identified population. The same phenomenon is seen in non-Title I qualifying schools.

Perhaps more staggering, when looking at the overall identified populations of students who flagged using the universal screening of the NNAT, African American students in Title I qualifying schools are underrepresented by 22.29 percentage points and those in non-Title I
qualifying schools are underrepresented by 26.94 percentage points. By comparison, their white and Asian peers are considerably well-represented with white students making up 4.68 percent of the Title I qualifying population and then 14.25 percent of the identified population in those same schools. In non-title I qualifying schools, this number increases with white students accounting for 21.16 percent of the total population but 51.27 percent of the identified population.

Table 7

Identification Rates in Universally Screened Grades (K, 1, and 4) in Title I and Non-Title I Qualifying Schools

<table>
<thead>
<tr>
<th></th>
<th>African American</th>
<th>Hispanic</th>
<th>White</th>
<th>Asian</th>
<th>English Learner</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Title I Qualifying Schools</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Population</td>
<td>79.75%</td>
<td>13.53%</td>
<td>4.68%</td>
<td>.53%</td>
<td>13.38%</td>
</tr>
<tr>
<td>Gifted</td>
<td>29.62%</td>
<td>7.40%</td>
<td>51.85%</td>
<td>7.40%</td>
<td>7.40%</td>
</tr>
<tr>
<td>Advanced</td>
<td>50.92%</td>
<td>22.22%</td>
<td>18.51%</td>
<td>1.85%</td>
<td>22.22%</td>
</tr>
<tr>
<td>Talent Development</td>
<td>59.43%</td>
<td>23.85%</td>
<td>12.26%</td>
<td>2.42%</td>
<td>22.91%</td>
</tr>
<tr>
<td><strong>Total Gifted, Advanced, or Talent Development Identified (n = 877)</strong></td>
<td>57.46%</td>
<td>23.14%</td>
<td>14.25%</td>
<td>2.50%</td>
<td>22.34%</td>
</tr>
<tr>
<td><strong>Non-Title I Qualifying Schools</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Population</td>
<td>53.39%</td>
<td>7.42%</td>
<td>21.16%</td>
<td>2.56%</td>
<td>7.05%</td>
</tr>
<tr>
<td>Gifted</td>
<td>12.50%</td>
<td>0.00%</td>
<td>65.62%</td>
<td>14.06%</td>
<td>1.56%</td>
</tr>
<tr>
<td>Advanced</td>
<td>21.56%</td>
<td>9.80%</td>
<td>58.82%</td>
<td>3.92%</td>
<td>6.86%</td>
</tr>
<tr>
<td>Talent Development</td>
<td>31.69%</td>
<td>9.05%</td>
<td>44.90%</td>
<td>4.90%</td>
<td>6.41%</td>
</tr>
<tr>
<td><strong>Total Gifted, Advanced, or Talent Development Identified (n = 431)</strong></td>
<td>26.45%</td>
<td>7.88%</td>
<td>51.27%</td>
<td>6.03%</td>
<td>5.80%</td>
</tr>
</tbody>
</table>
Barriers to Equitable Identification

The quantitative results presented above indicate inequity in gifted, advanced, and talent development identification for African American students and students who attend Title I qualifying schools. These data were provided to focus group participants to identify areas of strength in identification in the District, as well as barriers to equitable identification. The teacher leaders in this focus group have a nuanced understanding of how identification happens within schools and how it is received by students, families, and educators. In order to gain their insights, they were asked two questions: 1. What practices are the District currently utilizing to support equitable gifted, advanced, and talent development identification? and 2. What are the barriers to equitable gifted, advanced, and talent development identification in the District?

In answering the first question, three major themes emerged. These teacher leaders felt that universal screening using a nonverbal ability assessment was a significant step in the right direction to equitably identifying students as it eliminated the need for parents or teachers to advocate for certain students to receive testing, but not others. In particular, as the second theme, they agreed that assessing at kindergarten was “a game changer” in ensuring interventions were put into place as soon as possible for precious young people. Many teachers discussed how students did not have the opportunity to be overlooked for many years of their educational experience, because if they were identified in the first half of kindergarten, they had to receive services.

One participant summed up the third theme quite succinctly, “By the district owning what it means to be gifted identified, it removes the subjectivity of teacher bias in the identification of students.” Namely, in the past, teachers discussed how students could be identified by schools as gifted by any criteria they wanted: they had good grades, they were well-behaved, their parents
advocated for them, or they had high test scores, to name a few. The majority of the teachers in the focus group (27 of the 30) felt that by the district norming the identification process, students of color and those from low-income households had a better chance of being identified.

When asked the second question, four main areas of concern were expressed by the teacher leaders. The first was that testing environments varied by school and that when students were tested whole group rather than in a small group, there may be issues with distraction and limited opportunities to monitor if students were fully engaged in providing the answers they intended. This theme was coupled with the second, in that almost all of the teachers (29 of the 30) noted that their students struggled with dexterity issues, namely being able to use a mouse on a desktop computer. Due to this issue, many of the teacher leaders found it was more effective to click for students who pointed out the answer they wanted, which was only possible in small group or one-on-one contexts.

Teacher leaders also expressed there was a significant digital divide for the kindergarten students in Title I qualifying schools, in particular. The majority of the educators (21 of the 30) either shared or agreed that many of their kindergarten students came into the year knowing how to navigate smart phones but not laptops or desktops, the technology most used for assessment. Consequently, they noted many students would spend a significant amount of time learning how to navigate the computer during the testing period or would randomly click because they had not yet understood the concept of the mouse or track pad. This issue mirrors that found in research on the digital divide between low-income and middle class households and between racial minority groups and whites (Judge, Puckett, & Bell, 2006; Moore, Vitale, & Stawinoga, 2018).

The final theme is perhaps one of the most prudent: the focus group participants universally noted that their students of color, particularly those from low-income households,
were the subject to a significant opportunity gap: analogical thinking. The teachers noted that analogical thinking is not taught in the pre-kindergarten or kindergarten curricula so unless their students were taught or exposed to this way of thinking and processing prior to entering school, they were not likely to understand the concept. Similar to students learning how to use technology as they were taking an assessment, teachers described how their students were doing the same when it came to answering nonverbal analogies questions.

**Implications**

These quantitative and qualitative data sets provide insight into the challenges of identification for gifted services. It has been documented nationally that students of color are often not accurately identified by current identification measures, a problem that is exacerbated for students in under-served and under-resourced communities (Ellison et al., 2000; Ford, 2014, 2015; Gallagher & Harradine, 1997; Giessman et al., 2013; Graham & Anderson, 2008; Whiting, 2009; Yaluma & Tyner, 2018). Despite implementing universal screening at an early age to mitigate as many opportunity gaps as possible, the District is experiencing this same trend with African American students being underrepresented by 22.29 percentage points in Title I qualifying schools and by 26.94 percentage points those in non-Title I qualifying schools. Universal screening also exceeds representative identification for white students, with white students surpassing their demographic representation by 9.57 percentage points in Title I qualifying schools and by 30.11 percentage points in non-Title I qualifying schools. However, with overall identification rates of 3.95 percent in Title I qualifying schools and 10.44 in non-Title I qualifying schools, the emphasis in the District should not be on identifying fewer white students but on identifying more African American students.
Further, it is clear that there is work that needs to be done in Title I qualifying schools to bolster identification across the board. With a 6.49 percentage point difference in identification rates, it is likely that opportunity gaps are in play even with universal screening in kindergarten. As indicated by the data from the teacher leader focus group, there are clear challenges that exist with testing that are with no fault to child: minimal exposure to analogical reasoning prior to assessment and lack of access to technology. If students are learning how to do analogical problems without guidance as they are taking the assessment, they are at a disadvantage to their peers whom have experienced analogical reasoning prior to universal screening. Further, if a student has not used the type of technology the assessment utilizes before, there is a steep learning curve that could hinder performance. Consequently, the District should explore potential interventions that address the opportunity gaps documented by focus group participants, including explicitly teaching analogical reasoning and providing students exposure and access to the technology they will be using for universal screening prior to the testing session.
Chapter 3: Literature Review of Interventions

As shown in the previous chapter’s needs assessment, there are opportunity gaps that lead to the under-representation of African American students and students who attend Title I qualifying schools in gifted identification within the District. Research has suggested multiple avenues towards lessening these barriers to opportunity; some focusing on preparing teachers to either differentiate for multicultural gifted learners or to uncover their own cultural biases, while others confront the structures that hinder high ability gifted students of color and those from communities that have been historically under-resourced from being identified, such as utilizing universal screening, localized norms, and talent development models (Calderon, 1999; Coleman & Southern, 2006; Fierros, 2009; Ford, 2015; Harris & Plucker, 2014; Horn, 2015; Kose & Lim, 2010; Swanson, 2006; Unzueta & Lowery, 2008). However, in the case of the District, many of these interventions are already taking place in one form or another with little evaluation to determine their effectiveness. If utilizing universal screening with district norms does not fully identify the gifted population of the district, interventions and their subsequent evaluations should be focused on either the opportunity gaps put in place that hinder performance or to alternative identification measures altogether. Consequently, it is proposed that an evaluation is completed of the effectiveness of an intervention run by the GT Office in the District focused on opportunity gap reduction using analogies and technology with PreK students in schools that qualify for Title I prior to universal screening with the NNAT.

Teacher Preparation and Training

With only three states requiring that general education teachers receive professional development on the needs of gifted students, it is clear that teachers are grossly underprepared to identify and meet the needs of gifted learners from any background (National Association for
Gifted Children, 2016). Consequently, one logical solution found in the literature is to provide effective, job-embedded professional development opportunities that will increase teachers’ knowledge surrounding the needs of multicultural gifted learners, as well as improve their abilities to incorporate differentiated, culturally responsive instruction into their daily lessons in order to better spot talent to increase identification rates (Calderon, 1999; Coleman & Southern, 2006; Harris & Plucker, 2014; Kose & Lim, 2010; Swanson, 2006).

Research indicates that training educators in excellence gaps and culturally responsive education can result in greater awareness in identifying giftedness in diverse populations and can be a stepping stone to serve as greater advocates (Ford, 2015; Harris & Plucker, 2014). This awareness and advocacy can have strong impacts on school cultures, but further professional development (PD) can also improve collaboration with families of students who have historically been underrepresented in gifted programs and aide the teachers’ abilities to provide greater supports to students and parents, which can support student achievement (Ford, 2015; Harris & Plucker, 2014; Lee et al., 2009). This increase in student achievement can directly lead to higher identification rates amongst historically underrepresented populations, based upon the metric used by the District for identification (Lymer & Jutras, 2019). Each of these benefits make PD a clear option for intervention; however, it is often difficult to implement with fidelity for a multitude of reasons.

Teacher PD is likely to be time-intensive and require resources such as expert speakers, space, and dedicated time to bring teachers together. Even if these obstacles are able to be overcome, training may not definitively lead to direct gains in equitable representation within gifted programs, and may in fact contribute to stronger levels of deficit thinking due to the group reinforcing their current culturally biased ideologies, despite the message of the training itself.
(Kose & Lim, 2010). As a result, professional development is more effective in heterogeneous, small group settings that allow for transparent and honest communication amongst all parties which can be resource heavy and require greater time commitments (Fierros, 2009). Further, the District has already poured ample resources into training teachers and administrators by facilitating regular and ongoing on-demand virtual training, systemic professional learning, and sponsoring numerous educators for the annual gifted education state conference, making further offerings limited based on exhausted resources (Lymer & Jutras, 2019).

**Professional Learning Communities**

Professional Learning Communities or PLCs can be a profound catalyst for implementing small group training that is effective in improving instructional practice and reducing cultural bias (Fierros, 2009; Unzueta & Lowery, 2008). Since the structure of a PLC is guided by the participants, they are highly customized and can easily address gaps in teacher preparation by teaching social justice or transformative pedagogy instead of opting for highlighting tolerance and cultural sensitivity (Robertson & Guerra, 2016). Great success has also been garnished from research in which educators participate in an in-depth and active PLC that facilitates their ability to “recognize how race is learned, lived, constructed, and negotiated” (Fierros, 2009, p. 4).

This approach can be most effectively implemented by using ethnography as the catalyst for examining these complex social structures so that participants can center their efforts on dismantling racist and culturally biased practices by first becoming keenly aware of them (Calderon, 1999; Fierros, 2009; Unzuetta & Lowery, 2008). Since many teachers have adopted a color-blind philosophy to race where they deny the existence of racial systems of oppression by removing their role in it since they “do not see race,” using ethnography can allow them to see racism without damaging their own self-image (Hagerman, 2013; Poteat & Spanierman, 2012;
Unzueta & Lowery, 2008). These realizations stem from participants being able to acknowledge structures of oppression in schools from a scientific viewpoint, allowing participants to maintain their self-affirmations while also accepting the reality of racism within our society, schools, and classrooms (Calderon, 1999; Fierros, 2009; Unzuetta & Lowery, 2008). By taking this approach, educators in the District could become more aware of how systems are in place within their schools and classrooms that prevent opportunity and access for many of their students of color, resulting in lower gifted identification rates.

However, PLCs have their pitfalls in similar ways that other forms of PD have, such as their time consuming nature, limited scope, and challenges with participant buy in (Kose & Lim, 2011). Further, when PLCs are made up of holistically like-minded individuals, they can reinforce deficit thinking and passive racist ideologies (Kose & Lim, 2011). Deficit thinking can inhibit the PLC from becoming transformative, thereby limiting its effectiveness in influencing supportive classroom climates, student-centered instruction, and positive interactions with students of color. PLCs must also have teacher collegiality and true collectivism, which can be difficult with varied ideologies or if the school struggles with culture and climate (Calderón, 1999; Kose & Lim, 2011; Ning et al., 2015). In the case of the District, teachers are asked to participate in many modes of PD and their list of responsibilities grows almost daily, making the PLC structure a challenge to implement systemically.

**Teacher Referrals**

Other than targeted, job-embedded PD, research suggests that interventions focused on the mechanisms for identification of gifted students may be useful in mitigating underrepresentation (Ford, 2015; Lakin, 2016; Peters & Gentry, 2012). The first option, teacher referrals, in conjunction with existing measures of identification such as ability or achievement
testing, has the potential to uncover students who may otherwise be overlooked (Peters & Gentry, 2012). Unfortunately, some districts use these referrals as gatekeepers, which prevent students who may not fit the white, middle class archetype of gifted from being formally identified (Ford, 2015). As a result, teacher referrals, with prescribed rating scales to mitigate cultural bias, could be used as another component to identification as they may uncover unidentified talent without the cost associated with other resource-heavy interventions (Lakin, 2016; Peters & Gentry, 2012).

Since teacher referrals are incredibly inexpensive and time-effective they can be a viable option to add to identification measures to boost the identification scores of high potential students who may not meet specific achievement thresholds, as evidenced by some research suggesting that appropriately designed referral forms, such as the HOPE Scale, have the potential to identify historically overlooked student populations (Ford, 2015; Lakin, 2016; Peters & Gentry, 2012). However, teachers can be biased and may not equitably identify students, especially if the referral form does not have culturally inclusive prompts, as evidenced by the fact that African American and Hispanic students receive the fewest number of referrals each year (Ford, 2015; Lakin, 2016; Jordan, Bain, McCallum, & Bell, 2012). If the referrals are not universal and designed with probing questions or rating scales based upon key characteristics of gifted students across cultural lines, they are inaccurate and ineffective in identifying gifted students (Peters & Gentry, 2012; Oakland & Rossen, 2005). Further, similar to time commitments associated with PD, teachers in the District may be resistant to completing a referral form for each student they teach so as to create meaningful norms.
Universal Screening

While teacher referrals are a cost-effective option for increasing opportunities for students to be identified as gifted, universal screening provides opportunity to all students to be considered for gifted identification. One method of promoting equity in gifted identification is utilizing universal screening using a nonverbal ability assessment (Ford, 2015; Lakin, 2016). Unfortunately, while beneficial, universal screening is often costly and can lead to under-identification if local norms are not utilized or if the subsequent achievement testing is too rigid (Ford, 2015; Lakin, 2016). This option is most effective if funding is available, local norms are utilized, and concerted effort is put into examining tests for inherent biases that may prevent gifted students of color or those from communities that have historically been under-resourced from being identified (Ford, 2015; Lakin, 2016; Peters & Gentry, 2012).

The District has fortunately opted to fund the universal screening of kindergarten students in the district with NNAT, hoping to increase their effectiveness in identifying historically underrepresented populations over solely relying on teacher referrals or achievement testing as screeners (Lakin, 2016; Lymer & Jutras, 2019). This move by the District is particularly important as universal screening has been proven to better identify students who were originally overlooked by IQ or other achievement testing (Ford, 2015; Lakin, 2015). These students, particularly students of color or those from under-resourced communities, have also been found to directly benefit from the distinction of “gifted” by making rapid achievement gains due to an increase in their services, thus making a stronger argument for the use of universal screening (Ford, 2015).

However, in order to be truly effective, universal screening must start young and continue throughout students’ educational experiences, a procedure that the District does not currently
universally implement with nonverbal ability, rather monitoring standardized assessment scores after the initial universal screening in kindergarten, perhaps due to the high cost of assessment (Ford, 2015; Lakin, 2016; Lymer & Jutras, 2019). Further, not all nonverbal ability tests equitably identify underrepresented populations, as the NNAT and Raven assessments have been shown to disproportionately underscore English Language Learners (Lohman, Korb, & Lakin, 2008). Also of concern, achievement and ability tests do have inherent biases linked to culture and curricular choices, which may prevent equitable identification rates if not balanced with other measures (Ford, 2015; Peters & Gentry, 2012).

**Local Norms**

Building off universal screening as a method for increasing gifted-identified students from historically underrepresented populations, using localized norms can further improve identification rates (Ford, 2015; Oakland & Rossen, 2005). Currently, it is common practice to use national norms for identification due to the assumption that it is an equitable and fair way to identify students, when in fact, it assumes that “students’ qualities are normally distributed and somewhat equally represented throughout our states and cities” (Oakland & Rossen, 2005, p. 59). Unfortunately, this is also the case in the District, as national norms are currently utilized to identify students as gifted or advanced in both ability and achievement (Lymer & Jutras, 2019). This policy ignores the huge disparities in achievement along lines of both social classes and race (Ford, 2015; Oakland & Rossen, 2005). For these reasons, the use of local norms becomes a viable intervention, as it directly ties identification to local levels of achievement and instruction, thus providing a lens to more effectively and equitably identify gifted students from every demographic, while also reflecting the natural differentiation that should occur in schools (Ford, 2015; Oakland & Rossen, 2005; Peters & Gentry, 2012).
Some other school districts already use lower cut off scores for gifted program placement to reflect the achievement levels of their population, which has resulted in more equitable representation (Ford, 2015; Oakland & Rossen, 2005). Further, using local norms in conjunction with creating a variety of means for identification, such as high achievement in either verbal, quantitative, or nonverbal ability assessments, can lead to equitable representation and greater opportunities for talent development (Ford, 2015; Peters & Gentry, 2012). Local norms also tie identification to instruction, rather than relying on norms that encompass many different curricula that span across the country (Sulak, 2014). Finally, they also allow for the district to be complaint with the USDE definition of gifted education, which dictates that a student is gifted when their ability or achievement is exceptional “when compared to others of their age, experience, or environment” (United States Department of Education, 1993, p. 3; Oakland & Rossen, 2005; Peters & Gentry, 2012).

However, the full implementation of local norms to identify gifted students will require considerable training at the district, administrator, and teacher levels since there will be a significant increase in identified students (Olszewski-Kubilius & Thomson, 2015). This method will also require considerable district buy in in order to intervention implementation of local norms at a number of schools before system-wide implementation since it has significant policy implications at a systems level. The District currently implements a district wide localized norm for identification, using a score of the 73rd percentile or higher on the NNAT as the first level of identification (Lymer & Jutras, 2019). However, this norming, as evidenced by the needs assessment presented in Chapter 2, has yet to yield representative representation of gifted, advanced, and talent development students across the district. It is unknown if school specific local norming would produce similar results as the district-wide local norming in the District.
However, one of the challenges with school-specific norming is students who transfer schools within the district may either lose or gain formal identification due to new norming, creating inconsistencies for students and families and logistical challenges for the district.

**Talent Development**

The next potential intervention serves as a catalyst for both accurate identification and differentiation for high ability students by providing students of color and those living in under-resourced communities opportunities for their talents to surface, otherwise known as talent development (Horn, 2015; Siegle et al., 2016). As such, the use of talent development as an intervention is useful in not only exposing students to a variety of resources and instruction that will allow them to flourish, but also as a tool for preparing students from under-resourced communities who have continually lacked resources and rigorous curricula to be able to compete and thrive in advanced academics by having multiple opportunities to do so (Horn, 2014; Ford, 2015; Oakland & Rossen, 2005; Siegle et al., 2016; Sulak, 2014). As evidence of its effectiveness, programs like Young Scholars in Fairfax, VA have dramatically increased student achievement and gifted identification of underrepresented populations by allowing students multiple points of entry into gifted programs by using a multi-year talent development model that allows for students’ talents to emerge and be identified formally, using multiple measures such as observations, student work portfolios, and anecdotal records (Horn, 2015, Lee et al., 2009; Siegle et al., 2016; Sulak, 2014).

Models like these have the potential to fill in skill gaps and decrease the excellence gap by providing students with academic opportunities, including acceleration and enrichment, sooner and with greater frequency (Coleman & Southern, 2016; Ford, 2015; Harris & Plucker, 2014; Lee et al., 2009). These opportunities promote student motivation and achievement, while
also leading to higher rates of high school graduation, college enrollment, and college retention (Kaul, Johnsen, Saxon, & White, 2016; Siegle et al., 2016). Not only do these empirical findings make this intervention highly desirable, but talent development has also been proven to show higher levels of equitable representation in historically underrepresented populations due to its multiple points of entry into gifted programs, while also increasing parent expectations for their students’ academic success (Horn, 2015; Lee et al., 2009; Siegle et al., 2016).

The pitfalls to talent development are few, but substantial. In order to be effective, talent development requires extensive training of teachers and administrators in both instruction and documentation, a requirement that may be challenging to overcome in schools with a lack of resources or an overabundance of tasks to complete (Horn, 2015). As a result, many talent development models occur outside of the school day, such as in an extracurricular or Saturday class, which not only limits who can attend, but also creates the additional challenges of students’ time management and abilities to navigate the demands of the program in addition to school (Lee et al., 2009). With talent development’s ultimate goal of reducing opportunity gaps for students, this extracurricular approach seems to be counter-intuitive and should instead be woven into curriculum and school day opportunities.

**Proposed Intervention**

While any of these discussed interventions could potentially create meaningful change in the District’s gifted programs, the results of the needs assessment discussed in Chapter 2 indicate that students would potentially most benefit from having exposure to technology and analogies prior to being assessed during the universal screening process. There is evidence that these forms of frontloading can make a difference in assessment results or in student’s analogical reasoning, which could increase gifted identification in Title I qualifying schools should
students’ learned analogical reasoning transfer to increased scores on the NNAT during universal screening (Vogelaar & Resing, 2016; White & Alexander, 1986). Further, research on the digital divide and computer-based assessments indicates that students learning how to operate the technology used for testing will reduce barriers to student performance (Erickan, Asil, & Grover, 2018).

**Use of Technology**

As evidenced in the Needs Assessment discussed in Chapter 2, many kindergarten students have not had the opportunity to utilize the assessment technology prior to assessment, with many struggling to learn how to use the computer while they are also learning how to take the assessment itself. This identified problem suggests attention should be paid to teaching students how to use the technology they will be assessed on prior to testing (Erickan et al., 2018). As Li and Atkins (2004) found, students who utilized and had access to computers prior to schooling had higher marks both in school readiness and cognitive assessments, suggesting that computer access supports students’ development and may have implications for computer based assessments. Further, access to computers in early education classrooms can narrow the digital divide by grade three (Sackes, Trundle, & Bell, 2011).

One component of many computer based assessments is the use of the mouse. Young students often need assistance with utilizing a mouse and often have many questions about how to use the technology while taking an assessment (Barnes, 2010). This is likely due to students’ dexterity, as developmentally many may struggle with the fine motor skills required to use a mouse effectively (Barnes, 2010, Donker & Reitsma, 2007; Hourcade, Bederson, Druin, & Guimbretiere, 2004). There is evidence that prekindergarten and kindergarten students are not as accurate when using mice, as many of the devices may be too large for their hands or their
dexterity may make them struggle to click on the right object (Hourcade et al., 2004). It is also critical that test images are large enough to increase accuracy, as the smaller the image on the screen, the harder it is for young people to accurately maneuver and click on their chosen answer (Hourcade et al., 2004).

As a result, it is recommended that children in prekindergarten and kindergarten receive additional guided practice before beginning to use a device to test, not only to gain familiarity with the functioning of the device but also in how the assessment may be formatted (Barnes, 2010). It may also be of benefit to reduce the length of testing sessions, zoom in more to the testing screen so images are large enough, reduce the size of the mouse to better fit the size of the students’ hands, and slow down the rate of movement of the mouse to aid students in more accurately selecting their answers (Barnes, 2010, Donker & Reitsma, 2007; Hourcade, 2004).

**Use of Analogies**

In addition to supporting young students with accessing technology effectively, it is also critical to support their analogical reasoning development. Analogical reasoning is thought to be stronger amongst gifted individuals, as it is often correlated with an enhanced ability to transfer problem-solving experience to find relationships between two or more seemingly dissimilar things (Vogelar and Resing, 2018). However, this ability hinges on two facets: prior experience and the ability to transfer that experience to new situations (Geake, 2008; Kanevsky, 2000; Vogelaar & Resing, 2018). Consequently, students with limited experience with these types of problem solving, particularly as the result of opportunity gaps, may be at a disadvantage with more complex forms of analogical reasoning as the cognitive demand will be higher with limited opportunities to transfer from (Volegaar & Resing, 2018). Considering most ability assessments used for gifted identification utilize analogical reasoning in one form or another, Volegaar and
Resing’s (2018) research points to the likelihood that if students have not been provided the opportunity to practice analogical reasoning, their ability to solve more complex problems will be limited, resulting in lower scores on ability assessments that focus on different forms of analogies. These analogical reasoning opportunity gaps may be one of the underlying factors to the underrepresentation of students of color and students who live in areas of concentrated poverty as indicated by focus group data in chapter two that highlights the lack of analogical reasoning in early grades curricula.

Researchers such as Vogelaar and Resing (2016; 2018) have researched the impact dynamic testing and instruction on gifted and average ability students’ abilities to improve performance on analogical assessments, which could point to possible opportunities to impact student scores on ability assessments for gifted identification. Their findings show that students who receive training, particularly with dynamic testing, can increase their accurate performance on analogical problems more than with simply practicing on their own without feedback (Vogelaar & Resing, 2017). Consequently, it is prudent to model for students and provide frequent coaching to support accelerated growth in analogical problem-solving (Vogelaar & Resing, 2017). However, their results indicated that gifted students would still outperform average ability students as gifted students were better able to apply their funds of knowledge in different problems, thereby supporting the need for exposure to analogical reasoning in building students’ tools to better perform on analogical assessments (Vogelaar & Resing, 2018).

When considering formal identification using the NNAT begins in kindergarten in the District, it becomes prudent to explore the impact of teaching analogical reasoning in primary grades. Explicit training, including the use of dynamic testing, on analogical reasoning in preschoolers has been shown to result in positive effects, pointing to the possibility that using
this strategy in the District could yield higher scores for students on the NNAT, particularly for those whom have not experienced opportunities to utilize this type of thinking prior to assessment (Vogelaar & Resing, 2016; White & Alexander, 1986). One of the advantages of focusing this intervention on prekindergarten students is their zone of proximal development is much larger than older children, providing a unique opportunity to accelerate learning and build their funds of knowledge of which can be later transferred to other domains (Kanevsky, 2000; Vogelaar & Resing, 2018).

Further, Vogelaar and Resing (2018) posit that the use of dynamic testing as a tool for coaching prekindergarten students in analogical reasoning may uncover talent in students whom have not been formally identified as gifted. In their study, they found that gifted students did not significantly benefit more from the dynamic testing intervention than average ability students, contrasting previous studies (Calero, García-Martín, Jiménez, Kázen, & Araque, 2007; Vogelaar & Resing, 2016; White & Alexander, 1986), suggesting that their pool of average ability participants may have been students who should have been identified as gifted but were not (Vogelaar & Resing, 2018). This possibility could point to the need for future research to determine if direct teaching of analogies to students can lead to more accurate gifted identification.
Chapter 4: Methodology and Procedures

Evaluating the District’s intervention of the use of lessons in analogical reasoning and increased technology access for PreK students (the intervention) has the potential to provide insight into whether frontloading skills has an impact of identification rates of students attending schools in under-resourced communities. The intervention selected eight schools that qualify for Title I to participate, four of which engaged in daily analogies lessons for six weeks using the *Lollipop Logic* workbooks (Risby & Risby, 2011) and the other four provided daily or weekly access to technology in addition to the analogies lessons. For the purposes of this evaluation, the pre-existing data that from the GT Office’s intervention will be used to determine the fidelity of the implementation and the impact of the treatment within the two intervention groups had on student performance on the NNAT and on teachers’ comfort with teaching analogical reasoning.

**Evaluation Design**

The GT Office in the District sought to increase the number of students from under-resourced school communities qualifying for formal gifted identification through the use of the NNAT universal screener. The intervention was designed to frontload lessons in analogical reasoning and provide opportunities to utilize technology prior to assessment in order to reduce identified opportunity gaps in testing. While initial outcomes were calculated by the GT Office, a formal evaluation has yet to be conducted (Lymer & Jutras, 2019). Following the logic found in Figure 1, a quasi-experimental, multi-level mixed-methods evaluation will be utilized to determine if the process was followed and to what extent the outcomes were realized. Further, the evaluation of this intervention will be grounded around the following evaluation questions:

- To what extent was the intervention conducted with fidelity?
• Did the analogies intervention increase gifted identification rates of participating students compared to previously assessed students?

• Did the analogies with technology intervention increase gifted identification rates of participating students compared to previously assessed students?

• How did participating teachers and GT Leads describe the impact analogies intervention had on their practice?
Figure 1

Logic Model

Inputs
- 8 Title I Qualified Elementary Schools with at least 2 PreK Classrooms
- 6 Weeks from February 2019 to April 2019
- 19 PreK Teachers
- 8 School-Based GT Leads
- 289 PreK Students
- 2 District GT Specialists
- Lollipop Logic Curriculum Books
- Technology used for Testing

Activities
- 6 Weeks of analogical reasoning lessons using Lollipop Logic at 8 schools
- 6 weeks of access and use of the technology used for testing at 4 of the 8 schools
- 1.5 hour pre-intervention training of all 27 PreK teachers and GT Leads
- As needed coaching by District GT Specialists

Outputs
- 19 Teachers Implementing the intervention
- 289 PreK Students engaging in the intervention
- Increased teacher capacity to teach analogical reasoning
- Teachers authentically and fully implement the intervention with the support of the GT Leads and District GT Specialists

Participation

Short
- Students increase analogical reasoning

Medium
- Students increase technological fluency

Outcomes

Increased student scores on the NNAT2 assessment

Higher gifted, advanced, and talent development identification rates of student enrolled in Title I qualified schools

Assumptions
- Teachers influence student achievement and learning gains
- Analogical reasoning is not regularly taught in school, particularly in primary grade levels

External Factors
- Shifts in school schedules and calendars that impact instructional time
- Teacher absences
- District expectations of general education PreK classrooms
Process Evaluation

As shown in Figure 1, the intervention was designed for eight Title I qualified schools to implement six weeks of analogies lessons in PreK classes with four of the eight also providing access to the technology used for testing 50 minutes weekly throughout the course of the intervention. A multi-level mix-methods parallel analysis of the teacher surveys, focus group data, and the student classwork scores will be conducted to determine the extent of the intervention’s implementation fidelity. The use of both quantitative and qualitative data will support the triangulation of data to better explain the experience of teachers and the impact that had on student completion of daily lessons and/or technology usage.

Outcome Evaluation

The mixed-methods outcome evaluation seeks to determine the degree to which the short, medium, and long-term outcomes are realized as the result of the analogies intervention. This evaluation will utilize a quasi-experimental design as the intervention participating student data will be compared with pre-existing system-wide data of students who have been previously assessed using the NNAT2.

The short-term outcome found in the logic model (Figure 1), is an increase in teachers’ capacities to teach analogical reasoning. In order to evaluate this outcome, multi-level analysis of both quantitative and qualitative data will be conducted simultaneously to fully explain the results. For the quantitative portion, an analysis of daily student classwork scores, along with the difference between students’ pre and posttest scores will be analyzed to determine if there was an impact on student performance with the analogy lessons. Further, an analysis of the Likert-scale survey responses from teachers at the midpoint of the intervention and post intervention will further indicate potential differences in teacher’s understandings of teaching analogical
reasoning. For the qualitative portion of the evaluation, teacher focus group data and the short answer portions of the teacher surveys will be analyzed through coding for themes to further explain the teacher experience with the intervention and their self-explained effectiveness with teaching analogical reasoning.

The medium-term outcomes are thought to be an increase in students’ analogical reasoning and an increase in their technological fluency (for students who participated in the technology access portion of the intervention). In order to evaluate the first of these outcomes, and analysis of their pre and posttest scores, along with trends in daily classwork, will be evaluated. Teacher and GT Leads responses to surveys and focus group data will also be coded and analyzed for themes related to students’ analogical reasoning. The second outcome will be evaluated by determining participation rates of students in technology access based on teacher spreadsheets. This data will also compare student NNAT2 scores for those who participated in the technology access portion of the intervention to those who do not.

The long term prediction is an increase in NNAT2 scores among students in Title I qualified schools, resulting in an increased rate of gifted identification. is thought to be that there would be an increase in gifted identification of students enrolled in Title I qualified schools due to an increase in their NNAT2 scores. In order to evaluate this outcome, multiple analyses will be done of participating PreK students’ NNAT2 percentiles including comparisons against the total district sample, the individual school’s scores in previous years, and against the scores of students who attend Title I qualified schools across the district.

Method

The District’s analogies intervention was implemented for six weeks between February 2019 and April 2019. The method for implementation of the intervention was established and
conducted by the GT Office, however the data from this intervention will be utilized to evaluate the outcomes of the intervention. The data analysis will follow a sequential explanatory mixed methods design to incorporate the quantitative and qualitative data gathered by the GT Office (Creswell & Clark, 2017).

Participants

Based on the needs assessment (Chapter 2), the intervention is focused on PreK students enrolled in Title I qualifying District schools. These students have more limited testing requirements than those in other grades, all PreK classrooms have paraeducators which reduces the strain of an intervention on the lead teacher, PreK students have not yet been universally screened, and PreK students at the end of the school year are most similar in age group to previous data collected through universal screening of kindergarten students at the beginning of their school year.

Site Identification

For this intervention, all of the principals and GT Leads of Title I qualified schools who had PreK classes were emailed in January of 2019 with the opportunity to participate in the intervention provided they could commit to the parameters of the intervention which included:

- Schools needed to have at least two PreK sections
- Schools must be able to commit to 10 minutes of analogies lessons per day
- School must be able to commit to 50 minutes weekly of technology usage with whatever technology students will use for the NNAT2
- Schools must be able to schedule and administer the NNAT2 at the conclusion of the intervention for student participants
Twelve schools committed to being selected for the intervention and eight were randomly selected to participate by putting the schools’ names on strips of paper and then placed into basket for people in the office to randomly pull from. Once the eight schools were selected, their names went back into the basket to determine which four would be randomly selected to teach analogies lessons for six weeks and which four would incorporate technology access in addition to teaching the daily analogies lessons. After this random selection, principals and GT Leads were notified of their selection and each confirmed their full participation.

**Participant Selection**

Participants were selected as the result of their school enrolling in the intervention. As such, the PreK teachers and GT Leads identified by the principals of the each of the selected schools became participants in facilitating instruction and assessment for the intervention. In total, nineteen teachers and eight GT Leads participated in the intervention.

Similar to teachers, all PreK students enrolled in sections selected by the principals to participate became participants unless they opted out. All schools disseminated letters to the parents and guardians of the PreK students in both English and Spanish to inform them of the intervention and give them an opportunity to opt out of assessment. Parents were informed that students who participated who scored in the 75th percentile or higher on the NNAT in PreK would automatically be flagged as gifted, advanced, or talent development, and students who scored below the 75th percentile would be able to re-take the NNAT during the kindergarten universal screening. Zero parents or guardians opted out of their student participating, and a total, 289 PreK students participated in the intervention, 148 of whom participated in the analogies only portion and 141 whom participated in the analogies and technology access intervention.
Comparison Group

Since the District has previously universally screened kindergarten students at the beginning of each academic year, the data gathered in the intervention will be compared with pre-existing data. First, each of the intervention group results will be compared to the schools’ previous year data from universal screening with kindergarten. Then the two intervention group results will be compared to determine if there are differences in results between the two. Finally, both of the intervention groups will be compared with the same year’s NNAT universal screening results of kindergarteners at the four schools who were not selected for the intervention. Within these comparisons, variables such as age, enrollment in Title I qualified schools, and race can be analyzed both system wide, within the intervention sample, and between individual schools.

Data Sources

Throughout the course of the analogies intervention, multiple types of data were collected including analogies lesson pre and post test scores based on activities in the *Lollipop Logic* workbooks (Risby & Risby, 2011), daily lesson classwork scores, and the NNAT2 scores of the student participants. In addition to student scores, teachers and GT Leads completed a mid-intervention and a post-intervention survey, as well as participated in a focus group at the mid-point of the intervention which was documented through notes taken by the GT Office on a PowerPoint in conjunction with the teachers and GT Leads.

For this evaluation of the District’s analogy intervention, pre-existing data will be utilized as it is available from the GT Office. This de-identified data includes mid-point and end of intervention teacher surveys, the intervention focus group questions and notes from the responses from participants, and student data trackers with student demographic data that include daily lesson student scores, technology access tracking, and student pre and post test scores from the
analyses unit. Further, the NNAT scores of PreK student participants from the eight intervention schools will be utilized along with the NNAT data from the kindergarten students in the four schools that were not selected from the intervention. The NNAT scores are normed using a national sample (Pearson Assessments, 2020).

Measures

The measures utilized for this intervention were pre-determined by the GT Office and an analysis of their reliability and validity will be conducted to support a sound evaluation. As Newcomer, Hatry, and Wholey (2010) describe, measures should reflect the needs of stakeholders and align to existing research. In the case of teacher surveys and focus group questions, they were designed to reflect the needs of the GT Office in understanding the experience of teachers and their beliefs about their own practice, indicating it an appropriate measure. An analysis of face validity of the questions used in both the surveys and the focus groups will also be done to determine the credibility of these measures.

Previous studies have not been completed on the usage of the Lollipop Logic series (Risby & Risby, 2011) on increasing students’ analogical reasoning. However, the student scores on both the analogies lessons and the pre and post assessments for the analogies lessons can be analyzed for reliability based on the consistency of scores produced from the intervention across the eight participating schools. The same will be true for the tracking of technology usage.

The NNAT assessment has established construct and criterion validity, as well as generalizability making it a strong measure for evaluating outcomes of this intervention (Lee, Karakis, Olcay Akce, Azzam Tuzgen, Karami, Gentry, & Maeda, 2021). The NNAT is also correlated to other measures used for gifted identification and has shown stronger results in identifying historically underrepresented populations (Lee et al., 2021). Coupled with multiple
years of pre-existing data from the usage of the NNAT for universal screening in the District, the NNAT is a strong measure to determine differences in outcomes as the result of the intervention.

**Variables**

Multiple independent and dependent variables will be analyzed in the evaluation of this analogies intervention. Independent variables are the analogical reasoning lessons and the access to technology. The moderating variables include student race, student school enrollment, and student age. The dependent variables under analysis will be students’ NNAT2 scores, as well as their classwork scores, pretest, and post test scores on their analogical reasoning lessons.

**Procedure**

Teachers implemented 30 days of lessons over the course of six weeks from February 2019 to April 2019, after attending 90-minute training on the curriculum and intervention design. Part of the intent of the GT Office was to simulate a real-world scenario to determine potential applicability across the system. Similar to most curricular changes that occur in the school system for areas outside of the core four contents, there is often a plethora of training opportunities in the first couple of years of the introduction of a new curriculum. However, beyond that experience, opportunities fall off so that the many new teachers who come in each year are not formally trained, and teachers who may have been trained do not have many opportunities for a refresher. Further, after most curricular trainings, there is minimal support within the schools in order to successfully implement the curriculum with fidelity. As a result, for most teachers in the intervention, the one training plus periodic email communication was all the support they received. In the case of a teacher reaching out for support or for those struggling to complete the intervention, one of the Gifted Education Specialists would provide one-on-one coaching, however this information was anecdotal and not formally tracked.
The six weeks of analogies lessons used lessons selected from the first three volumes of the *Lollipop Logic* books (Risby & Risby, 2011) that were purchased by the district. The themes of the lessons included relationships, pattern decoding, verbal and nonverbal analogies, and inferencing. Each lesson had a core worksheet and an extension activity to provide students ample opportunities to practice the skills they were learning. At the beginning of each theme, lessons were typically taught in a whole group setting and then with guided practice. The subsequent lessons were typically completed in small groups or independently as a grounding activity before or after student transitions from other classes, recess, or lunch. This gradual release provided students time to build their skills within in each theme to achieve independence prior to beginning the next theme.

The District designed this intervention for four of the eight schools to also give students time to use the technology used for the NNAT2 for at least 50 minutes a week, as shown in Figure I in the Appendix. The only requirement for technology usage was that schools used the same device as would be used for testing. The goal of this portion of the intervention is to determine if having access to technology prior to assessment has an impact on student performance on the assessment.

**Data Collection**

Data for this intervention was already collected by the District and as such, will be pre-existing for the purposes of this evaluation. A formal request will be made to the District to provide the de-identified data including the spreadsheet of student curricular scores, the intervention pre and post assessments, and the NNAT2 scores of student participants that are coded for individual student demographics including race, age, and a de-identified school name to allow for proper analysis. Further, the de-identified results of the teacher surveys, notes from
the Gifted Education Specialists, and teacher focus group data will be requested to determine themes across teachers’ experiences.

**Data Analysis**

The evaluation of the analogies intervention follows a sequential explanatory quasi-experimental design using mixed-methods (Creswell & Clark, 2017). The analysis of the quantitative data will precede the analysis of the qualitative data in order to triangulate the data and fully explain the outcomes of the intervention. Prior to an analysis of each of the research questions, descriptive statistics will be used to characterize the population of students who participated in each the intervention treatment groups to determine if the sampling of the intervention group mirrors that of the system.

In order to address the first research question, the first level of analysis will determine the frequency by which the analogies assignments were completed by classroom and by school to determine the fidelity by which the analogies lessons were taught. A similar frequency analysis will be completed for the technology logs documenting the time by which students experienced technology by week. The final method of analysis to determine intervention fidelity will be to utilize a conventional content analysis approach to examine the qualitative data provided in the focus group notes and the narrative components from the teacher surveys to determine themes for implementation fidelity (Hseih & Shannon, 2005).

A descriptive analysis will be completed to determine the demographic make-up of each of the intervention and control groups by the variables of race, age, gender, students with disabilities, and ELs. Then, an ANOVA will be run for the four groups’ NNAT percentile scores, covarying for age, to determine the level of significance age had in the overall results since the intervention group participants were in Prek and the control groups were in kindergarten.
Determining the extent to which the analogies only portion of the intervention had an impact on gifted identification rates of participating students as compared to previously assessed students will require quantitative analysis of NNAT scores. An initial T test of student NNAT percentile scores will be utilized to determine if there was a difference in scores between the analogies only intervention group and the comparison group. Once these initial tests are complete a bivariate correlative analysis will be used to determine if there is any potential correlation between analogy lesson post-test scores and the results of the NNAT for this intervention group. Then two binomial tests will be conducted to determine how the identification rates of the analogies only intervention compared to the expected values of the Title I qualifying school’s identification rates and the non-Title I qualifying school’s identification rates established in Chapter 2.

The analysis of the third research question will follow similar logic as the second. The first layer of analysis will incorporate a T test to compare NNAT scores between the two intervention groups in order to examine any potential differences in outcomes of the two treatments. Then a bivariate correlative analysis will be conducted for the analogies with technology intervention group to determine the level of correlation between participants’ analogies post assessment scores and their NNAT percentile scores. Finally, the same binomial analysis will be conducted as described for the second research question with the analogies with technology intervention data set.

The final research question requires quantitative frequency analysis of their responses to the Likert-scale questions in the teacher surveys, along with a conventional content analysis of teacher narrative responses to surveys and the focus group notes. The qualitative data will be examined using a naturalistic conventional content analysis framework to investigate potential
themes (Hsieh & Shannon, 2005; Vaismoradi & Snelgrove, 2019). The qualitative data, namely teacher focus group responses and teacher survey narrative responses, were conducted in teachers’ work environments in a format that is very common within the district. While data was collected in focus groups, notes were typed into a projected PowerPoint that all participants could view and were confirmed to be accurate by the participants throughout data collection, thereby enhancing the trustworthiness of the focus group data. Surveys were also anonymous in an effort to ensure teachers were able to respond freely and openly. However, as with any district led intervention, there is potential that participants may have skewed their responses to mirror that of the group or to avoid and perceived negative consequences despite the members of the GT office not serving in a support and not supervisory role.

The conventional method of content analysis will be used in order to explore teachers’ reactions and experiences with the intervention, as there is minimal analysis of the teacher perspective in previous research of similar interventions (Hsieh & Shannon, 2005; Vogelaar & Resing, 2016; 2018; White & Alexander, 1986). All qualitative data from the surveys and focus group notes will be scanned for frequency of language that can be classified as themes found present in the data and will not use pre-determined categories (Hsieh & Shannon, 2005; Vaismoradi & Snelgrove, 2019). As suggested by Hsieh and Shannon (2005), an analysis of the categories will be conducted to determine if there is relationship between them or not in order to support more accurate coding and discussion.

In order to establish trustworthiness of the analysis and data for both questions one and four, the content analysis of the focus group will be compared to the analysis of the teachers’ narrative survey responses to determine if the themes are supported across all data. The discussion of this analysis will be contextualized within current research on teacher experience
Running head: EFFECTS OF FRONTLOADING ON UNIVERSAL SCREENING

and practice within similar interventions (Swanson, 2006; Vogelaar & Resing, 2016; 2018), as well as with the quantitative analyses of the intervention. By doing so, the analysis aids in determining the fidelity of implementation and in assessing the impact the intervention had on teacher practice and abilities to teach analogies in the PreK classroom (Hsieh & Shannon, 2005). The use of this conventional content analysis aligns well to the sequential explanatory mixed methods design of this evaluation, as the results of this qualitative analysis has potential to provide a more robust understanding of the intervention and provide addition implications for further research to determine replicability.
Chapter 5: Research Findings and Implications

As described in Chapter 4, the evaluation of the District’s two-prong intervention is centered on these four research questions:

- To what extent was the intervention conducted with fidelity?
- Did the analogies intervention increase gifted identification rates of participating students compared to previously assessed students?
- Did the analogies with technology intervention increase gifted identification rates of participating students compared to previously assessed students?
- How did participating teachers and GT Liaisons describe the impact analogies intervention had on their practice?

Findings

The District provided de-identified data sets including an Excel spreadsheet of each of the intervention schools, coded for intervention group, participating PreK students’ demographic information, pre and post assessments from the intervention, scores for each of the 28 lessons and 28 extension activities, a technology log, and their NNAT percentile scores. This Excel tracker also included control data from the kindergarten students at each of the intervention schools, inclusive of demographic information and NNAT percentile scores. The second data set included two Excel files of the teacher’s mid-intervention and post-intervention survey responses and the third data set included the District GT Office’s focus group anecdotal notes, inclusive of the PowerPoint slides that tracked participant responses.

The first step of analysis of this data is to determine the homogeneity of the intervention and control groups’ demographic variables to determine the feasibility of across-group analysis. Given that the intervention groups featured PreK students and their respective control groups
were comprised of kindergarten students, an analysis of participant ages at the time of NNAT testing was critical to determine if these groups could be accurately compared. As shown in Figure 2, the box and whiskers plot of the distribution of ages at the time of NNAT testing amongst the intervention groups and the control groups were respectively similar. The range of ages for the analogies with technology intervention group (AWTi) was from four years and one month old to six years and seven months old. The range of ages for the analogies only intervention group (AOi) was from four years and seven months old to five years and seven months. The kindergarten control group (AWTc) for the AWTi had a range of age starting at five years and one month old and concluding at seven years and eleven months old. Within the analogies only control group (AOc) the range of ages was from five years old to seven years and one month old.

**Figure 2 Box and Whiskers Plot of Age by Intervention Group**

Further, a frequency analysis of each groups’ demographic variables of gender, race, IEP or 504 status, and qualification for English as a Second Language (ESOL) services was conducted to determine homogeneity across variables. The AWTi consisted of 188 PreK
participants, 102 of which were male and 86 were female. This intervention group was 13.29% Hispanic, 3.72% White, and 82.97% African American. In total, seven students had an IEP or 504 and 17 qualified for ESOL services. The AWTc from this set of intervention schools had a similar demographic breakdown. Of the 217 total students in the data set, 107 were female and 110 were male. Further, 11.52% were Hispanic, 3.22% were White, and 85.25% were African American. Of this group, 23 of the students had an IEP or 504 and 20 were classified as ELs.

The AOi group consisted of 173 PreK students, 93 of whom were female and 80 of whom were male. This group was 95.37% African American, 1.15% Hispanic, 1.15% were Asian, and 1.73% were White. This intervention group also had 6 students who qualified for ESOL services and 19 who had an IEP or 504. The kindergarten control group for this set of schools was similar in makeup, including 253 total students, 121 of which were male and 132 of which were female. Students in this control group (AOc) were 98.02% African American, 1.18% Hispanic, and .39% Asian. There were also 18 students classified as ELs and 42 who had an IEP or 504. It should also be noted that all four intervention and control groups come from Title I qualifying schools and that due to direct certification individual level FARMS or SES data is not reported. The findings of this frequency analysis of demographic variables determined that analysis could be done across overall groups given the demographic similarity amongst them, however disaggregated analysis by demographic variables could not accurately occur given each of the groups did not have a proportionate representation of students based on race, IEP or 504 status, or qualification for ESOL services.

Further, a frequency analysis of participating teachers was conducted in order to establish context of their qualitative responses. The PreK teacher participants, eight in each intervention group for a total of 16 participants, had a wide range of teaching experience. In the AWTi group,
37.5% of the teachers had three to five years of experience, 12.5% had six to eight years of experience, and 50% had fifteen or more years of experience. In the AOi intervention group, 37.5% of the participating teachers had three to five years of teaching experience, 12.5% had six to eight years of experience, 37.5% had nine to eleven years of experience, and 12.5% had fifteen or more years of experience.

**Fidelity of Implementation**

In order to examine the fidelity of implementation in both intervention groups, both quantitative and qualitative data were utilized in a sequential mixed-methods design. This analysis included implementing a descriptive frequency analysis of lesson completion, extension activity completion, pre and post-assessment completion, and technology log completion for both intervention groups using the tracking document provided by the District. This data was further explained by the naturalistic conventional content analysis of the qualitative data found in the mid and post intervention surveys, as well as focus group notes (Hseih & Shannon, 2005; Vaismoradi & Snelgrove, 2019).

Based on the scores provided in the tracker, the AWTi group had 63.30% of student participants completed the pre-assessment and 64.89% complete the post assessment. This data was mirrored in lesson completion with 62.73% of the participants completing the 28 lessons and 18.64% completing the lesson extensions. Additionally, this intervention group has a 33.76% completion rate of providing technology access across the course of the intervention.

However, upon examination of the data, one school (School 1) did not complete any of the tracker fields. As shown in Figure 3, the rates of completion are higher when this school is omitted with 92.25% completing the pre-assessment and 80.62% completing the post assessment.
assessment. Further, 91.42% completed the analogies lessons, 27.16% completed the extensions, and 49.20% completed the technology requirement.

Figure 3

Comparison of Intervention Completion Rates by Group

In order to further examine if School 1 participated in the intervention other than administering the NNAT assessment with the participating PreK students, the qualitative data from the mid-intervention focus group notes as well as the mid and post intervention surveys was scanned and coded for themes based on frequency of language (Hsieh & Shannon, 2005; Vaismoradi & Snelgrove, 2019). When isolating for responses from School 1, the theme from mid-intervention survey was that both participating teachers from this school struggled with using the grading tracker. One of these teachers shared, “It has been hard to find the time to input the data on the tracker.” This finding was triangulated with the post-intervention survey and the focus group notes, where the key them for both data, isolating for School 1, was that the inputting the scores in the tracker was too time-consuming or difficult. Further, both School 1
teachers indicated they had taught through lesson 11 at the time of the mid-intervention survey, which was the same completed lesson range as all of the other participating teachers across both intervention groups, indicating School 1 did complete the intervention but did not provide the student-level data for the lesson implementation nor technology completion.

As shown in Figure 3, the AOi group had a 91.91% completion rate of the pre-assessment as well as a 80.92% completion rate of the post-assessment. Further, this intervention group had a 70.58% completion rate of the analogies lessons and a 33.32% rate of completion for the extension activities. The AOi group also had a 97.69% NNAT completion rate.

Across Group Analysis

Given the wide distribution of ages and the established comparative homogeneity of the overall sample in the intervention and control groups across other demographic variables, as shown in Figure 2, it was necessary to run an ANOVA, covarying for age, to determine the impact age had on the NNAT percentile scores across groups. The results of this test showed the average NNAT percentile score for the AWTi group was 49.29 (SD = 25.52), the AWTc group had an average score of 28.67 (SD = 23.58), the AOi group had a mean of 34.19 (SD = 24.53), and the AOc group had a mean score of 22.63 (SD = 20.69), as shown in Table 8.

Table 8

<table>
<thead>
<tr>
<th>Mean NNAT Percentile Scores by Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>NNAT Percentile Score</td>
</tr>
<tr>
<td>M</td>
</tr>
<tr>
<td>SD</td>
</tr>
</tbody>
</table>

69
Utilizing the ANOVA to compare the intervention groups NNAT scores, covarying for age, it was found that there is a significant difference in scores across intervention groups $F(3,811) = 35.73, p = <.001$. This analysis, as shown in Table 9, also revealed that age was not a significant factor in the differences in performance on the NNAT across intervention groups $F(3,811) = .009, p = .926$.

**Table 9**

**ANOVA of Intervention Groups NNAT Percentile Scores Covaried for Age**

<table>
<thead>
<tr>
<th>df</th>
<th>$F$ (3,811)</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected Model</td>
<td>4</td>
<td>35.73</td>
</tr>
<tr>
<td>Age</td>
<td>1</td>
<td>.009</td>
</tr>
</tbody>
</table>

The estimated marginal means (Table 10), covaried for age, did not show a large difference as compared to the first mean analysis (Table 8). However, these marginal means were utilized to conduct the post hoc Bonferroni analysis to determine mean differences between treatment groups and their respective control groups, as shown in Table 11.

**Table 10**

**Estimated Marginal Means**

<table>
<thead>
<tr>
<th>Groups</th>
<th>Mean</th>
<th>Std. Error</th>
<th>95% Confidence Interval</th>
<th>Lower Bound</th>
<th>Upper Bound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analogies with Technology</td>
<td>49.34$^a$</td>
<td>1.84</td>
<td>45.74</td>
<td>52.95</td>
<td></td>
</tr>
<tr>
<td>Analogies with Technology K Control</td>
<td>28.62$^a$</td>
<td>1.88</td>
<td>25.36</td>
<td>31.89</td>
<td></td>
</tr>
<tr>
<td>Analogies Only</td>
<td>34.24$^a$</td>
<td>1.50</td>
<td>30.56</td>
<td>37.92</td>
<td></td>
</tr>
<tr>
<td>Analogies Only K Control</td>
<td>22.60$^a$</td>
<td>1.66</td>
<td>19.65</td>
<td>25.55</td>
<td></td>
</tr>
</tbody>
</table>

a. Covariates appearing in the model are evaluated at Age = 505.95
The pairwise comparisons for mean NNAT percentile scores using the Bonferroni adjustments show a significant mean difference between the AWTi group (Group I) and the AOi group (Group II) $MD = 15.10, p < .001$, 95% CI [8.45, 21.76]. A significant mean difference also occurred between Group I and its control group $MD = 20.72, p < .001$, 95% CI [13.90, 27.54]. Group II experienced a significant mean difference with its control group as well $MD = 11.64, p < .001$, 95% CI [5.11, 18.16].

Table 11

<table>
<thead>
<tr>
<th>Groups (I)</th>
<th>Groups (J)</th>
<th>Mean Difference (I-J)</th>
<th>Std. Error</th>
<th>$p$</th>
<th>95% Confidence Interval for Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analogies with Technology</td>
<td>Group II</td>
<td>15.10*</td>
<td>2.52</td>
<td>&lt;.001</td>
<td>8.45 - 21.76</td>
</tr>
<tr>
<td>(Group I)</td>
<td>Analogies with Technology</td>
<td>20.72*</td>
<td>2.58</td>
<td>&lt;.001</td>
<td>13.90 - 27.54</td>
</tr>
<tr>
<td>Only (Group II)</td>
<td>Control Group</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-15.10*</td>
<td>Group I</td>
<td></td>
<td></td>
<td></td>
<td>-21.76 - -8.45</td>
</tr>
<tr>
<td>11.64*</td>
<td>Analogies Only Control Group</td>
<td></td>
<td></td>
<td></td>
<td>5.11 - 18.16</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Based on estimated marginal mean
* The mean difference is significant at the .05 level.
b. Adjustment for multiple comparisons: Bonferroni

Given the significant difference in means between the treatment groups as well as between each treatment and its control, it was important to examine the distribution of the NNAT percentile scores to determine their proximity to normality. As shown in Figure 4, the distribution of NNAT percentile scores across the four groups varied. The four groups revealed
that the AWTi group was the only group to have a normal distribution of NNAT percentile scores. The AOi and both control groups bell curve skewed towards lower percentile scores.

**Figure 4**

*Histogram of NNAT Percentile Scores by Group*

A subsequent analysis of skew and kurtosis confirmed these findings. The AWT group had an approximately symmetric skew of 0.142 with a platykurtic kurtosis of -0.878. The AOi group had a moderate skew of 0.578 with a platykurtic kurtosis of -0.601. The AWTc group was also moderately skewed (0.976) with a platykurtic kurtosis of 0.158 and the AOc group was highly skewed (1.259) with a playkurtic kurtosis of 1.282.

**Impact of Analogies and Technology Intervention**

After examining the data across groups, an analysis of each treatment group and its corresponding control group was conducted to isolate the results of each treatment. First, in
order to determine the impact the AWTi intervention had on NNAT percentile scores, an independent samples T-Test was conducted to compare the means of the intervention group with its kindergarten control group. As shown in Table 12, the 177 participants who participated in the AWTi treatment (M = 49.29, SD = 25.524) compared to the 217 participants in the AWTc group from the same schools (M =28.67, SD = 23.583) showed a significant, positive difference in NNAT percentile scores, t(392) = 8.32, p < .001. Further, using Cohen’s (1988) strength of association guidelines, a large effect size, Hedges’ g = .84, 95% CI [.63-1.05], was found.

Table 12

| T-Test Comparing NNAT Percentile Scores for Analogies with Technology and Control Groups |
|-----------------------------------|----------------|---------------|----------------|----------------|
|                                   | Analogies with Technology | K Control     | t(392)         | p              | Hedges’ g |
| NNAT Percentile Score             | M         | SD           | M           | SD           | Lower | Upper |
| Percentile Score                  | 49.29     | 25.52        | 28.67       | 23.58        | .84   | .63   | 1.04 |

Since this treatment group participated in six weeks of analogical reasoning lessons, it is necessary to examine the potential relationship between the AWTi’s post assessment scores from the analogy lessons and their NNAT percentile scores. A correlative analysis found that the post assessment’s (n=122) mean was 70.39% with a standard deviation of 23.41%. The NNAT percentile score’s (n=177) mean was 49.29 with a standard deviation of 25.52. Using Cohen’s (1988) guidelines for strength of association, a small positive correlation was found between the two scores r(297) = .20, p = .033 (two-tailed), 95% CI [.015, .363].

Further, since this intervention was conducted as the result of the under-identification of gifted students attending Title I qualified schools it was important to examine how the identification rate of students participating in the AWTi compared to the expected value. As
established in Chapter 2, the expected value of the identification rate of students who attend Title I qualifying schools in the District is 3.95% with 96.05% not qualifying with the NNAT universal screener. Consequently, a binomial analysis (Table 13) was completed using the District’s established NNAT percentile for identification (>72) using the expected value of 96.05% to test if the AWTi group had a statistically significant observed proportion of students who did not qualify for gifted identification based on their NNAT percentile score. The test result showed that this intervention group had a significant \( p = <.001 \) observed proportion of 79% not qualifying for identification and 21% qualifying for identification with the District, surpassing the previous expected value of 3.95% for students in Title I qualifying schools.

Table 13

<table>
<thead>
<tr>
<th>Binomial of Title I Identification Rate as Expected Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category</td>
</tr>
<tr>
<td>----------</td>
</tr>
<tr>
<td>NNAT Percentile Score</td>
</tr>
<tr>
<td>&lt;=72</td>
</tr>
<tr>
<td>&gt;72</td>
</tr>
</tbody>
</table>

a. Alternative hypothesis states that the proportion of cases in the first group < .9605

A similar approach was taken to establish if the AWTi group had a statistically significant identification rate as compared to the previous expected value established in Chapter Two for non-Title I qualifying schools of 10.44% or 89.56% of students who do not qualify. The binomial analysis found a significant \( p = <.001 \) observed proportion of students who did not qualify for identification (79%) with a 21% identification rate surpassing the previous expected rate 10.44%, as shown in Table 14.

Table 14

<table>
<thead>
<tr>
<th>Binomial of Non-Title I Identification Rate as Expected Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category</td>
</tr>
<tr>
<td>----------</td>
</tr>
<tr>
<td>&lt;=72</td>
</tr>
</tbody>
</table>

a
In order to provide additional explanation and insight into these quantitative results, a naturalistic content analysis approach was taken to scan the mid and post intervention survey results for frequency of language to determine themes. In the mid-intervention survey, three themes emerged amongst the five teacher participants from the analogies with technology group who completed the survey question: “In your experience with the intervention thus far, have you noticed any changes with your students, their thinking, their behaviors, or other areas?” All five participants noted they saw positive changes in their students’ abilities to identify patterns, three of the five noting that they saw a change in students’ thinking processes. Four of the five also noted high levels of student engagement during the analogy lessons. It should be noted the prompt was leading and may have resulted in the consistency of themes across respondents.

These themes were compared with the post-intervention survey responses, as well as the themes noted from the mid-intervention focus group in order to establish trustworthiness (Hsieh & Shannon, 2005; Vaismoradi & Snelgrove, 2019). In the post intervention survey, four of the eight respondents from this group noted they saw improvement in their students’ ability to recognize patterns, three of which said they saw a difference in student thinking. Four of the eight also noted that they saw students’ analogical reasoning transferring to other content areas. Two teacher participants also expressly noted that they saw an improvement in the students’ ability to use the mouse for the computer, which may point to observed improvement in technological usage for participating students. These results corroborate the quantitative findings.
of this study, indicating that there was an observed difference in student performance at both the classroom-level and in the concluding NNAT assessment.

**Impact of Analogies Only Intervention**

An analysis of the AOi was conducted in isolation, similar to the approach taken with the AWTi, in order to determine the impact this treatment specifically had as compared to its control group. The first analysis of the AOi group was to examine the intervention’s impact on NNAT percentile scores. Consequently, an independent samples T-Test, shown in Table 15, was implemented to compare the means of this group with the AOc group from the AOi set of schools. The 169 PreK participants who participated in the AOi (M = 34.19, SD = 24.54) compared to the 253 participants in the AOc group (M = 22.62, SD = 20.69) showed a significant, positive difference in NNAT percentile scores, t(420) = 5.21, p < .001. There was medium effect size, interpreted using Cohen’s (1988) strength of association guidelines, noted by Hedges’ g = .51, 95% CI [.31, .714].

**Table 15**

| T-Test Comparing Analogies Only Intervention Group with Control NNAT Percentile Scores |
|---------------------------------|---------------------------------|----------------|----------------|----------------|----------------|
|                                 | Analogies Only | K Control | r(420) | p   | Hedges’ g | 95% Confidence Interval |
| NNAT Percentile Score          | M     | SD   | M     | SD  |               | Lower | Upper |
|                                | 34.19 | 24.54| 22.62 | 20.69| 5.21          | <.001 | .51   |

Further, since this treatment relied solely on the utilization of analogy lessons over the course of six week, it was necessary to determine if there was a relationship between the final posttest scores from the lessons and the NNAT percentile scores within the treatment group. A test for correlation revealed that the post assessment’s (n=140) mean was 56.9% with a standard deviation of 26.66%. The NNAT percentile score’s (n=169) mean was 34.19 with a standard deviation of 24.54.
deviation of 24.54. Based upon the guidelines for strength of association (Cohen, 1988), a small positive correlation was found between the two scores \( r(306) = .18, p = .037 \) (two-tailed), 95% CI [0.011, 0.33].

As was conducted with the AWTi group, a set of two binomial analyses were completed for the AOi group to determine how this treatment group’s gifted identification rates compared to the established expected values within the District. The first binomial analysis used the expected value of the non-qualifying identification rate of students who attend Title I classified schools (96.05%). The binomial analysis using the same grouping as previous analyses (Table 9) found that the AOi intervention group had a significant \( p < .001 \) observed proportion of 89% of students not meeting the threshold for identification and 11% being identified in the District, exceeding the previous expected value of a 3.95% identification rate for students in Title I qualifying schools.

**Table 16**

*Binomial of Title I Identification Rate as Expected Value*

<table>
<thead>
<tr>
<th>Category</th>
<th>N</th>
<th>Observed Prop</th>
<th>Test Prop</th>
<th>Exact Sig. (1-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NNAT Percentile</td>
<td>&lt;=72</td>
<td>151</td>
<td>.89</td>
<td>.96</td>
</tr>
<tr>
<td>Score</td>
<td>&gt;72</td>
<td>18</td>
<td>.11</td>
<td>&lt;.001(^a)</td>
</tr>
</tbody>
</table>

\(^a\) Alternative hypothesis states that the proportion of cases in the first group < .9605

The second binomial analysis used the previous expected value of the 89.56% non-identification rate found amongst non-Title I classified schools (Chapter 2). This analysis resulted in a non-significant result \( p = .501 \), with the observed proportion of 89% of intervention group not flagging for identification.

**Table 17**

*Binomial of Non-Title I Identification Rate as Expected Value*
A scan for frequency of language to code for themes of the mid and post intervention surveys was done for the AOi intervention teachers to provide additional evidence to explain the quantitative findings. The mid-intervention survey did not yield any consistent themes as only three participants submitted responses which did not share common key terms. The post intervention survey had three relevant themes: They felt students improved their pattern recognition, were making connections in other content areas, and spent more time thinking before answers which could lend insight into the statistically significant the improvements seen in identification rates and NNAT percentile scores. These themes were similar to the themes found in the AWTi group’s qualitative data, indicating that both treatment groups saw differences in student thinking and performance with analogical reasoning which supports the quantitative findings that the treatment increased mean NNAT percentile scores and overall gifted identification rates.

**Participating Teacher Feedback**

In order to establish how teachers experienced the intervention, as well as how they self-reported their views of their students throughout the intervention, mixed methods approach was taken to conduct a frequency analysis of likert scale prompts found in surveys, followed by an analysis of the available qualitative data. Three sets of data were provided by the district that provided insight into the participating teacher experience of the interventions, the mid intervention survey, the mid intervention focus group, and the post intervention survey. Each of the qualitative data sets were scanned for frequency of language and coded for themes, following

<table>
<thead>
<tr>
<th>Category</th>
<th>N</th>
<th>Observed Prop.</th>
<th>Test Prop.</th>
<th>Exact Sig. (1-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NNAT Percentile Score</td>
<td>&lt;=72</td>
<td>151</td>
<td>.89</td>
<td>.90</td>
</tr>
<tr>
<td></td>
<td>&gt;72</td>
<td>18</td>
<td>.11</td>
<td></td>
</tr>
</tbody>
</table>

a. Alternative hypothesis states that the proportion of cases in the first group < .8956
the protocol laid out by naturalistic conventional content analysis (Hsieh & Shannon, 2005; Vaismoradi & Snelgrove, 2019).

During the mid-intervention focus group, participating teachers and GT school leaders six themes emerged with the initial prompt of “What is going well [with the intervention] so far?”.

19 of the 22 potential respondents felt their students enjoyed finding patterns, all participants noted they appreciated the ready-made materials for the analogies lessons, 18 agreed the use of the sock sorting activity to model analogical reasoning was a strong way to start the lessons, 14 felt the analogy lessons were short enough to be using in transitions, 18 noticed the repetition of analogy types led to students working faster, and 17 noticed students transferring analogical reasoning to other content areas. This data appears to be trustworthy as each of the six themes were also present in either the mid-intervention survey and/or the post intervention survey, as well as in the GT District Specialist’s notes from the mid-intervention focus group.

The second mid-intervention focus group prompt, “What could be better [with the intervention implementation]?”, yielded four themes. 20 of the 22 participants felt the grading of analogies lessons and assessments took too long, 20 also felt it took too much time to input scores into data tracker for the student scores, 21 felt students struggled with drawing lines to connect like-objects in the worksheet matching activities, and 7 felt they would benefit from additional modeling of how to teach the lessons. The mid-intervention survey had limited responses (n = 8), but each of these themes were mentioned by at least one of the respondents in the narrative components. These themes were also examined against the post-intervention survey narrative responses (n =16) and similar results were observed, indicating the focus group’s second prompt’s themes are trustworthy.
A frequency analysis of the post intervention survey’s Likert scale questions revealed multiple self-reported changes in teacher belief and efficacy. In total, there were 16 respondents for the survey, however, two of the respondents indicated they were the program leads and not teachers implementing the intervention and thus indicated “Did Not Experience” for each of the prompts. Their data has been omitted from this frequency analysis, resulting in a sample size of $n = 14$.

As shown in Table 18, 50% of teacher participants indicated they strongly agreed that they noticed students who they previously have not as talented, with another 29% agreeing to this prompt. This response was mirrored with 29% strongly agreeing and 57% agreeing that they were better able to identify areas of student strength at the conclusion of the intervention. Further, 21% strongly agreed and 50% agreed to being better able to plan instruction that will support the development of students’ talents.

**Table 18**

*Post Intervention Teacher Survey Results to Likert Scale Prompts*

<table>
<thead>
<tr>
<th>Prompt</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
<th>Did Not Experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>I can better identify areas of strength in my students.</td>
<td>29%</td>
<td>57%</td>
<td>14%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>I noticed students who I hadn't before as talented.</td>
<td>50%</td>
<td>29%</td>
<td>21%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>I changed my instruction throughout the school day to incorporate more logic and/or analogies.</td>
<td>14%</td>
<td>36%</td>
<td>36%</td>
<td>7%</td>
<td>0%</td>
<td>7%</td>
</tr>
<tr>
<td>I am open to changing my instruction throughout the school day to incorporate more logic and/or analogies.</td>
<td>14%</td>
<td>64%</td>
<td>21%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
</table>
The post intervention survey also had key themes that presented across prompts. Most teacher participants noticed changes in their students thinking, particularly in the utilization of patterns to make connections to other content areas. Another overwhelming theme was teacher’s shift in expectations of their students, namely many mentioned they saw their students they previously considered “low” performing well on these analogical tasks. One teacher noted “…some students who are considered below grade level can learn content if it is presented in a different format… they did very well on lessons requiring spatial reasoning.”

Further, 88% of the 16 respondents believe analogies lessons should be infused in the core curriculum for early learning after seeing the impact it had on their students. One teacher shared, “Students need exposure to the concept before being able to complete a test on analogies. This allows us to ID more students with high ability.”
With the overwhelming consensus that analogical reasoning should be infused in curriculum, there were also recommendations to improve this intervention. Six of the 16 respondents noted that the amount of answer choices should be limited in some of the activities and four shared that more consideration needs to be taken with worksheet usage that requires the fine motor skills to use a pencil to draw a straight line to connect to items. Four also shared they felt that the lessons took too long and should be shortened to be more feasibly integrated into the school day without impacting other required subject matter.

Conclusions

The findings of the evaluation of this intervention suggest that the utilization of analogy lessons has the potential to increase identification rates of highly able students from Title I qualifying schools to be on par with the previously expected rate of identification amongst non-Title I qualifying schools. This result is increased if intentional technology access is also provided to students prior to assessment. Further, the use of analogical reasoning in the classroom may have an impact on teacher practice, namely their ability to better identify student talent and plan lessons that best nurture talent in students.

Discussion

The schools featured in this study all qualify for Title I and are racially segregated, with the analogies with technology set of schools serving a student population that is over 85% African American and the analogies only set of schools serving an over 95% African American student population, a higher distribution than seen in universally screened grades (75%) across the District (Chapter 2). As research has demonstrated, schools in urban centers are often segregated by race, with fewer resources, less rigorous instruction, and newer, unseasoned
teachers being assigned to schools that serve majority populations of students of color (Ladson-Billings, 2006; Milner, 2012; Noguera & Alicea, 2020).

Within the context of this study, teachers appeared to have more experience overall, however, a common theme across the qualitative data was that they often had low expectations of their students and were surprised to see them perform well on analogical reasoning tasks. This may indicate that the level of rigor in instruction provided to students prior to the intervention may not have been adequate, as low expectations of students by teachers has been demonstrated to result in lessons focused on remediation, rather than higher-level thinking (Chambers et al., 2014; Rubie-Davies, 2010; Rubie-Davies, Meissel, Alansari, Watson, Flint, & McDonald, 2020; Timmons, 2018; Yerrick & Gilbert, 2011).

However, as a result of participating in this intervention, many teachers noticed they saw their students in a new light and felt better able to identify student talent and plan lessons to nurture this talent. This shift in teacher mindset about their students, speaks to Swanson’s (2006) findings that when teachers see and experience their students’ success on complex tasks, their assumptions and implicit biases begin to shift. These qualitative data also suggest that by employing higher level thinking, such as lessons in analogical reasoning, teachers may have more opportunities to see their students succeed, thus having a positive impact on their expectations of students and level of instruction (Rubie-Davies et al., 2020; Swanson, 2006).

Further, the findings of this evaluation imply that the well-documented and pervasive underrepresentation of students of color, particularly African American students, and students from under-resourced communities both nationally (Campbell, 2012; Ford et al., 2008; Peters et al., 2019) and within this District (Chapter 2), may be in part the result of opportunity gaps in exposure to the content and technology by which they are being assessed. These results
reinforce Volegaar and Resing’s (2018) conclusion that lack of prior access to analogical reasoning may result in lower performance on analogical reasoning assessments and Barnes’ (2010) suggestion that students need opportunities to practice using technology before participating in computer-based assessments.

The normal distribution of NNAT percentile scores found in the analogies with technology group in Figure 4 indicate that this two-pronged effort may result in the expected distribution of scores on the NNAT compared to only focusing on analogical reasoning or doing nothing at all. Consequently, these identified opportunity gaps may be best addressed by adding both analogical reasoning into early learning curriculum and providing technology access to students throughout their time in school to support more accurate identification of their abilities.

However, the data also show that the implementation of analogical reasoning had a positive impact on student identification rates, with both intervention groups surpassing the previously establish Title I qualifying school’s rates. The AWTi group far surpassed the previous expected rate of 10.44% found at non-Title I qualified schools with a final identification rate of 21%. While the AOi group did not have a significant identification rate compared to this expected value, as shown in in Table 11, the 10.65% identification rate is still exceeded the previous expected value of 10.44%. As a result, both interventions appear to support more equitable identification rates as compared to non-Title I qualified school expected rates in the District.

Further, each of the intervention groups saw at least a ten-point increase in their overall NNAT percentile score means as compared to their respective control groups. This difference in means, coupled with the small positive correlation found between the lesson post-assessment
scores and NNAT percentile scores, indicates that by employing either level of the intervention will improve student outcomes on universal screener for gifted identification within the District.

These results support Vogelaar and Resing’s (2018) conclusion that by employing practice in analogical reasoning, students who may have gone under the radar are better able to perform on analogical assessments, such as the NNAT, to be more accurately identified. Since analogical reasoning requires prior experience and the ability to transfer that experience into new contexts, employing intentional time for students to practice analogical thinking should help students be more accurate in solving analogies in different situations (Geake, 2008; Kanevsky, 2000; Vogelaar & Resing, 2018). The qualitative data from the teacher participants supports this assertion as well with responses across all three sets of qualitating data indicating that teachers noticed changes in their students thinking, including their ability to recognize patterns and be able to transfer that knowledge to other content areas.

The success of this intervention, based on teacher feedback, also seems to be couched in how the intervention was implemented. Teachers routinely expressed that having organized, pre-made materials made implementation of the lessons considerably more manageable. They also noted that using manipulatives and not just relying on the analogies worksheets helped build student understandings and engagement levels, suggesting the treatment may have been improved with some adjustments to how lessons were taught. However, despite their recommendations for changes, participating teachers overwhelmingly confirmed they felt analogical reasoning should be incorporated within early learning curricula to not only support opportunity gap reduction but to provide students more points of access to higher-level thinking.

It should be noted that this intervention was focused on more accurately identifying gifted students who attend Title I qualifying schools by reducing opportunity gaps, not serving
them once they have been identified. The framework of this intervention is couched in leveling
the instructional playing field between Title I qualified and non-Title I qualified schools by
providing students opportunities to engage in higher order, conceptual thinking as well as to
utilize technology throughout their educational experience rather than testing students using
platforms and content by which they may have never been exposed. Critics may argue that this
intervention is a form of teaching to the test, however it is crucial to examine the differences in
opportunity between Title I qualified schools and non-Title I qualified schools. As research has
shown, students who attend Title I qualified schools often have more inexperienced teachers,
many of whom have low expectations of their students on the basis of their race or their families’
socioeconomic status, fewer instructional resources, and receive instruction focused on
remediation rather than high order thinking or reasoning (Chambers et al., 2014; Ladson-
Billings, 2006; Milner, 2012; Noguera & Alicea, 2020; Rubie-Davies, 2010; Rubie-Davies et al.,
2020; Timmons, 2018; Yerrick & Gilbert, 2011). As a result, one could infer that most non-Title
I qualified schools experience the exact opposite – they have teachers with more experience who
have higher expectations of their students, more instructional resources, and have opportunities
for higher level thinking within their classes.

As a result, there is a pervasive opportunity gap on who has access to analogical
reasoning and technology in their school experience based on their schools’ Title I qualification
status. This experience can be contextualized further as Title I schools predominantly serve
students of color, pointing to these opportunity gaps disproportionally impacting students of
color who attend schools in underresourced communities (Ladson-Billings, 2006; Milner, 2012;
Noguera & Alicea, 2020). It should, instead, be argued that by providing this intervention it is
creating a more instructionally similar opportunity in Title I qualified schools as would be
experienced in non-Title I qualified schools. That is, this intervention should be the baseline of instruction present in every school so as to provide students the opportunities necessary to build their funds of knowledge to be able to transfer their experiences onto an ability assessment such as the NNAT (Volegaar & Resing, 2018).

By identifying students as gifted early, it should also result in subsequent changes to service delivery for these students, including more rigorous instruction, school-based interventions, and opportunities to engage in like-ability groups, which over time has the potential to reduce additional opportunity gaps such as the excellence gap (Plucker & Peters, 2018; Plucker, Peters, & Schmalensee, 2017). Early, accurate gifted identification is crucial to enact policies around service delivery. However, further research and attention should be paid to how the service delivery model adapts to better serve and support a more demographically representative population of gifted students, with attention being paid to culturally affirming and responsive gifted education practices to ensure students are retained and uplifted in available gifted programing (Ford, 2015; Ford, et al., 2008). The emphasis should be on adapting programs to be more culturally inclusive because with universal exposure to analogical reasoning and technology, the universal screener for gifted is more accurately identifying students of color from underresourced schools. These students have always belonged in these programs and attention must be paid to ensuring they receive gifted services that reflect the fullness of who they are (Ford, 2015).

Overall, the results of this evaluation highlight that data outcomes must be contextualized and examined, especially if the data has disproportionate differences between racial groups (Ladson-Billings, 2006; Milner, 2012; Noguera & Alicea, 2020). The District, like many others nationally, was not identifying a proportionate representation of students by racial or
socioeconomic groups as gifted, advanced, or talent development. However, by implementing this two-pronged intervention, their results shifted because the system provided the inputs necessary for students to be able to demonstrate success rather than expecting them to perform on tasks they may have never had exposure to before. As a result, this study may provide insight as to how other districts may question why their gifted identification rates appear as they do and be proactive in finding opportunities to remove barriers to the equitable identification of their students.

**Limitations**

This evaluation utilized pre-existing, de-identified data from the District. As a result, there are limitations to monitoring the implementation of the intervention throughout, as well as accurately monitoring the fidelity of implementation as shown in the lack of student-level lesson data for School 1 in the AWTi group. Further, the intervention groups were demographically similar in that all students attended Title I qualifying schools and the significant majority of students were African American. As a result, certain student groups did not have a large enough sample size to determine the impact the intervention may have had on their NNAT percentile scores and identification rates, namely ELs, students with disabilities, and students from other racial groups.

**Recommendations**

For researchers, it is recommended that this study is replicated with larger sample sizes of different student groups to be able to analyze more accurately the effect the intervention has on these other student groups. When replicating this study, researchers should consider adding additional schools to the intervention, including schools that do not qualify for Title I, to determine if the impact that intervention has in non-Title I qualified schools. Further, while age
was not proven to have a significant impact on the NNAT percentile scores across the intervention and control groups, researchers should consider using same-grade students in both the treatment and control to reduce the range of ages observed across groups.

The findings of this study also suggest attention should be paid by practitioners and GT district administrators to ensure students have opportunities to engage in analogical reasoning and utilize the technology they will be tested with prior to implementing universal screeners for gifted identification particularly within their Title I qualified schools. Using teacher’s feedback, districts should consider developing analogical reasoning lessons that are highly engaging and woven into early learning curricula to support wide-spread implementation. Practitioners and GT district administrators should also consider adapting the analogies lessons in a digital format that allows for automatic grading to reduce the workload of scoring each assignment and assessment.
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http://dx.doi.org/10.1016/j.intcom.2006.05.008
Running head: EFFECTS OF FRONTLOADING ON UNIVERSAL SCREENING


Hong, E., Greene, M., & Hartzell, S. (2011). Cognitive and motivational characteristics of


Oakland, T., & Rossen, E. (2005). A 21st-Century model for identifying students for gifted and
talented programs in light of national conditions: An emphasis on race and ethnicity. Gifted Child Today, 28(4), 56.


Running head: EFFECTS OF FRONTLOADING ON UNIVERSAL SCREENING


Counseling, 6(2), 26.
Appendix A

Table 19 Summary Matrix

<table>
<thead>
<tr>
<th>Research Questions</th>
<th>Measures</th>
<th>Variables of Interest</th>
<th>Data Collection</th>
<th>Data Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>To what extent was the intervention conducted with fidelity?</td>
<td>Lesson scores, Pre and Post Scores, Teacher Survey Data, Technology Usage Log</td>
<td>Participation rate, school, completion rate</td>
<td>Pre-existing data</td>
<td>Frequency analysis of completed assignments; frequency analysis of technology usage log; conventional content analysis by school of qualitative data</td>
</tr>
<tr>
<td>Did the analogies intervention increase gifted identification rates of participating students compared to previously assessed students?</td>
<td>NNAT2; Teacher Focus Group Data; Teacher Mid and Post Surveys; Student Post Assessment Scores</td>
<td>NNAT2 scores; student race; age; Title I; post assessment scores</td>
<td>Pre-existing data</td>
<td>T-test comparing intervention data to control group; ANOVA of NNAT scores by intervention group controlled for age; Correlation test of post-assessment and NNAT scores; Binomial analysis of ID rate compared to expected values</td>
</tr>
<tr>
<td>Did the analogies with technology intervention increase gifted identification rates of participating students</td>
<td>NNAT2; Teacher Focus Group Data; Teacher Mid and Post Surveys; Student Post Assessment Scores</td>
<td>NNAT2 scores; student race; age; Title I; post assessment scores</td>
<td>Pre-existing data</td>
<td>T-test comparing intervention data to control group; ANOVA of NNAT scores by intervention group controlled for age; Correlation test</td>
</tr>
<tr>
<td>Research Questions</td>
<td>Measures</td>
<td>Variables of Interest</td>
<td>Data Collection</td>
<td>Data Analysis</td>
</tr>
<tr>
<td>-------------------</td>
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<td>----------------------</td>
<td>----------------</td>
<td>--------------</td>
</tr>
<tr>
<td>compared to previously assessed students?</td>
<td>Teacher Focus Group Data; Teacher Mid and Post Surveys</td>
<td>Observations, student improvement, teacher strength, teacher weakness</td>
<td>Pre-existing data</td>
<td>of post-assessment and NNAT scores; Binomial analysis of ID rate compared to expected values</td>
</tr>
<tr>
<td>How did participating teachers and GT Leads describe the impact analogies intervention had on their practice?</td>
<td></td>
<td></td>
<td>Frequency analysis of Likert-scale teacher survey questions; conventional content analysis of open-response teacher survey questions and focus group data</td>
<td></td>
</tr>
</tbody>
</table>
Biographical Statement

Dr. Rae Lymer serves as a Gifted Education Specialist for a Mid-Atlantic Urban District. They are the Vice President of the Maryland Educators of Gifted Students and serve as the Co-Chair of the Maryland Gifted and Talented Advisory Council. Dr. Lymer presents on topics related to individualized instruction for the gifted, asset-focused gifted education, and equitable gifted identification practices. They also regularly work directly with teachers and administrators on building equitable and effective gifted instructional services, developing models of meaningful professional learning, program evaluation, and improving instructional practice. Prior to earning their Ed.D. in Urban Leadership from Johns Hopkins University, they earned their B.A. in Linguistics and Gender and Women’s Studies from the University of Wisconsin-Madison and their M.S. in Urban Education from Johns Hopkins University.