LEVERAGING TECHNOLOGY TO ADDRESS DISPARITIES IN EDUCATION:

THE ROLE OF SCHOOL SOCIAL WORKERS TO ADVANCE STUDENT SUCCESS

by

Kelli Reneé Rogers

DISSERTATION

Submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy at
The University of Texas at Arlington May, 2021

Arlington, Texas

Supervising Committee:

Dr. Randall Basham, Supervising Professor
Dr. Maria Scannapieco
Dr. Debra Woody
Dr. Jandel Crutchfield
Dr. David Sparks

Table of Contents

Abstract

Education plays a critical role in the advancement and survival of ethnic minority children and youth. However, access to quality education still eludes many ethnic minority children as a result of instances of prejudice, institutional racism, and structural discrimination. Due to these obstacles, ethnic minority children and youth often lag behind their white peers in many social indicators including higher rates of poverty and lower educational attainment, which impedes their academic success and upward mobility. Several studies have applied technology interventions to address educational equity issues and found improved performance on state test scores. Therefore, this research examines the role of educational technology in helping to reduce educational disparities by providing greater equitable opportunities and access to resources and, thus, offers an innovative approach to promoting academic achievement in ethnic minority students. This research employs a three-phase approach, which begins with an overview of the types of educational technology applications currently being used in primary and secondary school classrooms while examining the impact that these educational technology applications have on student academic achievement. Phase 2 explores primary school teachers' experiences and perceptions of the impact of technology on teaching and learning, giving context to the features, attributes, and optimal conditions of technology use that facilitate and promote student learning, along with the challenges and limitations teachers face with integrating educational technology into classroom instruction. The final phase uses an exploratory sequential mixed-methodological design to examine the relationship between teachers' technology readiness levels and the use of educational technology in the classroom, along with the relationship between school culture and climate and technology use. In this design, the qualitative findings of Phase 2 of this study will be converted into quantitative data based on emerging patterns and the frequency of particular responses to the interview questions and used to develop a structured, closed-ended questionnaire measuring the culture and climate of primary schools in Coppell ISD and Plano ISD in relation to technology integration. Additionally, a quantitative analysis of the responses to the questionnaire will be used to further explore whether teachers' use of educational technology in their classroom is more a function of the school's culture and climate in which they work than of their technology readiness. Overall, this study will fill gaps in the literature with comprehensive research inclusive of the relevant multidimensional factors affecting the association of specific educational technology utilization in the classroom and improved student learning and performance. This research will conclude with a discussion of school social workers' role in understanding and addressing educational disparities and ensuring that all students have equal access to educational resources and supports necessary to maximize their potential in the educational process. Additionally, this study will suggest research priorities to leverage technology to reduce disparities in education and improve the academic outcomes of ethnic minority children and youth.

Chapter 1: Introduction

Problem Statement

When examining the history of ethnic minority children and youth in the U.S., instances of prejudice, institutional racism, and structural discrimination are prevalent. Such instances have served to deny equal access to education and continue to influence the educational outcomes of ethnic minority youth (Johnson, Davis, & Williams, 2004). As a result of these obstacles, ethnic minority children and youth often lag behind their white peers in most indicators of educational achievement. These educational disparities, commonly referred to as the academic achievement gap, are evident early in childhood and persist through the K-12 education and are reflected in levels of school readiness, grades, standardized test scores assessing academic achievement, such as reading and mathematics, participation in special education programs, enrollment in gifted and talented programs and advanced courses, drop-out and high school graduation rates, and college admission data (American Psychological Association, Presidential Task Force on Educational Disparities, 2012; National Research Council, 2004; Whaley & Noel, 2012; Williams, 2014; Zhao, 2016).

The American Psychological Association, Presidential Task Force on Educational Disparities (2012) defines educational disparities to include differences in educational outcomes that may result from differential or biased treatment of ethnic minority students within the educational system expressed in explicit or implicit forms, differences in socioeconomic status as reflected in the poor quality of schools that children of low socioeconomic status and marginalized ethnic minority backgrounds attend which result in unequal opportunities to learn, and different responses to educational systems or different sets of educational needs. Although barriers to equitable academic conditions and access for ethnic minorities previously in

accordance with law were declared unconstitutional with the U.S. Supreme Court decision in *Brown v. Board of Education* (1954), public education systems throughout the U.S. continue to confront wide disparity in the achievement of ethnic minority children and youth and their white counterparts due to institutional racism and structural discrimination (Howard & Navarro, 2016; Teasley et al., 2017). Moreover, despite a plethora of school reform efforts over the past three decades, in the guise of free-market educational reform, and the intensity of standards-based education movement, scripted curriculum, heightened accountable corporate influence, and legislative mandates such as No Child Left Behind (NCLB) and the Common Core State Standards (CCSS), educational experiences and performance for ethnic minority students remain distinctly different than their white peers (Howard & Navarro, 2016).

The academic achievement gap exists at school entry and usually widens over time. For example, numerous studies have found that, on average, ethnic minority children arrive at kindergarten or 1st grade with lower levels of school readiness than white children (Brooks-Gunn, Klebanov, & Duncan, 1996; Duncan, Brooks-Gunn, & Klebanov, 1994; Farkas, 2003; Lee & Burkham, 2002; Phillips, Brooks-Gunn, Duncan, Klebanov, & Crane, 1998). Also, the National Assessment of Educational Progress (NAEP; 2015) reported that by the end of the fourth grade, African American and Latino students are two years behind their white peers in reading and math. By eighth grade, these students have slipped three years behind and by twelfth grade four years behind. The current achievement gap correlates to the longstanding difference in educational opportunity and attainment that looms between ethnic minority students and their white counterparts. While some contend that racial disparities in education are due to a combination of various factors such as institutional practices, poor teacher quality, lack of cultural relevance in school curriculum and learning opportunities, and racial re-segregation of

schools, one of the more prevalent explanations has been an explicit focus on the role that race and racism play in school policies, pedagogies, and practices (Howard & Navarro, 2016).

Educational attainment is one of the most important determinants of life chances in terms of employment, income, health status, housing, and many other amenities, and is perhaps the greatest indicator of success and progress toward achieving the American dream (Belfield & Levin, 2007; Grogan- Kaylor & Woolley, 2010). As such, educational inequality for ethnic minority youth may lead to subsequent disadvantages in social and economic opportunities for ethnic minority families and communities, as academic success has significant implications for occupational success, economic stability, physical health, and life options (Williams, 2014). Therefore, ethnic minority families have sought education as a pathway for economic mobility, empowerment, social transformation, and to influence policy (Howard & Navarro, 2016), as education is traditionally viewed as a leveler of opportunity (Fram, Miller-Cribbs, & Van Horn, 2007).

Significance

The educational disparity has been a long-standing social, political concern and is a grand challenge for social work because of its implications for equal opportunity and social justice. The Grand Challenges of Social Work focuses on innovations to solve social problems, especially those that disproportionately affect the most vulnerable in our society while eliminating injustices and inequities due to race, ethnicity, religion, sexual and gender identity and expression, abilities, custom, class, and all other human differences. Social work recognizes that economic systems and strata of power can confer extravagant privileges to some while prohibiting equal access for all, thereby begetting injustice and inequity (Barth et al., 2019).

Furthermore, social work is well-positioned to address educational inequality because of the key roles that social workers play in schools.

The goal of school social work is to give all children the opportunity and resources to help them succeed academically and socially in a safe and healthy school environment (National Association of Social Workers, 2012). According to the National Association of Social Workers (NASW; 2012), school social workers seek to ensure equitable educational opportunities; ensure that students are mentally, physically, and emotionally present in the classroom; and promote respect and dignity for all students. Thus, school social workers play a vital role in helping students gain access to and effectively use resources and support necessary to maximize their potential in the educational process, as well as identifying areas of need that are not being addressed by the local education agency and community and working to create services that address those needs. The school social work profession has consistently focused on coordinating the efforts of schools, families, and communities towards helping students improve their academic achievement by using its unique ecological perspective to enhance understanding of factors in the home, school, and community that affect students' educational experiences as well as interventions that foster students' academic progress. Also, school social workers help school systems meet expectations of federal, state, and local mandates, particularly those designed to promote equal opportunity, social justice, and the removal of barriers to learning (NASW, 2012).

Racial bias in the classroom is a salient and long-standing challenge that continues to mediate educational opportunities and outcomes for many ethnic minority children and youth. As stewards of social justice in public K-12 educational settings, school social workers should have a great interest in attempts to eliminate racial disparities in education (Teasley et al., 2017). Additionally, school districts employ social workers to help children and adolescents address

problems that impede students' educational progress. As Standard 11 of the NASW (2012) Standards for School Social Work Services recognizes, school social workers shall engage in advocacy that seeks to ensure that all students have equal access to education and services to enhance their academic progress. Advocating for evidence-based approaches to reducing racial and ethnic achievement gaps can create equal educational opportunities for all children and ensure that ethnic minority students achieve at higher levels.

Theoretical Foundation

Critical race theory. Racial disparities in the U.S. remain persistent and pervasive, as institutional racism continues to operate through laws, policies, and practices embedded within social structures, systems, and institutions that limit improvements for ethnic minorities in different aspects of society. This is evident by racial disparities in educational outcomes, employment opportunities, and income distribution. Critical race theory (CRT) provided the theoretical underpinning for this study to understand the power, privilege, and inequalities inherent in public education systems throughout the U.S that impact the academic achievement of ethnic minority children and youth. CRT offers insight into how the relationship between race, racism, and power maintains and supports racial inequality as well as the role they play in educational opportunities among ethnic minority children and youth (Sampson & Garrison-Wade, 2011). CRT is based on the following assumptions: race is a social construction, race affects all aspects of social life, and racism is intensely entrenched within American society. Proponents of CRT are committed to promoting social justice, presenting the meaning and consequences of racism and discrimination from the viewpoint of ethnic minorities, and examining racism and its intersection with other forms of oppression such as sexism, classism,

homophobia, and nativism (Graham, Brown-Jeffy, Aronson, & Stephens, 2011; Ortiz & Jani, 2010).

As CRT asserts, racism is endemic to American life and therefore the U.S. educational system. For that reason, it is important to understand the structural and societal barriers to academic achievement to help ethnic minority students overcome them. School social workers often report satisfaction in their career assisting youth in direct practice, but the knowledge and skills necessary to create systemic change and address racial inequalities in the school setting are lacking (Gholson, 2015). Therefore, CRT offers social workers a tool for examining racial disparities in education from a macro lens.

CRT provides an appropriate framework to examine how issues of race impact the educational experiences, opportunities, and outcomes of ethnic minority students. A central theme of CRT is the idea that schools often function based on values, principles, and foundations that are not culturally diverse or representative, irrespective of racial make-up. Dominant cultural customs are frequently presented as universal and the dominant culture's experiences and perceptions are used to characterize those of differing cultural orientations as not qualified or suitable to succeed. Standards of performance are often Eurocentric, and poor performance by members of ethnic minority groups is frequently interpreted as inferior aptitude that reflects overall group characteristics. In this way, inequalities persist through subjective bias or privileging of certain cultural orientations over others (Graham et al., 2011).

Ethnic minority children and youth attend schools where their experiences, histories, cultural practices, and perspective are largely excluded from school curriculum and learning opportunities. Data from the U.S. Department of Education informs us that more than 80 percent of classroom teachers are white and middle-class (Snyder & Dillow, 2013). Hence, the likelihood

that many, if not most, teachers may be quite unaware of the racial experiences, cultural knowledge, practices, and dispositions that ethnic minority students bring from their homes and communities is likely high. Thus, CRT helps teachers understand how white privilege and its accompanying component affect their practice and influence how ethnic minority students experience school (Howard & Navarro, 2016).

Social equity theory. As a critical theory, CRT promotes a structural approach to addressing racial inequalities rather than considering the social processes that influence racial disparities and limit improvement for ethnic minority children and youth. However, several other theoretical models explain the racial disparities with a focus on deficiencies in children's environment, cultural and family factors including parental education, household income, and parenting styles, and factors within schools that perpetuate inequality of opportunity. Assessing these differing explanations in light of social work's professional knowledge base and values are important for informing practice and policy efforts to improve the well-being and life opportunities of ethnic minority children. Specifically, social work's commitment to social justice and its conceptualization of individual functioning as intertwined with social and structural contexts provide an important framework for understanding and responding to racial disparities (Fram, Miller-Cribbs, & Van Horn, 2007). Therefore, the social equity framework coupled with a focus on expanding access to existing resources and opportunities proves useful in exploring efforts with the potential to reduce disparities in education.

SET is proposed as a conceptual framework because it describes social processes that influence racial disparities. Social processes refer to social interactions that occur between individuals, groups, and social settings (McKown, 2013). According to McKown (2013), there are two types of social processes that contribute to racial disparities: direct influences and signal

influences. Direct influences support and promote positive academic outcomes and contribute to racial disparities when they are unequally distributed to children from different racial-ethnic groups. Signal influences are cues that communicate negative expectations or stereotypes about a child's racial-ethnic group (McKown, 2013). Consistent with the definition of stereotype threat, when children from negatively stereotyped groups detect such cues, their academic achievement can be hindered (American Psychological Association, Presidential Task Force on Educational Disparities, 2012).

Direct influences on racial disparity may take place at home, in school, and even in neighborhoods. In the home, particularly for young children, the characteristics and quality of parent-child relationships and parenting styles play a significant role in children's academic outcomes. Research suggests that there is racial-ethnic variability in parenting practices, and optimal parenting is, on average, more available to white children than to ethnic minority children (McKown, 2013). In school, the quality of teachers, curriculum, and teacher-student relationships have a critical influence on academic achievement, and they vary systematically by racial-ethnic groups. High-quality teaching and positive teacher-student relationships are, on average, more available for white students than to ethnic minority students (Holen, 2018; McKown 2013). Lastly, several studies have found connections between neighborhood characteristics and student achievement (Emdin, Adjapong, & Levy, 2016; Grogan- Kaylor & Woolley, 2010). According to Herman (2009), whiter neighborhoods are associated with access to higher-quality educational and learning opportunities. Students typically have little choice over their residential neighborhoods. While parents have more choice in the neighborhood in which their families reside, the choices of ethnic minority parents are often constrained by income and housing discrimination, among other factors (Herman, 2009).

Overview of Important Literature

Persistent racial inequality in education, child health care, the child welfare system, the juvenile justice system, and other social domains has renewed interest in the possible role of discrimination. In defining racial discrimination, many scholars and legal advocates distinguish between disparate treatment and disparate impact, creating a two-part definition. According to the National Research Council (2004), disparate treatment occurs when individuals are treated less favorably because of their race and suffer adverse or negative consequences. Disparate impact occurs when behaviors or practices that do not involve race directly harm members of a disadvantaged racial group without a sufficiently compelling reason (National Research Council, 2004).

Although U.S. laws and policies forbid discrimination based on race and ethnicity, institutional policies and practices can still fuel, magnify, and perpetuate existing inequalities. Even policies and practices that appear neutral and are equally applied without regard to race, ethnicity, gender, or other demographic difference can deepen existing disparities (Pager & Shepherd, 2008). For example, an agency's application process may unintentionally and disproportionately limit access for some racial or ethnic groups if the process fails to take into account underlying and often historical factors that make services less accessible for some groups. Whereas 50 years ago acts of discrimination were overt and widespread, today it is harder to assess the degree to which increasing amounts of variance in individual experiences and outcomes may be shaped by ongoing forms of discrimination or other nonracial factors. Nevertheless, it is important to understand when and how members of racial minority groups may be systematically disadvantaged not only by the willful acts of particular individuals, but also the broader structural features of a society that can contribute to unequal allocation of

resources, opportunities, and outcomes through the ordinary functioning of it cultural, economic, and political systems (National Research Council, 2004).

The term structural discrimination has been used loosely in the literature, and interchangeably with institutional discrimination and structural or institutional racism, to refer to the range of policies and practices that contribute to the systematic disadvantages of members of certain groups (Pager & Shepherd, 2008). Discrimination is not the only cause of racial disparities in the U.S. Indeed, persistent racial inequality is the product of complex and multifaceted influences. Nevertheless, existing evidence suggests that laws and policies have systematically placed the racial minority children in inadequate educational environments, further perpetuating and increasing the overall racial disparities in educational outcomes. Thus, a focus on structural and institutional sources of discrimination encourages us to consider how opportunities may be allocated based on race in the absence of direct prejudice or willful bias as well as how historical practices and current policies remain an important factor in shaping existing patterns of racial inequality in education.

Racial discrimination in education. It has been more than five decades since the U.S Supreme Court's landmark decision in *Brown v. Board of Education*, which declared racial segregation in public schools unconstitutional, yet the U.S. has failed to provide ethnic minority youth with access to quality education that white youth receive. Public schools today remain strongly segregated by race and income, as federal court decisions and government inaction have contributed to the persistence of apartheid conditions in schools. Today, the average white student attends a school where 77 percent of the other students are white, while African American and Hispanic students attend schools where only 30 percent of the other students are white (Brittain & Kozlak, 2007). On average, white children attend schools with better-paid and

credentialed teachers, higher per-pupil spending, and more ideal class sizes. In contrast, ethnic minority children are more likely to attend public schools with poorer quality educational programs, substantially limited resources, less experienced teachers, larger class sizes, substandard facilities, and lower per-pupil spending (Brittain & Kozlak, 2007; Johnson, Davis, & Williams, 2004; Potter & Morris, 2017). Furthermore, racial minority schools are more likely to be housed in high-poverty neighborhoods that have high crime rates and limited access to community resources that enhance learning and academic achievement (Brittain & Kozlak, 2007; National Research Council, 2004). Consequently, the schools attended by ethnic minority children tend to provide different, and often unequal, learning experiences (Potter & Morris, 2017).

The emphasis on structural discrimination in education focuses on the legacies of past discrimination that brought about and maintains existing racial inequalities. The modern-day segregation of public schools, for example, has well-established links to historical practices of redlining, housing covenants, racially targeted federal housing policies, and other forms of active discrimination within housing and lending markets (Pager & Shepherd, 2008). Furthermore, the bulk of funding for primary and secondary education throughout the U.S. is provided by revenue raised from local property taxes. This system of funding results in a disparity in the quality of education between property-rich districts better able to raise money for education and property-poor districts with limited economic resources (Brittain & Kozlak, 2007). Too often, these property-poor districts are comprised of predominantly racially minority students, as more than 60 percent of African American and Hispanic students attend high poverty schools, compared with 17 percent of white students (Pager & Shepherd, 2008). Thus, past discrimination, particularly as mediated by ongoing forms of social segregation, underlie racial inequalities in

education and are likely to persist well into the future with consequences for a broader range of outcomes (Bowles, Loury, & Sethi, 2007). Therefore, the resulting lower quality of education common in poor and racial minority school districts places these students at a disadvantage in competing for future opportunities (Massey, 2006).

Current explanations attribute much of the achievement gap, which is used to describe a nationwide phenomenon of continual racial disparities in academic achievement and persistent disparities in educational attainment, to differences in the quality of schools attended by children (Potter & Morris, 2017). Within classrooms, educational quality depends on several factors: the particular qualities and attributes of the teacher, the social and physical context in which learning unfolds, and the specific activities and events structuring how children experience their time as learners. Teachers are important as primary facilitators of the learning environment, and as resources, mentors, and supports for children's academic success. Teacher attributes appear particularly important to predicting academic outcomes, with more experienced teachers, teachers with stronger academic and cognitive skills, and teachers with subject-specific preparation and expertise all associated with positive effects on student learning. Unfortunately, high-poverty and racial minority schools, on average, have teachers with less experience, shorter tenure, and emergency credentials rather than official teaching certifications (Fram et al., 2007; Orfield & Lee, 2005). Schools in high poverty neighborhoods also face greater incidences of social problems, including teen pregnancy, gang involvement, and unstable households, which are antithetical to academic success (Pager & Shepherd, 2008). Additionally, classroom peers are important to individual student learning, as differences in race, socioeconomic status, and skill level can expose children to diverse perspectives, strengths, and norms (Fram et al., 2007). According to the American Psychological Association, Presidential Task Force on Educational

Disparities (2012), higher levels of racial integration of schools are associated with elevated

achievement scores, particularly for reading and during the elementary grades as well as reduced

dropout rates for African American and Hispanic students and higher rates of enrollment in

higher education. These effects associated with racial integration hold even after controlling for

socioeconomic status and several other demographic characteristics. Additionally, research

supports that racial diversity in schools increases access to networks promoting academic

achievement and career aspirations.

When scholars consider the role of the family in the academic achievement gap, they

traditionally focus on differences in economic resources. Historically disadvantaged minority

families tend to earn less than their white counterparts making educationally beneficial

experiences less readily available. Consequently, economic disparity has sometimes been labeled

as the primary means by which the family contributes to racial disparities in academic

achievement (Potter & Morris, 2017). While to some extent, racial disparities in academic

achievement arise out of economic disparities that are associated with differential academic

success within, as well as between, racial groups, even when controlling for socioeconomic

status, there are considerable differences among racial groups in academic achievement in

kindergarten through 12th grade (Olneck, 2005; Potter & Morris, 2017).

Innovation

Since the publication of the "Coleman Report," which assessed the availability of equal

educational opportunities to children of a different race, color, religion and national origin

(Mason, 2016), substantial resources have been devoted to addressing resource inequalities and

implementing evidence-based approaches to reduce the achievement gap. Such initiatives

include federal efforts such as Head Start programs, financial assistance through Title-I, Part A

of the Elementary and Secondary Education Act (ESEA) to school districts with large proportions of students from poorer families, many of whom are minority, to reduce funding inequities, and various strategies implemented by individual states aimed at raising learning standards and making state and local policies more coherent and comprehensive, through what is known as the standards-based movement (Braun, Wang, Jenkins, & Weinbaum, 2006). Additionally, several studies have applied technology interventions to address educational equity issues and found improved performance on state test scores (Tawfik, Reeves, & Stich, 2016). As a result, educators and policymakers looking for strategies to close the achievement gap and improve student learning have sought solutions involving new uses of technology in all areas of K-12 education to support a diverse array of educational goals, especially for disenfranchised and minority students.

Although much of the literature examining educational technology use and student achievement seems to emphasize that there is a positive correlation between these variables, not all approaches of using educational technology result in equally good performance, and not all students learning with educational technology learn better than those learning without educational technology under all conditions (Lei & Zhao, 2007; Li & Ma, 2010). This suggests that the relationship between educational technology and student academic achievement is complex and constantly evolving. Therefore, examining educational technology by itself is not enough to determine its effects on academic achievement. What seems to be important is how technology is used and the optimal conditions necessary to promote student learning with the support of educational technology, especially for children of color and from low-income families. Thus, this research advances the current state of knowledge regarding the use of technology in education with up-to-date, comprehensive research inclusive of the relevant

multidimensional factors affecting the association of specific educational technology utilization in the classroom and improved academic performance.

Rationale for Dissertation

The social work profession has a long history of advocacy with ethnic minority students dating back to the beginning of the 20th century. However, despite the linkage between social work values and education reform, there seems to be little movement inside the profession that addresses the complexities of education reform. Even though the goal for equal educational opportunity is supported by the values held by the social work profession, the profession's commitment to its achievement and record of accomplishment are not what they should be (Teasley, 2004). If the social work profession is to follow its historical role as an instrumental advocate for change and social justice in the education of ethnic minority youth, then intervention strategies that promote and advance educational opportunities of ethnic minority students and address major issues of education reform should be examined.

Education plays a critical role in the survival of ethnic minority youth. It is through education that the traditional barriers to advancement are overcome. The personal and social costs of poor education for ethnic minority youth are considerable for the individuals, their families, their communities, and the economic viability of our nation. Research suggests that poor education leads to large public and social costs in the form of lower-income and economic growth, reduced tax revenues, and higher cost of public services such as health care, public assistance, and criminal justice (Belfield & Levin, 2007). Moreover, these effects are often passed onto the next generation, as there is a connection between parent's socioeconomic status and their children's level of educational and occupational attainment (American Psychological Association, Presidential Task Force on Educational Disparities, 2012). On the contrary, Belfield

& Levin (2007) posited that better-educated students earn higher incomes, live healthier lives, pay higher taxes, and prove less likely to be involved in crime. This social reality means the persistent patterns of poorer educational outcomes for ethnic minority children will contribute to the persistence of racial inequality in other areas of life (Grogan-Kaylor & Woolley, 2010). If life chances depend so heavily on educational supports, educational disparities must be redressed to equalize opportunities in a democratic society.

Although the social work profession plays multiple roles in education reform, initiatives that are based on objective findings from school social work research methods are lacking. School social workers assist and advocate for students' educational needs and resource procurement that reinforce learning in students and improvement in academic performance, address internal and external factors that contribute to structural inadequacies in the educational system, introduce innovative, outcome-based intervention methods that further the education of students, and assist in the design and development of strategic plans and initiatives that correspond to the educational needs of students and improve school systems (Teasley, 2004). Presently, the use of educational technology in the classroom plays a significant role in public education, and research suggests that the use of technology is beneficial in addressing individualized educational needs and improving engagement, particularly among students at risk of failing courses or dropping out of school (Alliance for Excellent Education, 2014), and can assist in closing the academic achievement gap (Rosen and Beck-Hill, 2012). Therefore, school social workers should become more knowledgeable of evidence-informed approaches to leverage technology as an instructional tool to reduce disparities in education and close the academic achievement gap.

Although there is general agreement on the seriousness of racial disparities in education, there is no consensus on its causes or solutions. Some research suggests that children who reside predominantly in the racial minority or predominantly poor neighborhoods are at a disadvantage because of the contextual effects of social segregation. Other studies note the significant problems associated with persistent and severe disparities that affect the quality and resources of schools serving ethnic minority students. The third direction of scholarship reflects that differences in culture, family structure, and parenting styles may be to blame for different educational experiences and outcomes of ethnic minority children and youth (Fram, Miller-Cribbs, & Van Horn, 2007). However, the focus of this work is not to revisit debates around disparate educational outcomes across ethnic and racial lines, and address the root causes of these disparities, but rather to examine the role of technology in helping to reduce academic disparities in schools.

This study focused on using educational technology to transform learning experiences for ethnic minority children and youth to provide greater equity and accessibility. Equity in education means increasing all students' access to educational opportunities with a focus on closing achievement gaps and removing barriers that students face based on their race, ethnicity, socioeconomic status, or geographical location. Therefore, this research aimed to assess the ability of educational technology to improve equitable educational opportunities and outcomes by providing all students access to appropriate resources that support learning and success, regardless of their cultural and socioeconomic background. To further explore the effect of educational technology applications on students' academic achievement, this research examined types of technology currently being used in K-12 classrooms, for what purposes, the specific features of educational technology that promote student learning, and under what conditions. The

results from this study suggest research priorities to leverage technology to reduce disparities found within educational systems and level the field of opportunity.

Manuscript 1

Using the theoretical framework of ==distributed cognition theory==, along with research-based teaching practices of differentiated instruction, the first phase of this research examined the impact of educational technology applications on student academic achievement. Since technology has become apparent in many K—12 classroom and, undoubtedly, will continue to play an increasingly important role in the years to come, knowledge of evidence-informed approaches to incorporate various educational technology applications to provide effective teaching and better learning opportunities, especially for low-income and minority children, will create a foundation for further research in reducing disparities in education and closing the academic achievement gap. The goal of this evaluation was to systematically review the current literature relating to the use of technology in school learning and teaching that has become a priority in the U.S. within the last two decades. The specific research questions (RQ) for this study were:

> RQ1: What types of educational technology applications are currently being used in K-12 classrooms in the U.S.?
>
> RQ2: What impact do these educational technology applications have on student academic achievement?

The findings of this review informed the interview questions to be used in the qualitative phase of the study based on how educational technologies are being used, by whom, for what purposes, and under what conditions.

Manuscript 2

The second article of this study explored the impact of education technology applications on improving teaching and learning based on the experiences and perceptions of primary school teachers. In general, the literature concerning the use of educational technology in K-12 classrooms has traditionally focused on how much technology is used in schools. Although educational technology has the potential to impact teaching and learning, the use of educational technology alone does not automatically produce desirable student academic outcomes (McFarlane, 1997). Meaningful and effective use of educational technology for teaching and learning depends upon clear objectives and well-designed tasks that come from a thorough understanding of the effects of technology on student academic achievement (Lei & Zhao, 2007). Therefore, to advance the current state of knowledge regarding the use of technology and the optimal conditions necessary to promote student learning with the support of educational technology, especially for children of color and from low-income families, this study seeks to answer the following research questions:

     RQ3: How do primary school educators describe the current use of educational technology in the classroom?

     RQ4: How do educators describe the impact of their school's culture and climate on the use of technology in the classroom?

     RQ5: What are primary school teachers' perceptions of the impact of educational technology on student academic achievement?

     RQ6: Based on educators' experiences, what role do patterns of educational technology use in primary school classrooms play in enhancing student learning and achievement?

RQ7: How do educators describe facilitators and barriers to integrating educational technology into traditional classroom instruction?

The experiences and attitudes described in this phenomenological study were used to gain insight regarding the specific features, attributes and optimal conditions of educational technology that facilitate and promote student learning and enhance academic performance. Further, this study examined the role that school culture and climate play in teachers' use of technology in their classrooms to enhance traditional classroom instruction and support student learning. This study serves as Phase 1 in the exploratory sequential mixed-methodological design utilized in article three.

Manuscript 3

Despite the sharp increase in the number and variety of technological tools available to students in schools, many schools do not yet have access to or have adopted approaches for using technology in ways that can improve learning daily. Resultantly, researchers have made a great deal of effort for many years to identify which factors affect teachers' motivation and use of educational technology in their classrooms. While evidence indicates that teachers' attitudes towards educational technology and the integration of that technology into instruction are inseparable, school culture and climate are critical factors in the progression and effectiveness of technology integration in classrooms. Therefore, this study further explored how school culture and climate and teachers' technology readiness contribute to technology integration in the classroom. Combining qualitative and quantitative research methods, this study sought to answer the following research questions:

RQ8: What is the technology readiness level of primary school teachers in CISD and PISD?

RQ9: What is the effect of the demographics of the teachers such as age, gender, race/ethnicity, level of education, years of teaching experience, grades taught, and subjects taught on teachers' technology-readiness level?

RQ10: Is teachers' technology readiness related to their use of educational technology in their classroom?

RQ11: What are the cultural characteristics of CISD and PISD primary schools concerning technology integration?

RQ12: Are school culture and climate related to teachers' use of educational technology in their classroom?

RQ13: Will teachers' use of educational technology in their classroom be more a function of the school culture and climate than of their technology readiness?

The findings of this study provided insights and specific suggestions for creating a sustainable school culture and climate that supports technology as an integral facet of student learning. The following chapters will first outline the shared component of the three articles within the dissertation, which includes the role of technology in education, followed by the rationale for each article.

References

American Academy of Social Work and Social Welfare. (2016). *Social work's 12 grand challenges*. Retrieved from http://aaswsw.org/grand-challenges-initiative/12-challenges/ensure-healthy-development-for-all- youth/

American Psychological Association, Presidential Task Force on Educational Disparities. (2012*). Ethnic and racial disparities in education: Psychology's contributions to understanding and reducing disparities.* Retrieved from http://www.apa.org/ed/resources/racial-disparities.aspx

Barth, R. P., Gehlert, S., Joe, S., Lewis Jr., C. E., McClain, A., Shanks, T. R., Sherraden, M., Uehara, E., Walters, K. L. (2019). Grand challenges for social work: Vision, mission, domain, guiding principles, and guideposts to action. *Grand Challenges for Social Work.* Retrieved from https://grandchallengesforsocialwork.org/wp-content/uploads/2019/09/GCSW-Principles-2-5-19.pdf

Bowles, S., Loury, G. C., & Sethi, R. (2007). Is equal opportunity enough? A theory of persistent group inequality (Working Paper No.). Retrieved from http://tuvalu.santafe.edu/~bowles/IsEqualityEnough2007.pdf

Braun, H. I., Wang, A., Jenkins, F., & Weinbaum, E. (2006). The Black-White achievement gap: Do state policies matter? *Education Policy Analysis Archives, 14*(8).

Brittain, J., & Kozlak, C. (2007). Racial disparities in educational opportunities in the United States. *Seattle Journal for Social Justice, 6*(2), 591-647.

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

Emdin, C., Adjapong, E., & Levy, I. (2016). Hip-hop based interventions as Pedagogy/Therapy in STEM: A model from urban science education. *Journal for Multicultural Education, 10*(3), 307-321. doi:10.1108/JME-03-2016-0023

Fram, M. S., Miller-Cribbs, J. E., & Van Horn, L. (2007). Poverty, race, and the contexts of achievement: Examining educational experiences of children in the U.S. south. *Social Work, 52*(4), 309-319. doi:10.1093/sw/52.4.309

Gholson, T. C. (2015). *The roles and experiences of black school social workers: Are they prepared to fill in the gap s for black youth in K–12 school settings?* (Doctoral Dissertation). Retrieved from ProQuest Dissertations Publishing. (3737655)

Graham, L., Brown-Jeffy, S., Aronson, R., & Stephens, C. (2011). Critical race theory as theoretical framework and analysis tool for population health research. *Critical Public Health, 21*(1), 81-93. doi:10.1080/09581596.2010.493173

Grogan- Kaylor, A. & Woolley, M. E. (2010). The social ecology of race and ethnicity school achievement gaps: Economic, neighborhood, school, and family factors. *Journal of Human Behavior in the Social Environment, 20,* 875-896.

Herman, M. R. (2009). The black-white-other achievement gap: Testing theories of academic performance among multiracial and monoracial adolescents. *Sociology of Education, 82(1),* 20-46.

Holen, S. (2018). A chance lost in the prevention of school dropout? Teacher-student relationships mediate the effect of mental health problems on noncompletion of upper-secondary school. *Scandinavian Journal of Educational Research, 62*(5), 737–753.

Howard, T. C., & Navarro, O. (2016). Critical race theory 20 years later: Where do we go from here? *Urban Education, 51(3),* 253-273.

Johnson, S. D., Davis, L. E., & Williams, J. H. (2004). Enhancing social work practice with

ethnic minority youth. *Child and Adolescent Social Work Journal, 21*(6), 611-627.

doi:10.1007/s10560-004-6407-3

Lei, J., & Zhao, Y. (2007). Technology uses and student achievement: A longitudinal study.

Computers and education, 49(2), 284—296. doi:10.1016/j.compedu.2005.06.013

Li, Q., & Ma, X. (2010). A meta-analysis of the effects of computer technology on school

students' mathematics learning. *Educational Psychology Review, 22*(3), 215—243.

doi:10.1007/s10648-010-9125-8

Mason, C. P. (2016) Using reality therapy trained group counselors in comprehensive school

counseling programs to decrease the academic achievement gap. *International Journal of*

Choice Theory and Reality Therapy, 35(2), 14-24.

Massey, D. S. (2006). Social background and academic performance differentials: White and

minority students at selective colleges. *American Law and Economics Review, 8*(2), 390-

409. doi:10.1093/aler/ahl005

McFarlane, A. (1997). What are we and how did we get here? In A. McFarlane (Ed.),

Information technology and authentic learning: Realizing the potential of computers in

the primary classroom. London, England: Routledge.

McKown, C. (2013). Social equity theory and racial-ethnic achievement gaps. *Child*

Development, 84(4), 1120-1136.

National Association for Social Workers. (2012). *NASW standards for school social work*

services. Washington, DC: National Association for Social Workers.

National Research Council. (2004). *Measuring racial discrimination.* Washington, DC: The

National Academies Press. doi:10.17226.10887

Olneck, M. (2005). Economic consequences of the academic achievement gap for African

    Americans. *Marquette Law Review, 89*(1), 95-104.

Openshaw, L. (2008). *Social work in schools: Principles and practice*. New York, NY: Guilford

    Press.

Ortiz, L., & Jani, J. (2010). Critical race theory: A transformational model for teaching

    diversity. *Journal of Social Work Education, 46*(2), 175-193.

    doi:10.5175/JSWE.2010.200900070

Pager, D., & Shepherd, H. (2008). The sociology of discrimination: Racial discrimination in

    employment, housing, credit, and consumer markets. *Annual Review of Sociology, 34*(1),

    181-209. doi:10.1146/annurev.soc.33.040406.131740

Potter, D., & Morris, D. S. (2017). Family and schooling experiences in racial/ethnic academic

    achievement gaps: A cumulative perspective. *Sociological Perspectives, 60*(1), 132-167.

Sampson, D. & Garrison-Wade, D. F. (2011). Cultural vibrancy: Exploring the

    preferences of African American children toward culturally relevant and non-culturally

    relevant lessons. *Urban Review, 43,* 279-309.

Snyder, T. D., & Dillow, S. A. (2013). *Digest of Education Statistics 2012 (NCES 2014-015).*

    Washington, DC: National Center for Education Statistics, Institute of Education

    Sciences, U. S. Department of Education.

Tawfik, A. A., Reeves, T. D., & Stich, A. (2016). Intended and unintended consequences of

    educational technology on social inequality. *Tech Trends, 60*(6), 598—605.

    doi:10.1007/s11528-016-0109-5

Teasley, M. (2004). School social workers and urban education reform with African American

    children and youth: Realities, advocacy, and strategies for change. *School Community*

    Journal, 14(2), 19-38.

Teasley, M. L., McRoy, R G., Joyner, M., Armour, M., Gourdine, R. M., Crewe, S. E., . . . Fong,

    R. (2017). *Increasing success for African American children and youth* (Grand

    Challenges for Social Work Initiative Working Paper No. 21). Cleveland, OH: American

    Academy of Social Work and Social Welfare.

Whaley, A. l., & Noel, L. (2012). Sociocultural theories, academic achievement, and African

    American adolescents in a multicultural context: A review of the cultural compatibility

    perspective. *The Journal of Negro Education, 81*(1), 25-38.

Williams, J. H. (2014). How to best address the needs of African American children vulnerable

    to the continual widening of the achievement gap. *Social Work Research, 38*(3), 131-134.

    doi:10.1093/swr/svu022

Zhao, Y. (2016). From deficiency to strength: Shifting the mindset about education inequality.

    Journal of Social Issues, 72(4), 720—739. doi:10.1111/josi.12191

Chapter 2: Article Components and Introduction

The following chapters (chapters 3-5) provide a rationale for each of the three articles included in this dissertation. The first article is a systematic review of literature that evaluates the impact of educational technology applications on student academic achievement. Further, the article examines how methodological and research features affect the overall outcome of educational technology on student academic achievement, suggests research priorities, and outlines specific implications for policymakers, educators, and social work. The second article utilized a qualitative transcendental phenomenological approach to explore and describe the impact of educational technology on student learning based on the experiences and perceptions of primary school teachers. To further assess the ability of educational technology applications to improve equitable educational opportunities and outcomes, this research explored types of technology currently being used in primary school classrooms, for what purposes, the specific features and attributes of educational technology that promote academic achievement and improved student performance, and under what conditions. The third article employed an exploratory sequential mixed-methodological design to examine the relationship between teachers' technology readiness levels and the use of educational technology in the classroom, along with the relationship between school culture and climate and technology use. In this design, the experiences and attitudes described in the qualitative phase of this study (article two) was then converted into quantitative data based on emerging patterns and the frequency of particular responses to the interview questions and used to develop a structured, closed-ended questionnaire measuring the culture and climate of primary schools in CISD and PISD regarding technology integration. Additionally, a quantitative analysis of the responses to the questionnaire was used to further explore whether teachers' use of educational technology in their classroom is

more a function of the school's culture and climate in which they work than of their technology readiness. This research concludes with a discussion of school social workers' role in understanding and addressing educational disparities and ensure that all students have equal access to educational resources and support necessary to maximize their potential in the educational process. Additionally, this study suggests research priorities to reduce disparities in education and improve the academic outcomes of ethnic minority students.

The Role of Technology in Education

There has and continues to be increased discussion of the integration of technology for instruction in K-12 classrooms, as the integration of technology in classrooms is rapidly emerging as a way to provide more educational opportunities for students (Greer, 2014). Technology integration is often understood and examined in terms of teachers' use of computing devices such as computers, laptops, tablets, software, or the internet for instructional purposes (ChanLin, 2007; Hew & Brush, 2007). One reason reasons for the increasing push towards the integration of technology in K-12 school instruction is that today's learners are frequently characterized as millennial students, digital natives, or members of the net generation (Greer, 2014), as these students have grown up with computers, video games, cell phones, and the internet. Students of the 21st century are described as early and ready adopters of most new technologies, and they have been shown to demonstrate great interest in using emergent technologies in their learning. Educators have been encouraged to adopt educational technology to engage these learners in the classroom (Greer, 2014). Also, research demonstrates that the use of educational technology can improve students' standardized test scores (Hew & Brush, 2007; Swain & Pearson, 2002), critical thinking and problem solving, and self-concept and motivation for learning (Hew & Brush, 2007).

The belief that technology can positively impact student learning has led to government mandates of the creation of programs for the integration of technology in elementary and secondary schools (Hew & Brush, 2007). Established through the No Child Left Behind Act of 2001, the Enhancing Education Through Technology (EETT) program provides formula and competitive grant awards to states to improve the capacity of high-need schools to improve student academic achievement through the use of educational technologies. The program also seeks to assist students in crossing the digital divide by ensuring that every student is technologically literate by the time the student finishes the eighth grade, regardless of the student's race, ethnicity, gender, family income, geographic location or disability; as well as encourage the effective integration of technology resources and systems with teacher training and curriculum development to establish research-based instructional methods that can be widely implemented as best practices by state and local educational agencies.

It is important to note that while many view educational technologies as the solution to all that ails the education system that will allow all students to meet their greatest learning potential, there is much debate on whether or not technology has been making a significant impact on student achievement, as studies conducted on the most current instructional strategies that are being used to integrate technology into K-12 classrooms show mixed results (Delgado et al., 2015; Inan & Lowther, 2010). Due to the inconsistent empirical support, policymakers, educators, school social workers, and others must understand the relationship among various factors that influence student learning and academic outcomes. Over the last two decades, policymakers have articulated different rationales for the integration of technology into the school curriculum. These rationales often emphasize three key themes: (a) using technology to address challenges in teaching and learning, (b) using technology to foster changes in the content

and quality of teaching and learning, and (c) using technology to prepare students for an increasingly technological world (Groff & Mouza, 2008).

The role of technology in education can be grouped primarily into three broad categories: technology for instructional preparation, technology for instructional delivery, and technology as a learning tool. Teacher's professional use of technology involves preparation for various classroom activities such as preparing instructional material, communicating or collaborating with peers, students and their parents, locating digital resources, and creating lesson plans (Inan & Lowther, 2010). When technology is used for instructional delivery, teachers present instruction utilizing a projector or students may use computer-assisted learning applications such as drill and practice, tutorials, and simulations to reinforce concepts from instructional units. The third category, technology as a tool, involves student use of technology applications that fosters critical thinking, conceptual development, problem-solving skills, and teamwork (Greer, 2014; Inan & Lowther, 2010; Levin & Wadmany, 2008). Ultimately, successful technology integration lies in matching the use of educational technology with the material to be taught and the learning goals for the particular curriculum to motivate students and achieve the desired learning outcomes (Greer, 2014).

According to the most recent report from the National Center for Education Statistics, approximately 97 percent of teachers now have one or more computers in the classroom every day. Additionally, internet access in schools has also increased, as 93 percent of computers in classrooms have internet access, and the ratio of students-to-computer has decreased from 11 to 1 to 1.7 to 1. Despite the amount of resources and funding that has been allocated to immerse schools with technology, the development of new technologies for use in classroom instruction, and the support and even promotion of educational technology use in K-12 classrooms by the

National Council for Accreditation of Teacher Education (NCATE), the International Society for

Technology in Education (ISTE), the U.S. Department of Education and others, the actual use of

educational technology in K-12 classrooms remains low (Delgado et al., 2015; Greer, 2014).

Recent studies indicate that on average, teachers use computers several times a week for

preparation but only once or twice a year for instructional purposes (Groff & Mouza, 2008), as

the most common ways that teachers are using technology are for presentations, information

delivery, administrative purposes, and for managing student records (Delgado et al., 2015; Levin

& Wadmany, 2008).

Although most teachers believe computers are a valuable tool for teaching and learning,

many of the teachers do not have the computer integration skills or knowledge to enhance

lessons and provide meaningful experiences with technology (ChanLin, 2007; Inan & Lowther,

2010). Teachers find it difficult to prepare to learn and teach new content while also learning

new methodologies in computer-based learning (Pasco & Adcock, 2007). Additional barriers to

technology integration and utilization in the classroom identified in the literature include

minimal professional development and technical support, lack of access to technology hardware

and software, reliability of technology, insufficient time to plan for the inclusion of technology in

the curriculum, and teachers' attitudes and beliefs towards technology (Greer, 2014; Hew &

Brush, 2007; Inan & Lowther, 2010).

Research suggests that educational technology can be a powerful tool for transforming

learning. However, to realize fully the benefits of technology integration in K-12 classrooms and

provide authentic learning experiences, educators need to use technology effectively in their

practice. The following studies will examine the role of educational technology in supporting

learning and teaching while providing greater equity and accessibility for ethnic minority

children and youth. To provide a holistic view of the impact of educational technology on student learning and academic achievement, these articles will evaluate the impact of technology integration on various components of student learning and performance including academic achievement data, classroom engagement, and attitude and motivation to learn.

The following chapter provides an exhaustive summary of current evidence relevant to the types of educational technology applications that are currently being used in K-12 classrooms in the U.S., as well as the impact of these educational technology applications on student academic achievement. This article lays the groundwork for the subsequent articles by exposing the narrow focus of existing primary studies on the effects of educational technology on student academic achievement along with the gaps in the literature. Next, the specific features of educational technology and the optimal conditions necessary to promote academic achievement were explored, using a qualitative transcendental phenomenological approach, based on the experiences and perceptions of primary school teachers. Finally, using a qualitatively driven sequential design with a quantitative supplemental component, the influence of teachers' technology readiness and school culture and climate on technology integration in the classroom was examined. Thus, the three articles included in this dissertation advances the current state of knowledge regarding the role of technology in education with comprehensive research inclusive of the multidimensional factors affecting the association of specific educational technology utilization in primary school classrooms and improved academic outcomes. This research will conclude with a discussion of school social workers' role in understanding and addressing educational disparities and creating solutions that leverage technology to improve learning opportunities and academic outcomes of ethnic minority children and youth.

References

ChanLin, L. (2007). Perceived importance and manageability of teachers toward the factors of integrating computer technology into classrooms. *Innovations in Education and Teaching International, 1* (44), 45-55.

Delgado, A., Wardlow, L., O'Malley, K., & McKnight, K. (2015). Educational technology: A review of the integration, resources, and effectiveness of technology in K-12 classrooms. *Journal of Information Technology Education: Research, 14*, 397-416. doi:10.28945/2298

Eifler, T., Greene, T., & Carroll, J. (2001). Walking the talk is tough: From a single technology course to infusion. *The Educational Forum,* 4(65), 366-441.

Greer, R. J. (2014). *Relationship of teacher epistemic beliefs, perceived barriers to technology use, and integration of educational technology* (Doctoral Dissertation). Retrieved from ProQuest UMI Dissertations Publishing. (3684688)

Groff, J., & Mouza, C. (2008). A framework for addressing challenges to classroom technology use. *Association for the Advancement of Computing in Education Journal, 16*(1), 21-46.

Hew, K. F., & Brush, T. (2007). Integrating technology into K-12 teaching and learning: Current knowledge gaps and recommendations for future research. *Educational Technology Research and Development, 55*(3), 223-252. doi:10.1007/s11423-006-9022-5

Inan, F. A., & Lowther, D. L. (2010). Factors affecting technology integration in K-12 classrooms: A path model. *Educational Technology Research and Development, 58*(2), 137-154. doi:10.1007/s11423-009-9132-y

Levin, T., & Wadmany, R. (2008). Teachers' views on factors affecting effective integration of

  information technology in the classroom: Developmental scenery. *Journal of Technology*

  and Teacher Education, 2(16), 233-263.

No Child Left Behind Act of 2001, Pub. L. No. 107—110 (2001).

Pasco, B., & Adcock, P.G. (2007). New rules, new roles: Technology education standards and

  teacher education. *Educational Considerations, 2*(34) 29-31.

Swain, C., & Pearson, T. (2002). Educators and technology standards: Influencing the digital

  divide. *Journal of Research on Technology in Education, 3*(34), 326-335.

Chapter 3: Article 1: Integrating Educational Technology to Address Disparities in

Education: Implications for School Social Work

Abstract

Educational disparity has been a long-standing social, political concern and is a grand challenge for social work because of its implications for equal opportunity and social justice. As stewards of social justice in public K-12 educational settings, school social workers help students gain access to and effectively use resources and support necessary to maximize their potential in the educational process, as well as identifying areas of need that are not being addressed by the local education agency and community and working to create services that address those needs. Several studies have applied educational technology interventions to address academic achievement equity issues and found improved performance on state test scores. Thus, twelve evaluation studies of educational technology in primary and secondary schools in the United States conducted after 2001 were synthesized, examining the impact of educational technology applications on student academic achievement. Although much of the research conducted emphasizes a positive correlation between these variables, not all approaches of using educational technology resulted in equally good performance, and not all students learning with educational technology learned better than those learning without educational technology under all conditions. This critique identifies both strengths and weakness of existing literature, suggests research priorities, and outlines specific implications for educators, policymakers, and school social workers.

Keywords: educational disparities; technology integration; student learning; achievement gap; academic performance, educational inequalities

Integrating Educational Technology to Address Disparities in Education: Implications for School Social Work

Education plays a critical role in the advancement and survival of ethnic minority children and youth. However, access to quality education still eludes many ethnic minority children as a result of instances of prejudice, institutional racism, and structural discrimination. Due to these obstacles, ethnic minority children and youth often lag behind their white peers in many social indicators including higher rates of poverty and lower educational attainment, which impedes their academic success and upward mobility. These educational disparities, commonly referred to as the academic achievement gap, are evident early in childhood and persist through the K-12 education and are reflected in levels of school readiness, grades, standardized test scores assessing academic achievement, such as reading and mathematics, participation in special education programs, enrollment in gifted and talented programs and advanced courses, drop-out and high school graduation rates, and college admission data (American Psychological Association, Presidential Task Force on Educational Disparities, 2012; National Research Council, 2004; Whaley & Noel, 2012; Williams, 2014; Zhao, 2016).

According to the American Psychological Association, Presidential Task Force on Educational Disparities (2012), educational disparities include differences in educational outcomes that may result from differential or biased treatment of ethnic minority students within the educational system expressed in explicit or implicit forms, differences in socioeconomic status as reflected in the poor quality of schools that children of low socioeconomic status and marginalized ethnic minority backgrounds attend which result in unequal opportunities to learn, and different responses to educational systems or different sets of educational needs. Although barriers to equitable academic conditions and access for ethnic minorities previously in

accordance with law were declared unconstitutional with the U.S. Supreme Court decision in *Brown v. Board of Education* (1954), public education systems throughout the U.S. continue to confront wide disparity in the achievement of ethnic minority children and youth and their white counterparts due to institutional racism and structural discrimination (Howard & Navarro, 2016; Teasley et al., 2017). Moreover, despite a plethora of school reform efforts over the past three decades, in the guise of free-market educational reform, and the intensity of standards-based education movement, scripted curriculum, heightened accountable corporate influence, and legislative mandates such as No Child Left Behind (NCLB) and the Common Core State Standards (CCSS), educational experiences and performance for ethnic minority students remain distinctly different than their white peers (Howard & Navarro, 2016).

Educational disparity has been a long-standing social, political concern and is a grand challenge for social work because of its implications for equal opportunity and social justice. The Grand Challenges of Social Work focuses on innovations to solve social problems, especially those that disproportionately affect the most vulnerable in our society while eliminating injustices and inequities due to race, ethnicity, religion, sexual and gender identity and expression, abilities, custom, class, and all other human differences. Social work recognizes that economic systems and strata of power can confer extravagant privileges to some while prohibiting equal access for all, thereby begetting injustice and inequity (Barth et al., 2019). Furthermore, social work is well-positioned to address educational inequality because of the key roles that social workers play in schools.

The goal of school social work is to give all children the opportunity and resources to help them succeed academically and socially in a safe and healthy school environment (National Association of Social Workers, 2012). According to the National Association of Social Workers

(NASW; 2012), school social workers seek to ensure equitable educational opportunities; ensure that students are mentally, physically, and emotionally present in the classroom; and promote respect and dignity for all students. Thus, school social workers play a vital role in helping students gain access to and effectively use resources and support necessary to maximize their potential in the educational process, as well as identifying areas of need that are not being addressed by the local education agency and community and working to create services that address those needs. The school social work profession has consistently focused on coordinating the efforts of schools, families, and communities towards helping students improve their academic achievement by using its unique ecological perspective to enhance understanding of factors in the home, school, and community that affect students' educational experiences as well as interventions that foster students' academic progress. Also, school social workers help school systems meet expectations of federal, state, and local mandates, particularly those designed to promote equal opportunity, social justice, and the removal of barriers to learning (NASW, 2012).

As stewards of social justice in public K-12 educational settings, school social workers should have a great interest in attempts to eliminate racial disparities in education (Teasley et al., 2017). As Standard 11 of the NASW (2012) Standards for School Social Work Services recognizes, school social workers shall engage in advocacy that seeks to ensure that all students have equal access to education and services to enhance their academic progress. Advocating for evidence-based approaches to reducing racial and ethnic achievement gaps can create equal educational opportunities for all children and ensure that ethnic minority students achieve at higher levels.

Presently, the use of technology in the classroom such as computers, mobile devices, interactive whiteboards, multimedia, and the Internet play a significant role in public education

(Cheung & Slavin, 2012). Moreover, several studies have applied educational technology interventions to address academic achievement equity issues and found improved performance on state test scores (Tawfik, Reeves, & Stich, 2016). As a result, educators and policymakers looking for strategies to close the achievement gap and improve student learning have sought solution involving new uses of technology, especially for students placed at-risk. School social workers should become more knowledgeable of evidence-informed approaches to teaching and learning that promote positive academic outcomes for all students, as recognized by the NASW Standards for School Social Work Services (2012).

Current Study

This study focuses on using educational technology to transform learning experiences with the goal of providing greater equity and accessibility. Equity in education means increasing all students' access to educational opportunities with a focus on closing achievement gaps and removing barriers that students face based on their race, ethnicity, socioeconomic status, or geographical location. Therefore, the aim of this study was to systematically review the current literature relating to the use of educational technology in primary and secondary schools to improve student academic achievement. The results from this review will create a foundation for further research in integrating technology to reduce disparities in education and close the academic achievement gap. By highlighting current initiatives and strategies to reduce disparities in education, this study offers ways school social workers can assist in the design and development of strategic plans and initiatives that correspond to the educational needs of students and address major issues of education reform. The specific aims of this study are:

1. To identify and describe the educational technology applications used in primary and secondary schools to improve student academic achievement and cite evidence of effectiveness.

2. To examine how methodological and research features affect the overall outcome of educational technology on student academic achievement.

3. To analyze the content of current literature and synthesize the findings of all relevant studies, thereby making the available evidence more accessible to educators and decision-makers and generating new insights for educational leaders, school social work, and education policy.

Method

Selection Criteria

A comprehensive literature search was performed to identify all evaluation studies of educational technology in primary and secondary schools for improved student academic achievement. Articles were assessed for possible inclusion using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework (Moher, Liberati, Tetzlaff, Altman, & Prisma Group, 2009). The PRISMA framework was developed to improve the reporting of both systematic reviews and meta-analysis and consists of a 27-item checklist and four-phase flow diagram (Moher et al., 2009). To delineate the domains of inclusion criteria, the PICO framework was used, and the included studies were assessed using the Covidence reference software program (https://www.covidence.org/home). Articles deemed eligible for this study met the following inclusion criteria:

1. Evaluation studies whose primary focus was any type of educational technology, including computers, multimedia, interactive whiteboards, and other technology applications used to improve student academic achievement.

2. Studies involved students in grades K—12.

3. The educational technology intervention under study was aimed at improving student academic performance.

4. Studies published from 2001 to present day.

5. Studies took place in the United States and the report was available in English.

6. Some form of evaluation data was provided.

Studies of educational technology interventions aimed at improving behavior, engagement, communication, or integration were not included unless they also measured academic achievement. Articles reporting on educational technology application without any form of outcome data also were excluded.

Search Strategy

Using the search terms: 'computer assisted instruction,' 'educational technology,' and 'student achievement,' 'academic achievement,' 'academic performance,' 'academic success,' 'grades,' 'gpa,' 'academic outcomes, a literature search was conducted using the following relevant electronic databases: Academic Search Complete, Computer Source, Education Abstracts (H.W. Wilson), Educational Administration Abstracts, ERIC, Information Science & Technology Abstracts (ISTA), Library, Information Science & Technology Abstracts, Literary Reference Center, Mental Measurements Yearbook with Tests in Print, PsycARTICLES, Psychology and Behavioral Sciences Collection, PsycINFO, Science & Technology Collection, Social Work Abstracts, and Teacher Reference Center. As this review sought to examine the use

of educational technology among primary and secondary school students in the United States, studies selected were limited to English language and K—12 students in the United States. Although such studies could also include primary and secondary students in other countries, studies were excluded if they failed to address academic achievement of K—12 students in the United States. Additionally, searches were limited from 2001 to present day, as the No Child Left Behind (NCLB) Act of 2001 emphasized the improvement of student academic achievement with the use of educational technology in primary and secondary school classrooms through the Enhancing Education through Technology (EETT) program. These search parameters were applied to minimize the identification of dated or irrelevant results and allows us to take into consideration the significant advancements of technology and the use of technology in school learning and teaching that has become a priority in the U.S. within the last two decades. Additional studies were identified through a manual search of the reference lists of relevant studies to identify articles that have cited and were cited by included studies. A search of the grey literature was conducted to reduce the potential for publication bias using online searches of the U.S Department of Education website, whose mission is to promote student achievement and preparation for global competitiveness by fostering educational excellence and ensuring equal access (https://www.ed.gov), and other research universities and institutes. Lastly, more targeted searches were conducted via Google Scholar using the terms 'educational technology and student achievement' to ensure that documents absent from the above databases were not overlooked.

Search Results

The combined searches from electronic bibliographic databases as well as other data sources resulted in 527 studies for potential inclusion. Article titles and abstracts were reviewed and after removal of duplicates and articles deemed not applicable, 52 articles were read in full.

Of these articles, 40 were excluded due to not meeting inclusion criteria. Twelve articles were

retained for inclusion in the systematic review. See Table 1 for a summary table of the studies.

Results

The results of this literature review indicated mixed results. Of the twelve evaluation

studies included in this review, examining the effect of educational technology applications on

student academic achievement, the finding of five studies indicated that educational technology

did not have a statistically significant impact on student achievement, and the results of one

study found that educational technology applications produced a positive but small effect on

student achievement. Contrastingly, the results of six studies demonstrated substantial impact of

educational technology on student learning outcomes, with one study citing larger effects for

language minority groups and students with special needs. These findings suggest that, although

much of the literature examining educational technology use and student achievement seems to

emphasize that there is a positive correlation between these variables, not all approaches of using

educational technology result in equally good performance, and not all students learning with

educational technology learn better than those learning without educational technology under all

conditions. In addition to these overall findings, this review also looked at the differential impact

of educational technology on student academic achievement by key methodological features

(e.g., research design, sample characteristics) and substantive features (e.g., type of intervention,

program duration and intensity, measurement instrument, conceptual framework) in order to

explain this variance.

Methodological Features

Research design. One potential source of variation may lie in the research design of the different

studies. There were four main types of research designs: randomized experiments ($N = 1$), quasi-

experiments ($N = 7$), meta-analysis ($N = 2$), and post-hoc studies ($N = 2$). Ten of the twelve studies reported having a traditionally taught control group; however, many of these evaluations did not establish initial equivalence, making it impossible to know whether the treatment and control groups were comparable at the start of the experiment. Additionally, to prevent disruption to the educational setting, participants were from intact classrooms and were not randomly assigned to treatment or control, although classrooms as a whole were randomly assigned to treatment or control groups. While, it may be necessary to use a quasi-experimental research design to receive the advantage of minimal possible reactive arrangement effects, the present findings point to an urgent need for more practical randomized studies in the area of educational technology for student academic achievement.

   Sample characteristics. Primary school in the U.S. commonly consists of grades K—8, and secondary school consists of grades 9—12. The studies included in this review involved students in grades K—12, with the majority being in elementary and middle school ($N = 10$) possibly due to previous reviews suggesting that educational technology had greater impact on primary school students than secondary school students. Only four of the twelve articles included in this study reported demographic information of the participants. Green (2010) examined the impact of interactive student notebooks on mathematics and science achievement of fifth graders, including 2.2% Asian, 72.9% African American, 6% Hispanic, and 18.9% White. Kebritchi, Hirumi, & Bai (2010) examined the effect of a set of mathematics instructional games called DimensionM^{TM} on the academic achievement of high school Algebra and Pre-Algebra students, including 5.9% African American, 73.4% Hispanic, 16% White, and 4.8% Other. Gulek & Demirtas (2005) examined the impact of participation in a laptop program on student achievement, including 14% Asian, 1% Filipino, 6% Hispanic, 0% African American, and 79%

White. Lastly, Shoemaker (2013) examined the effect of computer-aided instruction on mathematics achievement of fifth graders, including 95% White, 2% African American, 1% Hispanic, 1% Asian, and 1% Native American. Although socioeconomic status was not reported, two studies were conducted in schools in highly educated, high-income communities; two studies was conducted in inner-city schools located in urban school districts, in which 82% of the student population in one school participated in the free or reduced lunch program; and two studies were conducted in schools in rural school districts, where 40% of participants in one study qualified for the free or reduced lunch program.

Substantive Features

Type of intervention. Another source of variation in the articles included in this review was the educational technology related variables. These variables include computer math games ($N = 2$), computer-aided instruction ($N = 2$), interactive student notebooks ($N = 1$), way in which technology is used ($N = 1$), frequency of technology use ($N = 5$), and educational software ($N = 1$). Only two of the five studies that investigated how the frequency of educational technology use affects student learning outcomes reported improved student achievement. This suggests that, while literature concerning educational technology has traditionally focused on how much technology is used in schools, the quantity of technology use alone is not critical to student learning. What seems to be important, however, is the way in which technology is used, and the specific educational technology applications that are beneficial to improved student achievement.

Program duration and intensity. It is important to note that only half of the studies ($N = 6$) provided sufficient information regarding the duration and intensity of educational technology implementation. Results from two studies indicated that students utilized educational technology daily for one academic year, while the other three studies reported a short duration, ranging from

6.5 weeks to 18 weeks. The intensity of the educational technology interventions implemented ranged from 30 minutes per week to three hours per day. Studies with longer durations (e.g., 18 weeks, one year) produced positive effects of educational technology use on academic achievement. This suggests that short-term technology interventions often have an insignificant impact. Therefore, educational technology should be implemented in long-term learning efforts, and educators must maintain realistic expectations that the intervention results may not be immediate.

Measurement instrument. The dependent measures included quantitative student achievement data, such as test scores ($N = 9$), grade point average (GPA; $N = 2$), end-of-course grades ($N = 1$), and scale scores ($N = 2$). Learning outcomes examined by Gulek & Demirtas (2005) included GPAs, end-of-course grades, and test scores. In general, evaluations focused on traditional measures of student performance, primarily standardized tests ($N = 8$), in which four of these studies indicated improved achievement. Three of the four studies that used non-standardized assessments as instruments to measure the effects of educational technology on student achievement produced positive results, which supports Li & Ma (2010) findings that studies using non-standardized tests showed larger effects of technology on student achievement than studies using standardized tests. Non-standardized tests often need to deal with issues of reliability and validity, as literature suggests non-standardized tests could artificially inflate, and thus distort, the effects of technology on student achievement (Li & Ma, 2010).

Conceptual framework. Less than half of the evaluations included in this review appear to be theoretically driven studies ($N = 5$). Both Carr (2012) and Kebritchi et al. (2010) used the experiential learning theory to build the conceptual framework to measure the effects of educational technology on mathematics achievement. Both Harris (2010) and Shoemaker (2013)

tested the theory of constructivism in measuring the effects of educational technology on achievement in reading and math. Lastly, Green (2010) used theory of multiple intelligences to support the use of interactive student notebooks.

Though it may be theoretically interesting to ask whether the impact of technology itself can be separated from the impact of particular applications and evaluated as such, in practice, diverse components of educational technology with potential means of enhancing student outcomes (i.e., hardware, software, content, instructional method, etc.) are often intertwined and cannot be separated. As Cheung & Slavin (2013) argued, components of multi-element educational technology interventions can be varied to find out which elements contribute to effectiveness and to advance theory, but it is also of value for practice and policy to know the overall impact for students even if the theoretical mechanisms are not yet fully understood. Thus, pragmatically, the question is no longer whether teachers should use educational technology or not, but rather how best to incorporate various educational technology applications into classroom settings to provide effective teaching and maximize student performance.

Discussion

It has been long assumed that educational technology can be used to personalize learning as well as accelerate, amplify, and expand the impact of effective teaching practices. However, the evidence to date does not support complacency. The contradicting views of this literature review, the existence of relatively few recent and comprehensive empirical studies in school settings, and the cited methodological inconsistencies in theses evaluations necessitate further extensive and rigorous research to help educators better understand, integrate, and facilitate educational technology applications in the classroom.

This review to some extent has exposed the narrow focus of existing primary studies on the effects of educational technology on student academic achievement. To further explore the effect of educational technology applications on student learning and achievement, the following issues should be considered. First, the importance of the quality of educational technology use is increasingly recognized because research indicates that even if educational technology applications are used at a certain frequency, not all technology applications are equally constructive and helpful to student learning. In other words, examining the quantity of educational technology use by itself is not enough to determine its effects on student achievement. To achieve maximum benefits of educational technologies, we therefore need to consider how it is being used, by whom, for what purposes, and under what conditions. Second, it is helpful to examine whether teachers feel prepared to use technology effectively in the classroom to support student learning. Research suggests that educational technology integration into instruction is increased with teacher training. Middleton & Murray (1999) reported that teacher's attitude towards educational technology and the integration of that technology into instruction are inseparable. Additionally, the effectiveness of student learning with educational technology is highly dependent on teaching approaches, type of programs, and learner characteristics. Therefore, it is vital that educators are provided opportunities to gain experience and confidence in using educational technology applications to achieve learning objectives and to select engaging and relevant digital learning content. Finally, this study used student academic achievement data as an indicator for effectiveness of educational technology. Other outcomes are also important components of educational outcomes, such as student behavior, classroom engagement, attitude and motivation, identity and self-esteem, mental health, and career

aspirations. Explorations of these aspects may enhance the effectiveness of educational technology to help develop full citizens.

Limitations

It is important to mention several limitations of this review. First, due to the scope of this review, only quantitative evaluations of student achievement were included. However, there is much to be learned from qualitative research that can add depth and insight to understanding the effects of educational technology on student achievement. It is becoming increasingly clear that it not only matters that students have access to technology, but it also matters how this technology is used for learning and instruction. Thus, studies that include the experiences and perspectives of educators who use technology effectively in their practice could provide further insight on the specific features, attributes, and optimal conditions of educational technology that promote various aspects of student learning and performance. In addition, the studies included in this review failed to identify the design features of educational technology that were utilized and how learning was promoted, therefore, future studies should explore how specific features of educational technology promote academic achievement with an experimental design. Third, more than half of the studies (67%) included in this review did not provide sufficient demographic characteristics of participants. This limitation may reduce generalizations of results to students of different ethnic backgrounds or socio-economic status. Fourth, the majority of the studies included in this review evaluated the impact of educational technology on student academic achievement in STEM subjects. Further exploration of the effectiveness of educational technology in social studies instruction and learning is needed to determine to what extent findings are dependent on the classification of courses. In other words, are there particular subjects (e.g., mathematics, science) that are more suitable for educational technology than

others? Finally, even though the types of educational technology applications reviewed in this study were adapted from previous literature, the researcher acknowledges that categories of educational technology are broad, comprised of both instructional technology applications and processes and technological tool to facilitate learning, and utilization can be instructionally useful or unproductive for given goals.

Conclusion

It is incumbent on school social workers to be knowledgeable of intervention strategies that promote and advance educational opportunities of ethnic minority and low-income students. Although findings of this literature review indicated mixed results, technology has become apparent in many K—12 classrooms and, undoubtedly, will continue to play an increasingly important role in the years to come. Despite such ambitious goals and the substantial optimism in educational technology, significant disparities in technology access and implementation between affluent and low-income schools have been identified. According to NASW (2012), school social workers work collaboratively with schools, families, and community professionals to increase accessibility and effectiveness of resources to meet student needs and promote optimal learning. Therefore, school social workers can support evidence-informed approaches to leverage technology as an instructional tool to reduce disparities found within the educational system by developing school-community partnerships to provide greater equitable opportunities and access to technology resources and supports that poor school districts are often unable to offer.

References:

Antonijevic, R. (2007, March 31—April 1). *Usage of computer and calculators and students'
achievement: Results from TIMSS 2003*. Paper presented at the Fourth International
Conference on Informatics, Educational Technology and New Media in Education,
Sombor, Serbia. Retrieved from https://files.eric.ed.gov/fulltext/ED497737.pdf

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

Carr, J. M. (2012). Does math achievement h'APP'en when iPads and game-based learning are
incorporated into fifth-grade mathematics instruction? *Journal of Information Technology
Education: Research, 11,* 269—286.

Cheung, A. C. K., & Slavin, R. E. (2012). How features of educational technology applications
affect student reading outcomes: A meta-analysis. *Educational Research Review, 7*(3),
198—215. doi:10.1016/j.edurev.2012.05.002

Cheung, A. C. K., & Slavin, R. E. (2013). The effectiveness of educational technology
applications for enhancing mathematics achievement in K—12 classrooms: A meta-
analysis. *Educational Research Review, 9*, 88—113. doi:10.1016/j.edurev.2013.01.001

Green, T. (2010). *The effects of the interactive student notebook on fifth grade math and science
achievement* (Doctoral Dissertation). Retrieved from ProQuest UMI Dissertations
Publishing. (ED522431)

Gulek, J. C., & Demirtas, H. (2005). Learning with technology: The impact of laptop use on
student achievement. *The Journal of Technology, Learning and Assessment, 3*(2), 1—38.

Harris, D. (2010). *The impact of electronic educational technology on ninth grade at-risk
reading students: A quantitative investigation of reading achievement* (Doctoral
Dissertation). Retrieved from ProQuest UMI Dissertations Publishing. (3418329)

Howard, T. C., & Navarro, O. (2016). Critical race theory 20 years later: Where do we go from

    here? *Urban Education, 51*(3), 253—273. doi:10.1177/0042085915622541

Kebritchi, M., Hirumi, A., & Bai, H. (2010). The effects of modern mathematics computer

    games on mathematics achievement and class motivation. *Computers and Education,*

    55(2), 427—443. doi:10.1016/j.compedu.2010.02.007

Kim, S., & Chang, M. (2010). Computer games for the math achievement of diverse students.

    Journal of Educational Technology & Society, *13*(3), 224—232.

Lei, J., & Zhao, Y. (2007). Technology uses and student achievement: A longitudinal study.

    *Computers and Education, 49(*2), 284—296. doi:10.1016/j.compedu.2005.06.013

Li, Q., & Ma, X. (2010). A meta-analysis of the effects of computer technology on school

    students' mathematics learning. *Educational Psychology Review, 22*(3), 215—243.

    doi:10.1007/s10648-010-9125-8

Middleton, B. M., & Murray, R. K. (1999). The impact of instructional technology on student

    academic achievement in reading and mathematics. *International Journal of Instructional*

    Media, 26(1), 109—116.

Moher, D., Liberati, A., Tetzlaff, J., Altman D. G., & The PRISMA Group. (2009). Preferred

    reporting items for systematic reviews and meta-analyses: The PRISMA statement. *PLOS*

    *Medicine, 6(*7). doi:10.1371/journal.pmed.1000097

National Association for Social Workers. (2012). *NASW standards for school social work*

    services. Washington, DC: National Association for Social Workers.

No Child Left Behind Act of 2001, Pub. L. No. 107—110 (2001).

Shoemaker, T. L. (2013). *Effects of computer-aided instruction on attitude and achievement of fifth grade math students* (Doctoral Dissertation). Retrieved from ProQuest Dissertations Publishing. (3595355)

Tawfik, A. A., Reeves, T. D., & Stich, A. (2016). Intended and unintended consequences of educational technology on social inequality. *Tech Trends, 60*(6), 598—605. doi:10.1007/s11528-016-0109-5

Teasley, M. L., McRoy, R G., Joyner, M., Armour, M., Gourdine, R. M., Crewe, S. E., . . . Fong, R. (2017). *Increasing success for African American children and youth* (Grand Challenges for Social Work initiative Working Paper No. 21). Cleveland, OH: American Academy of Social Work and Social Welfare.

Wang, Y., & O'Dwyer, L. (2011). Teacher-directed student use of technology and mathematics achievement: Examining trends in international patterns. *Journal of Computers in Mathematics and Science Teaching*, *30*(1), 79—135.

Zhao, Y. (2016). From deficiency to strength: Shifting the mindset about education inequality. *Journal of Social Issues, 72(4),* 720—739. doi:10.1111/josi.12191

Chapter 4: Article 2: A Qualitative Phenomenological Exploration of Teachers'

Perspectives of the Impact of Educational Technology on Teaching and Learning

Abstract

Preliminary findings indicated when carefully designed and thoughtfully applied, educational technology can result in enhanced learning and positive educational outcomes. However, teachers struggle to find meaningful and innovative ways to use technology in the classroom to support student achievement. The purpose of this study was to explore types of technology currently being used in primary school classrooms, for what purposes, the specific features of educational technology that promote academic achievement, and under what conditions. A qualitative research design with a phenomenological approach was used with primary school teachers in a public school district based in Coppell, TX who have experience using educational technology to support teaching and learning. Data were collected through semi-structured interviews. Concerning the impact of educational technology on student learning and achievement, results of the content analysis revealed four themes: individualized learning, increased participation and engagement, broader student exposure and collaborations, and problem-solving skills. Moreover, educators identified two specific patterns of educational technology use that enhance its impact on student learning and achievement: frequency of use and appropriate use. Facilitators and unique challenges that are present in a technology-rich learning environment were also discussed. In general, results indicated that to fully leverage the power and potential of technology integration in the K-12 classroom, technology integration must be a school-wide effort reflected in the perceptions and visions of administrators as well as school policies and practices. Finally, research priorities are suggested and implications for school social workers and administrators to support these capabilities are outlined.

A Qualitative Phenomenological Exploration of Teachers' Perspectives of the Impact of

Educational Technology on Teaching and Learning

Research suggests that educational technologies represent not only excellent instructional tools but also a revolutionary classroom approach that can help students achieve important gains in learning and academic achievement (Eteokleous, 2008). Traditional learning environments have failed to maintain student engagement toward school learning. Engagement occurs when students take responsibility for their learning, feel invested in learning tasks, and see the value of school learning in the real world (Varier et al., 2017). Additionally, Varier et al. (2017) reported traditional learning environments have also failed to prepare students for the 21st-century workplace. Twenty-first-century learning is focused on the development of complex, higher-order competencies including critical thinking, problem-solving, effective communication and collaboration, creativity, and digital literacy. The development of 21st-century skills and technological proficiency is consistent with the goals of national educational policies such as Race to the Top and science, technology, engineering, and mathematics (STEM) initiatives. Meeting these learning goals requires a technology-rich learning environment that places students at the center of learning and instruction (Varier et al., 2017).

Consequently, over the last two decades, there has been a call for technology integration in public schools that focuses on teacher and student use of technology to support the learning of core subject-area content. In 2009, a U.S. national survey found that 97% of teachers had at least one computer in their classrooms, and 54% were able to bring additional computers into their classrooms for technology-focused lessons. Despite this sharp increase in the number and variety of technological tools available to students in schools, only 40% of teachers reported that their students often used technology during instructional time (Jones, 2017). Therefore, it not only

matters that students have access to technology, but it also matters how this technology is used for learning and instruction (Jones, 2017; McCulloch, Hollebrands, Lee, Harrison, & Mutlu, 2018; Zimlich, 2015).

Many teachers primarily use technology to support lesson planning and administrative purposes or for the display of course materials, methods that are unlikely to develop student understanding, stimulate their interest, or increase their proficiency (McCulloch et al., 2018). Eteokleous (2008) described two approaches to the application of computer technology in the classroom: traditional and transformational. The traditional practices of technology integration are characterized as "learning from computers" (Eteokleous, 2008, p. 673). Learning from computers refers to computer-assisted learning and drill and practice programs designed to help students acquire basic skills. Transformational practices of technology integration are a shift to "learning with computers" (Eteokleous, 2008, p. 673). In this approach, technology functions as intellectual partners with the instructor and student to engage and facilitate higher-order thinking, problem-solving, and collaborative learning. Students use technology to create new meaning and content, articulate their understanding of a topic, and present it to others.

A growing body of research sheds light on various implementations of educational technology to support students actively using technology to complete learning tasks rather than passively watching teachers use technology. Examples of technology implementations include using technology that supports the delivery of content such as student-driven research and presentations, interactive games, and differentiated content. Educators often use technology-based programs for drill and practice as well as an intervention to support students at academic risk by providing additional study materials, organizational tools, or individual support and timely and constructive feedback (Peck, Kappler Hewitt, Mullen, Lashley, Eldridge, & Douglas,

2015; Zimlich, 2015), as research suggests that students who struggle with basic skills benefited the most when high-quality technology applications were used together with traditional instruction (Denham, 2019). A variety of technology has been adapted for use in educational settings. Although some technologies may not have originally been developed with classrooms in mind, teachers have found ways to use them effectively in the classroom. Therefore, in this paper, the terms technology and educational technology will be considered synonymous.

Factors Influencing Technology Integration

It is becoming increasingly clear that merely introducing technology in schools is not enough to ensure technology integration since technology alone does not enhance teaching and learning. Rather, it is how teachers use technology that has the potential to transform their teaching and create new opportunities for learning (Angeli & Valanides, 2009; Koehler & Mishra, 2005). Technology integration as defined by the National Educational Technology Standards (NETS), includes alignment with curriculum and instruction, active interaction with technology tools, and the use of technology to promote a range of important cognitive skills (International Society for Technology in Education, 2008). Further, Koehler and Mishra (2005) developed the concept of technological pedagogical content knowledge (TPCK) to emphasize the importance of teachers having an integrated understanding of how technology, content, and pedagogical methods work together to increase learning within their particular content discipline. According to the TPCK theory, the use of technology influences the teaching of content. Interaction between the characteristics of technology and the structure of the content directs the methods and strategies used in teaching content. Also, a teacher's knowledge of the content area directs the technological tools selected and the pedagogical methods used. Finally, since the teacher's understanding of technology, content, and pedagogy interact, the teacher's expertise

with pedagogy also will dictate the use of technology and the content being taught (Koehler & Mishra, 2005). Thus, the TPCK framework posits that it is in the overlap between knowing the content, appropriate pedagogy, and ways that technology can be used that enables educators to teach with technology successfully (Angeli & Valanides, 2009; Koehler & Mishra, 2005).

Teachers' teaching philosophies, as well as their attitudes and beliefs about technology as an instructional tool, greatly influenced the ways they used technology in the classroom (Eteokleous, 2008; Jones, 2017). One factor that can influence a teacher's belief regarding the use of technology is the perceived value for the instructional use of that technology and whether or not technology integration would positively impact the teacher's instructional goals. As the perceived usefulness of educational technology increases, so does the likelihood that the technology will be utilized (Shifflet & Weilbacher, 2015). Furthermore, teachers' perceptions of the usefulness of educational technologies are linked to the conditions and attitudes at the schools in which they teach. Schools and school districts can either encourage or discourage the use of technology through their policies and practices, the support services they provide for technology implementation, the presence or lack of an organized and comprehensive plan to integrate technology, and the general attitude toward technology and its use (Zimlich, 2015). According to Ritzhaupt, Dawson, and Cavanaugh (2012), factors such as the number of years of teaching, level of education of the teacher, and classroom factors also influence whether teachers use educational technology. Teachers' use of technology decreases in correlation with the number of years spent teaching in a classroom but increases with the level of professional education, either college courses or professional development.

Benefits of Technology Integration

Integrating educational technologies into classroom instruction has many benefits. The use of educational technology in primary education makes it possible for a teacher not only to expand the range of ways of presenting lessons but also to change the educational process itself by making it more interesting for students. Putting technology in the hands of students supports their ability to communicate, create, and collaborate with technology, develop higher-order thinking skills, and engage with course content. Educational technology can result in increased student achievements in many content areas, including mathematics, social studies, English, writing, and science (Ritzhaupt et al., 2012), as well as on standardized tests, improved school attendance, fewer behavior problems, growth in cumulative GPA, and increased motivation to keep learning (Ojose, 2009).

Additionally, teachers who have successfully incorporated technology into their traditional classroom instruction indicated that educational technology applications created student-centered classroom environments that fostered teacher-facilitated learning as well as opportunities for increased student engagement and attention, which resulted in improved academic performance (Bukofser, 2013; Jones, 2017; Ojose, 2009). Teachers also reported educational technology helps teachers to differentiate instruction based on the individual needs and learning styles of the students (Jones, 2017; Keppler, Weiler, & Maas, 2014). Furthermore, educational technology allows students to become less dependent on the teacher and more self-directed in their learning (Blachowicz et al., 2009; Bukofser, 2013; Keppler et al., 2014; Ojose, 2009; Zimlich, 2015).

Theoretical Framework

The conceptual basis for this research uses the innovation diffusion theory (IDT) to enhance our understanding of the diffusion and utilization of technology to support the academic success of children and youth. IDT focuses on understanding how, why, and at what rate innovative ideas and technologies spread in a social system (Rogers, 1962). In his book "Diffusion of Innovations," Rogers (1983) defined innovation as an idea, practice, or object that is perceived as new by an individual or another unit of adoption. It matters little whether or not the idea or object is objectively new, as measured by the lapse of time since its first use or discovery; however, if an individual perceives the idea or object to have an unexampled use, it is an innovation. Diffusion is the process by which an innovation is communicated through certain channels over time within a particular social system (Rogers, 2003). Thus, the diffusion of innovation only takes place when a social system accepts it as an innovation and then shares information about it within the system and with other systems.

In IDT, Rogers (2003) proposed the social process to be particularly influential in innovation adoption. An individual's decision to adopt an innovation is influenced by their perception of the (a) relative advantage of innovation over previous ideas and experiences, (b) compatibility with the needs of potential adopters, (c) complexity of use of the innovation, (d) trialability, or how the innovation may be examined or tested, and (e) observability of the results. Additionally, Rogers (2003) established five specific categories for users who are readily willing to adopt new ideas and products compared to those who are skeptical about innovations, differentiated based on a time dimension. The adopter categories include innovators, early adopters, early majority, late majority, and laggards. According to IDT, innovators and early adopters of an innovation are keys to that innovation's diffusion throughout a system.

An individual's decision about adopting innovation is not spontaneous, but rather a process developed over time involving a sequence of various actions. Rogers proposed a model for studying the stages through which an innovation passes before an individual takes it into use called the Innovation-Decision Process Model. The innovation-decision process is essentially an information-seeking and information-processing activity in which the individual is motivated to reduce uncertainty about the advantages and disadvantages of the innovation (Rogers, 1983). The first step of the innovation-decision process begins with the knowledge stage, in which the individual is exposed to an innovation's existence and gains an understanding of how it functions. The next stage is the persuasion stage, occurring when the person forms a favorable or unfavorable attitude about the innovation. The third step is the decision stage, occurring when the individual chooses to adopt or reject the innovation. The implementation occurs after the decision stage and takes place when the new idea is put into practice. The final step is the confirmation stage, which transpires when the individual seeks supportive messages that confirm their decision. Rogers (2003) argues that even after the decision of adoption is made, it can be reversed if the individual is exposed to conflicting messages about the innovation.

Despite documentation of the increasing willingness of educators to adopt computer-based technology to enhance teaching and learning, studies have found that technology is underutilized in practice applications (Caso-Morris, 2007). This may be due to a knowledge-attitude-practice (KAP) gap, where potential adopters have both the knowledge about and favorable attitude towards innovation but fail to adopt (Rogers, 2003). Diffusion of computer technology in schools has likely been impeded by a complex array of challenges, concerns, and limitations, as many educators recognize the benefits of student technology use but have insufficient knowledge of methods for integrating technology into the curriculum (Eteokleous,

2008; Shifflet & Weilbacher, 2015). Thus, an important factor that encourages technology integration is an understanding of how technology interacts with the content. Training should not only include improving basic technology skills but also provide an opportunity to establish pedagogical connections between the affordances of technology and the teaching of a particular content domain (Angeli & Valanides, 2009). Other factors have been found to interfere with teachers' belief in the relevance and benefit of technology for teaching and learning and its implementation include the lack of access to appropriate educational technology, issues with Wi-Fi connectivity, inadequate technical and pedagogical support, and insufficient time for the teachers to familiarize themselves with the technology to implement it in classroom instruction. (Eteokleous, 2008; Jones, 2017; Shifflet & Weilbacher, 2015; Zimlich, 2015).

Current Study

Preliminary findings indicated when carefully designed and thoughtfully applied, educational technology can result in enhanced learning and positive educational outcomes. However, teachers struggle to find meaningful and innovative ways to use technology in the classroom to support student achievement. Due to sparse research on the specific features, attributes, and optimal conditions of educational technology that promote various aspects of student learning and performance, this study aimed to assess the ability of educational technology to improve equitable educational opportunities and outcomes based on the experiences and perspectives of primary school teachers. To further explore the effect of educational technology applications on student learning, this research explored types of technology currently being used in primary school classrooms, for what purposes, the specific features of educational technology that promote academic achievement, and under what conditions. The specific research questions were:

RQ3: How do primary school educators describe the current use of educational

technology in the classroom?

RQ4: How do educators describe the impact of their school's culture and climate on

the use of technology in the classroom?

RQ5: What are primary school teachers' perspectives on the impact of educational

technology on student academic achievement?

RQ6: Based on educators' experiences, what role do patterns of educational

technology use in primary school classrooms play in enhancing student learning and

achievement?

RQ7: How do educators describe facilitators and barriers to integrating educational

technology into traditional classroom instruction?

Method

To examine the perceptions of primary school teachers concerning the impact of

educational technology on student learning, this study used a qualitative research design with a

phenomenological. The goal of this study is to describe the meaning of this experience in terms

of what was experienced and how it was experienced, as well as a commonality of the

experiences with the participants (Creswell, 2007; Moustakas, 1994). Specifically, this study

took the transcendental phenomenology approach – where the description of the lived

experiences was considered the phenomenon and how the recording of the lived experiences are

transcribed to life (Creswell, 2013). The current study is the qualitative phase of an exploratory

sequential mixed-methodological design to inform scale development.

Recruitment and Participants

Purposive samples of primary school teachers in Coppell Independent School District (CISD) who have experience using educational technology to support teaching and learning were selected based on the objective and characteristics of the study. Primary school teachers were selected to help maintain the homogeneity of the sample and focus the experience within the boundaries of primary school students, as research suggests that educational technology has a greater impact on primary school students than secondary school students. CISD is a public school system in Texas, with a statewide reputation for educational excellence, that consists of 11 elementary schools, three middle schools, one ninth-grade campus, two high schools, and one alternative campus. CISD has a staff of approximately 1,319, with nearly 13,207 students enrolled in August 2020 (Coppell Independent School District, 2020). Student demographics within CISD include 51.6% Asian, 27.6% white, 13.2% Hispanic/Latino, 4.2% African American, 3.1% two or more races, and 0.3% other. According to The Texas Tribune (2019), 24.4% of the students in CISD are at risk of dropping out of school-based on state-defined criteria, while 8.9% are economically disadvantaged and 14.1% are English language learners (Coppell Independent School District, 2020). All primary school teachers in CISD were eligible to participate in the study if they were English-speaking, able to provide voluntary informed consent, and experienced in using any type of educational technology in the classroom setting, including computers, multimedia, interactive whiteboards, and other technology applications used to enhance teaching and learning. The study was carried out with the support of the school district and was approved by the University of Texas at Arlington Institutional Review Board (IRB).

An invitation to participate in the study was emailed to primary school teachers in CISD. Teachers who were willing to participate scheduled a telephone interview with the researcher via Microsoft Bookings. Participants were informed about the study objectives and procedures and provided verbal consent before beginning the interview (Appendix B). The total number of teachers who completed all components of the study was seven. Additionally, the experiences and perceptions of one (1) teacher in Plano Independent School District were analyzed comparatively with the experiences of teachers in CISD. Plano is an adjacent community with similar demographic characteristics and findings consistent with CISD.

Findings

The results of the analysis show the interview data provide a rich description of teachers' reflections about the impact of educational technology on student academic achievement. Teachers described various interactions and dynamics of technological interaction in the classroom, specifically, the added value to teaching and learning that the 1:1 student-to-device ratio provides. The results are separated into five parts: (1) themes that captured the current use of educational technology in the classroom; (2) themes that revealed school culture and climate concerning technology integration; (3) themes that revealed the impact of educational technology on student learning; (4) themes that captured patterns of use that enhance its impact on student learning; and (5) themes that revealed challenges present in a 1:1 student-to-device learning environment (see Table 1).

All students have access to the same technology

Both Coppell ISD and Plano ISD use various forms of digital learning to enhance or extend classroom instruction. All of the educators interviewed for this study report having a "1:1 student to device ratio," with "preschool up to seniors" having access to either a Chromebook

(Plano), iPads (Coppell), or laptop. According to the participants, the 1:1 student-to-device ratio provides added value to teaching and learning, as one teacher stated, "I can do more things

Table 1. *Frequency of themes for research sub-questions*

	Codes/Categories	n
RQ1	All students have access to the same technology (Theme 1)	8
	Typical Use (Theme 2)	8
RQ2	High technology use (Theme 1)	8
	Teacher observation and evaluation (Theme 2)	8
	Support services for implementation (Theme 3)	8
	Professional development (subtheme 1)	7
	Technical support (subtheme 2)	3
RQ3	Individualized learning (Theme 1)	8
	Meets individual learners' needs (subtheme 1)	8
	Different ways to deliver instruction (subtheme 2)	4
	Applications that facilitate differentiation (subtheme 3)	8
	Help for struggling readers (subtheme 4)	5
	Opportunities for practice (subtheme 5)	4
	Increased participation and engagement (Theme 2)	8
	Broader student exposure and collaborations (Theme 3)	6
	Problem-solving skills (Theme 4)	5
RQ4	Frequency of use (Theme 1)	8
	Appropriate use (Theme 2)	5
RQ5	Technology doesn't always work (Theme 1)	8
	Concerns of negative effects on learning (Theme 2)	8
	Not all students have technology and internet at home (Theme 3)	4
	Overwhelming (Theme 4)	4

because all of the kids have access to the same technology, and they all are going to be able to follow along." Teachers across sites describe their classrooms as technology-rich, "so, even if someone comes in and they don't have an iPad, or if a student's iPad is dead, or they didn't bring their iPad, or their iPads glitching or whatever, I have an extra MacBook that I can just give them to work with, "as one teacher in Coppell ISD explained. However, it is important to acknowledge that the mere presence of a technology-rich environment is not sufficient for enhanced teaching and learning. In fact, the 1:1 student-to-device classroom frequently presents unique challenges and barriers to successful instruction, which will also be discussed.

Typical Use

The most frequent type of educational technology used by teachers in the classroom in Coppell ISD was "Vivitek boards." Educators described these interactive projectors as "pretty similar to the smartboard," and discussed using them primarily to teach lessons and present materials using its touchscreen capabilities and markup pen and project 3D images, especially in science. Educators in Coppell also report using Schoology as an online learning platform to provide students and parents with information, tools, and resources. For example, one educator described using this learning management system to "post videos or assignments on discussion boards where the kids can kind of chat back and forth." Both school districts reported using DreamBox, which is a K-8 digital math program.

Across sites, teachers reported that students frequently use their Chromebook, iPad, or laptop for online research and internet-based information accessing as well as typing and editing papers. Students in both school districts have their own Google accounts and access to the primary G suite tools. Kindergarten teachers in each of the two school districts report that students use their devices to do some coding, play a math game, or listen to stories. One teacher explained, "Some of the text is written above grade level. So, it will read it to them." In Plano, some of the students' textbooks are digital, including science, reading, and social studies.

While many teachers reported using many different applications of educational technology, one specific application described was the Seesaw digital portfolio. One educator explained students use the application to document what they are learning and see other kids' work in the classroom. Students can "show what they know" using photos, videos, drawings, text, PDFs, and links. For instance, "if they are doing a writing page in the journal, they can snap a picture and then use the record button and tell me what they wrote or count to 100 or this

number is greater than this number." This allows teachers to quickly assess whether the student acquired the intended knowledge and skills. Educators described other programs and applications that facilitate differentiation, which is included in the discussion regarding the impact of educational technology on student academic achievement.

Schools in Coppell and Plano ISD encourage the use of technology through their policies and practices, the support services they provide for technology implementation, the presence of an organized and comprehensive plan to integrate technology, and the general attitude toward technology and its use. Educators across sites acknowledge that school culture and climate are critical factors in the progression and effectiveness of technology integration in classrooms. Findings from the content analysis identified three themes that capture the impact of the school's culture and climate on educators' use of technology in their classroom: high technology use, teacher observation and evaluation, and support services for implementation.

High technology use

Teachers expressed their school district encourages teachers and students to leverage technology positively and has also developed a positive culture around technology integration, as one teacher described technology integration as being "a primary focus in Coppell right now." Across sites, teachers indicated technology is frequently used and "has become part of the everyday classroom." Several respondents reported students are not only using their devices daily but have access to a variety of tools that provide opportunities to extend learning. Although it appears technology tools have become a seamless part of the learning process in Coppell ISD and Plano ISD, one educator acknowledged that technology integration is an ongoing and "evolving" process, as there is "something new each year."

Teacher observation and evaluation

Without exception, teachers indicated having expectations to meet certain levels of technology proficiency. Teachers are also required to demonstrate effective use of technology to support learning in one of the annual lessons their school administrator observes. One teacher explained, "That is a domain of our appraisal system. It's through observation. You get four walkthroughs a year and one formal observation. Another educator added that these observations aim to identify student perceptions of the impact of technology on the quality of teaching and learning as well. She further detailed that administrators assess how students interact with the technology, as well as how the use of technology benefits student learning. Also, educators are required to implement technology in a variety of ways. For example, one teacher in Coppell mentioned, "We have specific requirements, which differs by grade levels. You have to be on Istation 30 minutes a week, you have to be on DreamBox... Whatever the minutes are for each program." Other teachers indicated they are given flexibility in how they use technology to support learning, as another teacher shared, "One of my action steps this year is I will use Words Their Way to try to improve students' spelling ability. So, I know my principal will be evaluating whether that was effective."

Support services for implementation

All eight teachers spoke of having the training and support they need for effective technology integration to support student learning. Both districts appear to offer a variety of training around the different programs, tools, and platforms that the districts use, along with opportunities that help with aligning the technology to the needs of the curriculum. According to teachers in Coppell ISD, training is not only are offered at a staff meeting, after school, or in the

summer, the district has a digital library of virtual training and webinars, "that you can say, 'Oh, I want to learn about this,' and you can find a course on it."

In addition to educators being provided opportunities to gain experience and confidence in using educational technology applications, educators across sites discussed multiple types of support that facilitate integrating educational technology into traditional classroom instruction. For example, one educator described having digital learning coaches (DLC) assigned to every campus. She explained, "When I'm having technical issues or even if I am like, 'Hey, I have this great idea for a lesson or an activity, but I'm not sure what the best way to do it is or what's the best app to use,' I know what DLC I can contact. They will meet with me and help me." Other teachers detailed, "We have a help desk team. Parents, teachers, or kids can fill out a help desk ticket to say like, 'This is what's going on. This is what technology it is. This is what the problem is.' And they'll communicate with you through email first, if they can, to solve the problem, if not, they'll come out to your campus to help you troubleshoot." Overall, these responses indicate that teacher training and technical support play important role in technology integration and utilization in the classroom.

Teachers across sites have positive attitudes towards technology integration and feel that it facilitates academic success. Concerning the impact of educational technology on student learning and achievement, results of the content analysis revealed four themes: individualized learning, increased participation and engagement, broader student exposure and collaborations, and problem-solving skills.

Individualized learning

The greatest impact of educational technology on student academic achievement discussed among teachers was the benefit of individualized learning. Five subthemes were

encompassed by this main theme: meets individual learners' needs, different ways to deliver instruction, applications that facilitate differentiation, help for struggling readers, and practice opportunities. Each participant agreed that educational technology can help create a personalized learning experience, ensuring that "students with learning differences get their needs met." Teachers across the two sites use technology to "individualize their instruction, keep track of what students are learning, and keep records of it." This supports existing research which suggests that the use of technology is beneficial in addressing individualized educational needs. For instance, one teacher explained, "There was a kid last year who had severe dysgraphia. So, he had speech-to-text where he could speak right to the iPad, and it would type it for him." Another teacher with similar experiences shared, "I have kids that are dyslexic and for them, reading any material is hard. Give them an iPad, they can listen to the book being read. Technology just allows you to give each kid what they need, whatever their mode of learning is." In addition to accommodating various learning styles, technology can be used to support English language learners, as one teacher mentioned, "the ability for technology to translate into students' native language is huge if they're not understanding something."

In conjunction with the benefit of individualized learning, half of the teachers interviewed for this study described educational technology as being able to help deliver instruction and teach topics instruction in different ways. Several teachers acknowledged, "When you have more interactive ways to teach kids and you have different modes of teaching, you can appeal to different types of learners. Therefore, they're going to learn more and that's going to impact their education." On several occasions, teachers used different websites and apps that are available on the internet. "We have lots of different subscriptions to different things like BrainPOP and Flocabulary, that have great video resources for kids and can give them a lot more

information than maybe I can give them. We can dive deeper or answer questions that maybe I didn't have an answer to." Another teacher detailed, "There are websites that have base ten blocks where they can create the numbers and drag and drop the actual blocks to see what it creates, and place value. Same thing with reading and sentences. They can manipulate and drag and drop words to see and create a sentence. All different things."

Educators across sites described several programs and applications that facilitate differentiation and individually targeted lessons. For example, with Words Their Way, which is a K – 5 supplemental literacy program that teaches phonics, spelling, and vocabulary, teachers administer spelling inventories and choose lessons based on students' achievement levels. One teacher explained, "I can look at, 'Are they having trouble with long vowels, short vowels? Are they advanced enough that they need work on Greek and Latin roots?' Then I can assign them like that." The second example of an application used to facilitate differentiation was Draw and Tell, which is a drawing app that encourages visual and verbal storytelling. Speaking on the benefits of this program, an educator expressed, "One child is still working on their letters and sounds, but they can draw a great picture, whereas someone more advanced will be typing a story." The third application described was Istation, which provides computer-adaptive instruction and educational resources tiered by readiness level. Once students take the Istation test, it gives them lessons to practice the skills of focus. For instance, "If it's phonemic awareness, it'll give them a couple of variations of games working on letters and sounds or if they're working on rhyming, more of the lessons and games will be on rhyming. Then we can check their work with their scores and see what we need to continue to work on." The fourth technology application used to facilitate individualized learning was Epic, which is a digital library for kids that allows teachers to target content that fits students' reading levels. Similar to

Epic, teachers also described Raz-Kids, a digital source that "will read to students who are struggling or read nursery rhymes that they were familiar with, like Twinkle, Twinkle Little Star, but they could just practice and practice. Easy pattern books, like the ball is red, the apple is red, where they can read with the book." The final application described to facilitate differentiation was Schoology, which allows teachers to group students with similar academic achievement for differentiated instruction and assignments. Furthermore, over half of the teachers included in this study described the added value of the 1:1 student-to-device ratio in addressing the individual needs of struggling readers. For example, one teacher advised, "If it's reading time, I can push out emergent readers to my kids who need strong picture support, who need two words on a page, and I can push out graphic novels to kids who need more. Nobody knows that your reading assignment looks different because everybody's on an iPad, but the kid who needs See Spot Run is reading that and the kid who's reading Magic Treehouse chapter book is reading that."

A final instructional accommodation for diverse learners through the use of technology in the classroom described by primary school teachers was opportunities for practice for the students. Several teachers claimed to use educational technology to support students' needs through remedial instruction, reinforcement, and repetitive practice. One teacher shared how students' word recognition increased through increased technology use and repeated practice. She explained, "I can see a difference in the phonics because that's something that you learn with repetition, and this year, where we've been on technology more than in the past, some of what they're able to do now is surpassing what they were able to do last year. I noticed just today, I had my eyes open going, 'Oh my gosh, you knew three sight words at the beginning in August and today [December] you knew sixty.' And that wasn't just one kid. That was eight kids." Overall, based on the experiences of teachers interviewed, integrating educational technology

into classroom instruction offers diverse learners focused repetition and deliberate practice for skill acquisition and achievement.

Increased participation and engagement

Without exception, educators spoke of heavy engagement and varied opportunities for participation and discussion as a result of integrating educational technology into classroom instruction. For example, one teacher spoke of a time when her students were unable to attend class due to an illness, "We Skyped with them, so, they were able to participate in the lesson." Other teachers commented that integrating technology into classroom instruction has students " Further, educators across sites also shared two (2) attributes of educational technology that influenced student participation and engagement: animated and interactive content and game-like features. Several teachers agreed, "The graphics and interactions make all the difference in the world. If it's interactive, with videos and animation, things they can move around and touch and hear, it appeals to all different kinds of learners." Other teachers also mentioned students are "more engaged in programs if they feel like it's a game." For instance, teachers shared their experiences with Dreambox, a digital math program used across sites, as one teacher expressed, "It's so engaging because they can do something with their avatars and they earn little prizes, they earn different levels. They're competing with each other, so they want to feel like they're winning."

Broader student exposure and collaborations

Over half of the participants (n=6) in this study discussed broader student exposure and collaborations as a result of integrating educational technology into classroom instruction. Several teachers shared their experiences using educational technology for global learning, where teachers can teach their students about world geography and cultures and connect their

classroom with students in different countries. One teacher connected her students with a class in Africa and described how her students enjoyed seeing students all across the world do the same things as they did in the classroom. She detailed, "We were comparing writing and they're like, 'They write just like us. They do calendar? Reader's workshop? We do that!' Just making those connections and then hearing them in a different language. It was a fun six weeks for us." Other teachers also acknowledged that integrating technology into classroom instruction can expose students to ideas, experiences, and answers to questions that otherwise would be inaccessible. For instance, a social studies teacher shared her experiences teaching about cultures and communities, as she described, "This student comes up to me, and he has his iPad, and he said, 'Look, here's how you write your name in 238 languages.' I don't know how he did that. Technology exposes students to things that I think, most teachers can't even think about." In general, teachers indicated that rich technology infusion into the everyday classroom offered an opportunity to expose students to varying perspectives and strategies that increase the depth of students' knowledge.

Problem-solving skills

The fourth most common theme identified that captures the impact of educational technology on student learning and achievement was problem-solving and visual thinking, as one teacher further explained that educational technology enables students to identify problems quicker and easier and also helps them analyze a complex problem. Another teacher discussed how technology fosters students' ability to locate and evaluate information quickly as well as communicate online and generate solutions. A third teacher noticed that game-like applications encourage students to try more difficult levels. Other teachers ($n=2$) described technologies as a

product of problem-solving and advised that students are also learning how to troubleshoot common technology issues.

Across sites, educators identified two (2) specific patterns of educational technology use that enhance its impact on student learning and achievement: frequency of use and appropriate use. All of the participants included in this study reported that while students use their devices every day, students' average screen time was "maybe an hour and a half a day," peppered throughout the day, and "it's in conjunction with other things." Also, teachers in Coppell reported students used their devices in all classes, including specials classes, as one teacher advised, "We get emails, have your kids bring their iPad to music or art."

Participants (*n*=5) in both school districts also discussed the importance of teaching students how to use technology in creative, productive ways that transform their learning. As teachers agreed, "You won't find kids just on an app to play on an app," and discussed the importance of making sure that children understand the goals and guidelines for using technology tools in the classroom. Moreover, teachers across sites described programs and applications that provide the ability to access their students' screens and "see what they're doing to keep them on track and measure their progress." One teacher in Coppell ISD mentioned using Google Classroom to monitor her students' devices, while one teacher in Plano ISD discussed using Go Guardian.

Without exception, teachers revealed that barriers to integrating educational technology into traditional classroom instruction were present and influenced their pedagogical decisions to incorporate technology. Four themes that capture these barriers were described: technology doesn't always work, concerns of negative effects on learning, not all students have technology and internet at home, and overwhelming.

Technology doesn't always work

The most frequent barrier to integrating technology into classroom instruction based on responses from teachers across sites is technology reliability, as all teachers shared experiences of days when technology did not work. One teacher stated, "Usually, it was a matter of the hardware and the software working," while other teachers complained of network and connectivity issues. Additionally, there was great dissatisfaction among teachers regarding the delayed response from tech support, as a teacher commented, "When you put in a support ticket, we're somewhere between three and five days for that to get resolved." Another teacher expressed discontent with the current approval process for student access to technology tools and apps and reports experiencing serious delays in getting apps approved.

Concerns of negative effects on learning

The second most frequent barrier to integrating technology into classroom instruction identified was teachers' concerns of negative effects on learning, as teachers expressed apprehension about excessive and over-reliance on technology. Several teachers (n=5) spoke of excessive technology hindering sensory processing and socialization, as a kindergarten teacher who shared her opinion regarding the importance of sensory and social activities explained, "They have to be able to pick up those cubes and count, one, two, three, four, right? It is so important, that you're touching everything in kindergarten." Moreover, teachers report while most students are comfortable using their devices and navigating the technology tools and applications utilized in the classroom, many children are becoming less proficient in essential life skills. For instance, one teacher mentioned, "Whenever they know how to maneuver their iPad and how to do everything, guess what we are teaching them? How to put their coat on, because they don't know how to do that by themselves. They don't know how to open their Capri Sun."

Other teachers (*n*=3) discussed the negative effects of technological tools on students' writing skills, as students have become so accustomed to taking shortcuts. One teacher mentioned, "I need to know if they know that a sentence starts with an uppercase letter because when they're doing that using their digital tools, they will simply autocorrect." Another example comes from a teacher who asked her students to pull up the *Compass* app to learn direction. One student asked about the spelling of compass, not knowing if it started with a *C* or *K*. After telling her students to try and figure it out, she advised, "They used that audio tool, instead of spelling, and honestly, that does concern me."

Not all students have technology and internet at home

Although devices are distributed evenly among all students in the classroom in both districts, many students lack access to digital devices or the internet at home. One teacher explained students in low-income households without home internet access are often dependent on a smartphone data plan. While schools and school districts are increasingly promoting the use of technology tools to complete homework, assessments, and other assignments, it appears that many educators are well aware of the digital divide and its impacts on the achievement gap. Regarding students with only smartphone access or no device at home, one educator advised, "What we would do for those kids is they can stay after school to work on assignments."

Overwhelming

Participants (*n*=4) shared that they sometimes feel overwhelmed by all the technological tools and applications that are introduced, as one participant indicated that her school has more programs and applications "than we could become efficient at using." Another teacher shared, "With all the different things that are pushed out, try this, try this, do this, it's difficult sometimes." Also, while some teachers enjoy having flexibility in how technology can be

implemented in the classroom, half of the participants report they feel overwhelmed with the lack of consistency because "not everybody knows how to use the same applications and programs" within schools.

Discussion

Findings from this study indicate that both Coppell ISD and Plano ISD are using a 1:1 student-to-device model, and teachers across sites have had similar experiences integrating technology into the classroom. According to the respondents, the 1:1 student-to-device learning environment empowered teachers to support students who learn in different ways by allowing them to present information in a variety of presentation styles and overall contributing to their increased instructional flexibility. Teachers indicate the 1:1 student-to-device ratio added value to the teaching and learning process by providing increased opportunities for individualized learning, student engagement, collaborations, and problem-solving, which are all critical qualities for a student-centered learning environment. Additionally, in order to create effective learning environments, teachers need opportunities to learn what classroom management skills work best in a 1:1 student-to-device classroom setting, as devices can simultaneously serve as a competitive or disruptive distraction.

Findings from this study also suggest that school culture and climate play an important role in teachers' use of educational technology in their classrooms. Teachers described their school's culture and climate around technology as both progressive and supportive, as both districts foster technology-rich learning environments by providing all students daily access to digital devices and computer-based learning programs and have implemented effective professional development and technical support. Further, teachers across sites are expected to

meet educational technology standards and performance indicators and are often evaluated through classroom observations.

Lastly, findings reveal the challenges of teaching in a 1:1 environment can be substantial. While technology quickens and simplifies research tasks for students, teachers mentioned several harmful effects that negatively influenced students' writing skills, social skills, and essential life skills. On the other hand, teachers report disparities in home access to technology, based largely on economic status, further limits the opportunities of low-income and minority students to practice essential learning skills and experience academic success. One of the barriers that most frustrated teachers, however, was technical problems and connectivity issues. Moreover, several teachers reported they often struggle with finding appropriate technological tools that add value to teaching and learning due to the many options available.

While the 1:1 student-to-device ratio contributes significantly to the teaching and learning process per the design criteria of being more learner-centered, a ubiquitous level of computers in classrooms does not automatically produce desirable student academic outcomes. Meaningful and effective use of educational technology for teaching and learning depends upon clear objectives and well-designed tasks that come from a thorough understanding of the effects of technology on student academic achievement. Thus, the experiences and perceptions of primary school teachers included within this study support the assertion that teachers would benefit from a framework for locating and acquiring potential curricular resources and software applications and aligning them to key student learning outcomes.

Although the results of this study support existing evidence of a rise in the use of educational technology in early education, this rise parallels a rise in the digital divide. Therefore, further research is needed to explore the intersection of educational technology and

equity and the role of educational technology in mitigating this early learning gap. And while the

discourse on the benefits of technology indicates promise in using educational technologies to

address educational equity issues, further attention is needed to better understand varying

degrees of impact to different demographics effects in technology-rich learning environments as

well as the consequences of educational technology on equity among low-income and minority

students. Finally, further research is needed to explore the perceptions of the students'

technology integration experiences in the classroom to fully leverage the power and potential of

technology integration in the K-12 classroom.

Conclusion

Researchers have made a great deal of effort for many years to identify factors that

facilitate integrating educational technology into traditional classroom instruction. Based on the

experiences and perspectives of primary school teachers within this study, school culture and

climate are integral to effective and sustainable technology integration in classrooms. Therefore,

technology integration must be a school-wide effort reflected in the perceptions and visions of

administrators as well as school policies and practices.

School social workers represent an integral part of the school system and are instrumental

in furthering the school's mission of educating children by providing academic support and

addressing barriers to student learning. School social workers assist in the design and

implementation of school-based initiatives to advance academic success and ensure a school

culture and climate conducive to student learning. Results of this study provide detailed

descriptions of the capabilities provided by the 1:1 student-to-device ratio that otherwise would

not be possible. Therefore, school social workers should become more knowledgeable of

evidence-informed approaches to fully leverage the power and potential of the 1:1 student-to-device ratio in the K-12 classroom to move towards a more equitable model of education.

References

Angeli, C., & Valanides, N. (2009). Epistemological and methodological issues for the conceptualization, development, and assessment of ICT–TPCK: Advances in technological pedagogical content knowledge (TPCK). *Computers & Education, 52*(1), 154-168. doi:10.1016/j.compedu.2008.07.006

Arlington Independent School District. (2019). About the Arlington ISD. Retrieved from https://www.aisd.net/district/about/

Blachowicz, C. L. Z., Bates, A., Berne, J., Bridgman, T., Chaney, J., & Perney, J. (2009). Technology and at-risk young readers and their classrooms. *Reading Psychology*, *30*(5), 387–411. doi:10.1080/02702710902733576

Bukofser, J. H. (2013). *The impact of the use of one-to-one netbooks on student achievement, teacher practice, and perceptions of technology in fourth-grade bilingual class* (Doctoral Dissertation). Retrieved from ProQuest UMI Dissertations Publishing. (3575554)

Caso-Morris, D. (2007). *School social workers' use of computer technology to expand school-based mental health services: An exploratory study* (Doctoral Dissertation). Retrieved from ProQuest UMI Dissertations Publishing. (3228656)

Colaizzi, P. (1978). Psychological research as a phenomenologist views it. In R. S. Valle & M. King. (Eds.), *Existential Phenomenological Alternatives for Psychology* (48-71). New York: Open University Press.

Coward-Vaughn, V. (2018). *Elementary teachers' experiences integrating technology with literacy instruction* (Doctoral Dissertation). Retrieved from ProQuest Dissertations Publishing. (10747519)

Creswell, J. W. (2007) Qualitative inquiry and research design: Choosing among five approaches (2nd ed.) Thousand Oaks, CA: Sage Publications, Inc.

Denham, A. R. (2019). Using the PCaRD digital game-based learning model of instruction in the middle school mathematics classroom: A case study. *British Journal of Educational Technology*, *50*(1), 415—427. doi:10.1111/bjet.12582

Eteokleous, N. (2008). Evaluating computer technology integration in a centralized school system. *Computers & Education, 51*(2), 669–686. doi:10.1016/j.compedu.2007.07.004

International Society for Technology in Education. (2008) *National educational technology standards for teachers* (2nd ed.). Eugene, OR: International Society for Technology in Education.

Jones, A. M. (2017). *Exploring teachers' blended learning experiences in a rural Alabama high school* (Doctoral Dissertation). Retrieved from ProQuest Dissertations Publishing. (10639618)

Jones, S. J. (2017). Technology in the Montessori classroom: Teachers' beliefs and technology use. *Journal of Montessori Research, 3*(1), 16-29. doi:10.17161/jomr.v3i1.6458

Keppler, M., Weiler, S. C., & Maas, D. (2014). Focused ubiquity: a purposeful approach to providing students with laptops. *Educational Technology & Society, 17*(4), 278—288.

Koehler, M. J., & Mishra, P. (2005). What happens when teachers design educational technology? the development of technological pedagogical content knowledge. *Journal of Educational Computing Research, 32*(2), 131-152. doi:10.2190/0EW7-01WB-BKHL-QDYV

Lei, J., & Zhao, Y. (2007). Technology uses and student achievement: A longitudinal study. *Computers and education, 49*(2), 284—296. doi:10.1016/j.compedu.2005.06.013

McCulloch, A. W., Hollebrands, K., Lee, H., Harrison, T., & Mutlu, A. (2018). Factors that

        influence secondary mathematics teachers' integration of technology in mathematics

        lessons. *Computers & Education, 123*, 26-40. doi:10.1016/j.compedu.2018.04.008

McFarlane, A. (1997). What are we and how did we get here? In A. McFarlane (Ed.),

        Information technology and authentic learning: Realizing the potential of computers in

        the primary classroom. London, England: Routledge.

Moustakas, C. E. (1994). *Phenomenological research methods*. Thousand Oaks, CA: Sage

        Publications, Inc.

Ojose, B. (2009). Promising practice of technology integration in math and science instruction: A

        case of California Charter High School. *International Education Studies*, *2*(3), 3—17.

        doi:10.5539/ies.v2n3p3

Padgett, D. K. (2008). *Qualitative methods in social work research* (2nd ed.). Thousand Oaks,

        CA: Sage Publications, Inc.

Peck, C., Hewitt, K. K., Mullen, C. A., Lashley, C., Eldridge, J., & Douglas, T. M. O. (2015).

        Digital youth in brick and mortar schools: Examining the complex interplay of students,

        technology, education, and change. *Teachers College Record*, 117.

Ritzhaupt, A. D., Dawson, K., & Cavanaugh, C. (2012). An investigation of factors influencing

        student use of technology in K-12 classrooms using path analysis. *Journal of Educational*

        Computing Research, 46(3), 229-254. doi:10.2190/EC.46.3.b

Rogers, E. M. (1962). *Diffusion of innovations* (1st ed.). New York: Free Press.

Rogers, E. M. (1983). *Diffusion of innovations* (3rd ed.). New York: Free Press.

Rogers, E. M. (2003). *Diffusion of innovations* (5th ed.). New York: Free Press.

Shifflet, R. & Weilbacher, G. (2015). Teacher Beliefs and Their Influence on Technology Use: A

    Case Study. *Contemporary Issues in Technology and Teacher Education, 15*(3), 368-394.

Silverman, D. (2005). *Doing qualitative research: A practical handbook* (2nd ed.). Thousand

    Oaks, CA: Sage Publications, Inc.

Storz, M. G., & Hoffman, A. R. (2013). Examining response to a one-to-one computer initiative:

    student and teacher voices. *Research in Middle Level Education Online*, *36*(6), 1—18.

    doi:10.1080/19404476.2013.11462099

The Texas Tribune. (2019). Arlington ISD. Retrieved from

    https://schools.texastribune.org/districts/arlington-isd/

Urbina, A., & Polly, D. (2017). Examining elementary school teachers' integration of technology

    and enactment of TPACK in mathematics. *International Journal of Information and*

    Learning Technology, *34*(5), 439—451. doi:10.1108/IJILT-06-2017-0054

Varier, D., Dumke, E. K., Abrams, L. M., Conklin, S. B., Barnes, J. S., & Hoover, N. R. (2017).

    Potential of one-to-one technologies in the classroom: Teachers and students weigh in.

    Educational Technology Research and Development, 65(4), 967-992.

    doi:10.1007/s11423-017-9509-2

Zimlich, S. (2015). Using technology in gifted and talented education classrooms: The teachers'

    perspective. *Journal of Information Technology Education: Innovations in Practice, 14*,

    101-124. doi:10.28945/2209

Chapter 5: Article 3: The Impact of School Culture and Climate and Teachers' Technology Readiness on Technology Integration: An Exploratory Sequential Mixed-Method Approach

Abstract

The Impact of School Culture and Climate and Teachers' Technology Readiness on

Technology Integration: An Exploratory Sequential Mixed-Method Approach

Despite such ambitious goals and the substantial optimism in educational technology, significant disparities in technology access and implementation between affluent and low-income schools have been identified (Mouza, 2008). According to the National Center for Educational Statistics (NCES; 2015), students attending poor high-minority schools have less access to computers, with an average student-to-computer ratio of 4:1, while affluent low-minority schools have an average student-to-computer ratio of 3:1. In addition to limited access to technology in school, studies reveal that over two-thirds of white households have access to computers with the internet, while less than half of Black, Hispanic, and low-income households have access to computers with the internet at home (Fairlie, 2012). This disparity in home access to technology further limits the opportunities of low-income minority students to practice essential learning skills and experience academic success. According to Mouza (2008), just as the presence of books and reading material at home can impact the reading readiness of a child when given access to appropriate technology, all students – regardless of their respective backgrounds – can make substantial gains in academic and technological readiness.

Traditionally, the digital divide referred to the gap between students who had access to the internet and devices at school and home and those who did not. Although significant progress is being made to increase computer and internet access in schools, libraries, and homes across the country, a digital use divide separates many students who use technology in creative, productive ways that transform their learning from those who predominantly use technology for passive content consumption. On its own, access to connectivity and devices does not guarantee access to engaging educational experiences or quality education. Without thoughtful intervention

and attention to the way technology is used for learning, the digital use divide could grow even as access to technology in schools increases. (U.S. Department of Education, 2016).

The primary objective of integrating technology into the curriculum is to facilitate higher-order thinking skills. Successful technology-enhanced learning fosters the development of students' ability to gather, analyze, evaluate, and synthesize information. However, current uses of technology in the classroom reflect a different picture. According to the U.S. Department of Education. (2016), many schools do not yet have access to or have adopted approaches for using technology in ways that can improve learning daily. Many teachers primarily use technology to support lesson planning and administrative purposes or for the display of course materials, methods that are unlikely to develop student understanding, stimulate their interest, or increase their proficiency (McCulloch et al., 2018; Potter & Rockinson-Szapkiw, 2012). Thus, research shows that although the presence of technology has increased in schools, it is not being utilized to the degree of greatest advantage (Potter & Rockinson-Szapkiw, 2012).

Teachers' Use of Educational Technology in Their Classroom

Internal factors. Researchers have made a great deal of effort for many years to identify which factors affect teachers' motivation and use of educational technology in their classrooms. According to Parasuraman (2000), teacher's attitudes and beliefs about technology, as well as their teaching philosophies (Eteokleous, 2008; Jones, 2017), can be expected to correlate with their intention to use technology in their classroom. Also, an individual's personality influences the way they interact with, experience, and use technology. Evidence strongly suggests that while some users have favorable views and reactions to technology, others experience challenges and frustrations using it effectively (Parasuraman, 2000). Based on a qualitative study of people's reactions to technology, Mick and Fournier (1998) found that technology may trigger feelings of

intelligence or efficacy, and it can also lead to feelings of ignorance and ineptitude. While positive feelings propel people toward new technologies, negative feelings may hold them back.

Another factor that can influence a teacher's motivation and use of technology is the perceived value for the instructional use of that technology and whether or not technology integration would positively impact the teacher's instructional goals. As the perceived usefulness of educational technology increases, so does the likelihood that the technology will be utilized (Shifflet & Weilbacher, 2015). However, although most teachers believe computers are a valuable tool for teaching and learning, many of the teachers do not have the computer integration skills or knowledge to enhance lessons and provide meaningful experiences with technology (ChanLin, 2007; Inan & Lowther, 2010). Teachers find it difficult to prepare to learn and teach new content while also learning new methodologies in computer-based learning (Pasco & Adcock, 2007).

Additionally, Pew Research Center (2016) reports there has recently been a pivot in the technology adoption discussion that looks at people's preparedness, such as their technical skills and their trust in technology, which may influence their use of technology-based products and services, separate and apart from their access to them. The term often used to capture these factors is *technology readiness*. Technology readiness refers to a condition or state in which a person is prepared to try new technology. The technology readiness construct refers to a person's predisposition to embrace and effectively use new technologies for accomplishing goals in home life, and at work (Parasuraman, 2000). In the education context, technology readiness relates to how prepared teachers are for new technology or the integration of technology to be used in the classroom. Therefore, schools and institutions integrating technology in teaching and learning processes need to understand educator's readiness to use such systems.

External factors. While evidence gathered from numerous studies indicated that external factors including access to computers, technical and administrative support, and school culture and climate also play important roles in teachers' use of technology in their classroom (Perkmen, 2014), school culture and climate are critical factors in the progression and effectiveness of technology integration in classrooms (Fu, 2013; Perkmen, 2014). School culture encompasses the vision, plans, norms, and values that are shared by school personnel. Focusing on the importance of school culture for technology integration, evidence indicates that effective technology integration depends on the perceptions and visions of school leaders rather than teachers' technology skills. For example, a school culture dominated by competition, and high-stakes testing can discourage teachers from integrating technology in their classroom. Therefore, school culture plays an important role in successful technology integration, as school culture influences teachers' actions, beliefs, and attitudes (Fu, 2013). Schools and school districts can either encourage or discourage the use of technology through their policies and practices, the support services they provide for technology implementation, the presence or lack of an organized and comprehensive plan to integrate technology, and the general attitude toward technology and its use (Zimlich, 2015). Thus, implementing effective teaching with technology integration requires changes not only in teachers' knowledge and beliefs but in school culture as well (Fu, 2013).

In contrast, the school climate is based on the perceptions of the individual teachers within the school and is grounded in the practices that are deemed important to the schools and their personnel. Although culture and climate are different, the educational climate of a school is associated with its school culture, both conceptually and empirically. School culture and climate are related because the norms and values that guide teachers' actions in the classroom affect

teachers' assumptions about teaching and learning. Therefore, the school culture and climate perpetuate actions, beliefs, and attitudes among teachers that can either complement or inhibit the implementation of technology in the classroom.

Among key factors that predict teachers' technology integration in their classrooms are opportunities for training and professional development. Additionally, the effectiveness of student learning with educational technology is highly dependent on teaching approaches, types of programs and applications, and learner characteristics. Acquiring more knowledge about technology and technology integration will affect the attitude with which it is approached and ignite a change in teaching behavior (Potter & Rockinson-Szapkiw, 2012). Therefore, educators must be provided opportunities to gain experience and confidence in using educational technology applications to achieve learning objectives and to select engaging and relevant digital learning content. It is within a school community characterized by trust and collaborative best practices that teachers will feel safe to successfully use technology to enhance the learning environment.

One of the primary roles of school leadership is to support teachers and create a shared vision for technology use. This can be achieved by creating expectations that professional development plans will include a technology component. In addition to creating a shared vision and building a supportive culture to encourage innovation, schools must also provide adequate resources to support successful technology use (Ertmer & Ottenbreit-Leftwich, 2010). Undoubtedly, a lack of resources can be a barrier to teacher technology use (Hew & Brush, 2007). When building a supportive infrastructure, schools must be well equipped, not only with technology resources but with the pedagogical expertise needed to facilitate meaningful uses

(Somekh, 2008). In a school where a positive and supportive technology climate exists, teachers believe that their school will support them in their integration efforts (Perkmen, 2014).

Social Work's Influence on School Culture and Climate

Social workers' broad influence on school culture, climate, and achievement often goes unnoticed. School social workers represent an integral part of the school system and are instrumental in furthering the school's mission of educating children by providing academic support and addressing barriers to student learning. According to the National Association of Social Workers (NASW; 2012), school social workers design and implement school-based programs to advance academic success and ensure a school culture and climate conducive to student learning and teaching excellence. Additionally, school social workers shall provide leadership and serve as consultants in developing a positive school climate, promoting optimal learning, improving interpersonal skills, and alleviating barriers to social and emotional development, while working collaboratively with school administration, school personnel, family members, and community professionals as appropriate to increase accessibility and effectiveness of services (NASW, 2012). Therefore, school social workers play an important role in professional development, as they provide school staff with essential information to help them better understand factors that may affect student performance and behavior and help teachers and administrators identify evidence-based practices for maintaining an effective learning environment. School social workers also help educators obtain resources to meet classroom and student needs (Hopson & Lawson, 2011).

Theoretical Framework

As several theories and models have been employed over the years to understand factors that can influence a person's intention to adopt and use new technology, the Unified Theory of

Acceptance and Use of Technology (UTAUT) was developed through the synthesis of previous

models explaining technology acceptance and utilization and has been shown to outperform

these models (Venkatesh & Zhang, 2010). Developed by Venkatesh, Morris, Davis, and Davis

(2003), UTAUT not only underscores the psychological and sociological factors that affect

technology acceptance, but also identifies the contingencies, such as gender, age, experience

with the technology, and voluntariness of use, that would amplify or constrain the effects of

these factors (Venkatesh & Zhang, 2010). As such, individuals' behavioral intentions and use of

technology primarily in organizational settings are argued to be influenced by four main

constructs: performance expectancy, effort expectancy, social influence, and facilitating

conditions. Performance expectancy is the extent to which a person believes that using

technology will enhance his or her performance. Effort expectancy is defined as the degree of

ease associated with the use of technology. Social influence is defined as the degree to which an

individual perceives that important others believe he or she should use technology. Factors and

resources that an individual believes exist to support technology use are termed facilitating

conditions (Venkatesh et al., 2003).

Current Study

As efforts to close the achievement gap between ethnic minority students and their white

peers continue to rely on technology-based learning, examining whether teachers feel prepared to

use technology effectively in the classroom to support student learning is imperative.

Additionally, it is believed school culture and climate are also integral components for teachers

gaining the necessary self-efficacy to take risks implementing technology-based teaching

strategies. Therefore, this exploratory study examined how school culture and climate, in

addition to teachers' technology readiness, influence technology integration in the classroom.

Specifically, the culture and climate of primary schools in Coppell Independent School District (CISD) and Plano Independent School District (PISD) concerning technology integration were examined as well as the technology readiness of the teachers within these schools. This study further tested the relationship between teachers' technology readiness levels and the use of educational technology in the classroom, along with the relationship between school cultures and climate and technology use, while exploring differences among teachers' technology readiness levels and the culture and climate in primary schools in CISD and PISD concerning the use of educational technology to support teaching and learning. This study aimed to answer the following research questions:

RQ8: What is the technology readiness level of primary school teachers in CISD and PISD?

RQ9: What is the effect of the demographics of the teachers such as age, gender, race/ethnicity, level of education, and years of teaching experience on their technology-readiness level?

RQ10: Is teachers' technology readiness related to their use of educational technology in their classroom?

RQ11: What are the cultural characteristics of CISD and PISD primary schools concerning technology integration?

RQ12: Are school culture and climate related to teachers' use of educational technology in their classrooms?

RQ13: Is teachers' use of educational technology in their classroom more a function of the school culture and climate than of their technology readiness?

It was hypothesized that teachers' technology readiness would have a significant and positive influence on their use of educational technology in the classroom. It was also hypothesized that school culture and climate would have a significant and positive influence on teachers' use of technology in the classroom. Additionally, it is argued that a major source of the differences in technology integration between schools is found in the characteristics of the educational environment rather than in the characteristic of the individual teachers. As a result, it was hypothesized that teachers' use of educational technology in their classroom will be more a function of the school culture and climate in which they work than of their technology readiness.

Method

This study utilized an exploratory sequential design in which both qualitative and quantitative research methods are combined (Creswell, Plano Clark, Gutmann, & Hanson, 2003). Open-ended interviews were conducted in Phase 1 of the study to describe the practices and attitudes of school administrators in CISD and PISD concerning technology integration. The practices and attitudes described in the qualitative interviews of Phase 1 were used in Phase 2 to develop a structured, closed-ended questionnaire. A quantitative analysis of the responses to the questionnaire then was used to identify differences among teachers' perceptions of their school culture and climate concerning technology integration as well as whether teachers' use of educational technology in their classroom is more a function of the school's culture and climate in which they work than of their technology readiness.

Sample. In Phase 1, qualitative, open-ended interviews were conducted with eight primary school teachers in CISD and one primary school teacher in PISD, an adjacent community with similar demographic characteristics and findings. In Phase 2, a closed-ended, structured questionnaire was developed and administered to 41 primary school teachers in CISD (27.5%)

and PISD (72.5%). CISD is a public school system in Texas, with a statewide reputation for educational excellence, that consists of 11 elementary schools, three middle schools, one ninth-grade campus, two high schools, and one alternative campus. CISD has a staff of approximately 1,319, with nearly 13,207 students enrolled in August 2020 (Coppell Independent School District, 2020). Student demographics within CISD include 51.6% Asian, 27.6% white, 13.2% Hispanic/Latino, 4.2% African American, 3.1% two or more races, and 0.3% other. According to The Texas Tribune (2019), 24.4% of the students in CISD are at risk of dropping out of school based on state-defined criteria, while 8.9% are economically disadvantaged and 14.1% are English language learners (Coppell Independent School District, 2020). PISD is an independent school district in Texas, that consists of 72 campuses and serves grades Pre-K–12. PISD employs 4,069 teachers, with approximately 50,405 students enrolled (Plano Independent School District, 2020). Student demographics within PISD include 24% Asian, 32% white, 26% Hispanic/Latino, 13% African American, 4% two or more races, and 1% other. According to The Texas Tribune (2019), 34.6% of the students in PISD are at risk of dropping out of school based on state-defined criteria, while 32.9% are economically disadvantaged and 18.3% are English language learners. A more detailed break-down of age, gender, race, level of education, and years of teaching experience can be seen in Table 1. Required Institutional Review Board procedures were followed and informed consent was obtained from each participant in both phases of the study.

Measures. A closed-ended, structured questionnaire was developed from the information and comments gathered during the exploratory interviews in Phase 1 and based on the UTAUT framework and previously validated questionnaires in published literature. The questionnaire was constructed of nine items designed to describe the behaviors and attitudes that reflect values

Table 2. *Sample Characteristics*

Variables	*n*	%
District		
Plano ISD	29	72.5%
Coppell ISD	11	27.5%
Age		
25—29	5	12.8%
30—39	6	15.4%
40—49	15	38.5%
50 +	13	33.4%
Gender		
Male	3	7.5%
Female	37	92.5%
Race		
White	32	82.1%
African American	2	5.1%
Hispanic	5	12.8%
Education level		
Bachelors	15	37.5%
Some masters	5	12.5%
Masters	18	45.0%
Postmasters coursework	1	2.5%
Doctorate	1	2.5%
Teaching experience		
3—5 years	6	15.0%
6—10 years	6	15.0%
11—19 years	14	35.0%
20 + years	14	35.0%

expected to be related to technology integration. The items were written with 5-point Likert-type

scale response categories ranging from 1 = *strongly disagree* to 5 = *strongly agree*. Participants

also were asked in the questionnaire to identify their age, gender, race/ethnicity, level of

education, and years of teaching experience. A 10-item index of the Technology Readiness Index

(TRI), measuring teachers' general beliefs about technology and their readiness to embrace and

interact with technology-based systems was included in the questionnaire as well.

Teachers' technology readiness was measured using the TRI. TRI was developed to

measure people's general beliefs about technology and gain an in-depth understanding of the

readiness of people to embrace and interact with technology-based systems, and how resulting

perceptions and behaviors can impact adoption and utilization (Lin & Hsieh, 2006). TRI is a

multiple-item scale comprised of four sub-dimensions: optimism, innovativeness, discomfort, and insecurity. Optimism relates to a positive view of technology and a belief that it offers people increased control, flexibility, and efficiency in their lives. Innovativeness refers to a tendency to be a technology pioneer and thought leader. Discomfort consists of a perceived lack of control over technology and a feeling of being overwhelmed by it. Insecurity involves distrust of technology and skepticism about its ability to work properly. Optimism and innovativeness are drivers of technology readiness, while discomfort and insecurity are inhibitors. Positive and negative beliefs about technology may coexist, and people can be arrayed along a technology belief continuum, from strongly positive attitudes at one end to strongly negative attitudes at the other (Lin, Shih, & Sher, 2007). Thus, a combination of positive and negative feelings about technology underlies the domain of technology readiness.

An abbreviated 10-item index of the TRI 1.0 by Parasuraman and Colby (2003) was published in its original 36-item form by Parasuraman in 2000 and has been widely used to date. The 10-items from the abbreviated instrument measure four components, which include technological optimism (two items), technological innovativeness (three items), technological discomfort (two items), and technological insecurity (three items). The two positive measures of technology readiness, optimism, and innovativeness are weighed against the two negative measures of discomfort and insecurity to measure a participant's overall technological readiness. The instrument's 5-point Likert-type questions are answered by indicating a score from 1 = *strongly disagree* to 5 = *strongly agree*. Based on TRI scores on the index's four individual components, Parasuraman and Colby also derived a segmentation scheme that categorizes people into five technology adoption segments: explorers, pioneers, skeptics, paranoids, and laggards. While the instrument was originally designed for external use in market research, Parasuraman

(2000) states that the instrument could be applied internally by organizations. This justifies its use in an internal educational setting.

The questionnaires were distributed and completed electronically protocol. Although qualitative and quantitative data collection and analysis occurred in separate phases, there may be overlap between the individuals who participated in the focus discussions in the qualitative phase and those who complete the questionnaire in the quantitative phase. An exploratory factor analysis of the responses to the nine items was conducted to identify the items that defined underlying factors in the questionnaire. The factor analysis was followed by non-parametric analysis of variance (Kruskal Wallis test) of the responses to items composing each factor. Finally, multivariate analysis was employed to identify the strongest predictor of teachers' use of technology in the classroom. Prior to quantitative analysis, checks of tests assumptions indicated all assumptions associated with the proper parametric and nonparametric test were met. Of the 41 study participants, one respondent did not answer more than three items of the TRI and, therefore, was excluded. Additionally, all statistical analyses will be carried out using Statistics Package for the Social Sciences (SPSS) v. 25.

Results

Results from Phase 1 – Qualitative Analysis of Open-Ended Interviews

This research focused on the fundamental assumptions underlying the culture and climate of primary schools in CISD and PISD concerning technology integration. Based on the information gathered in the opened-ended interviews in Phase 1, three themes that capture the impact of the school's culture and climate on educators' use of technology in their classroom were identified: high technology use, teacher observation and evaluation, and support services for implementation. Participants emphasized their school encouraged the use of technology

104

through their policies and practices, the support services they provide for technology implementation, the presence of an organized and comprehensive plan to integrate technology, and the general attitude toward technology and its use. Educators across sites indicated that school culture and climate are critical factors in the progression and effectiveness of technology integration in classrooms.

High technology use

Teachers expressed their school district encourages teachers and students to leverage technology positively and has also developed a positive culture around technology integration, as one teacher described technology integration as being "a primary focus in Coppell right now." Across sites, teachers indicated technology is frequently used and "has become part of the everyday classroom." Several respondents reported students are not only using their devices daily but have access to a variety of tools that provide opportunities to extend learning. Although it appears technology tools have become a seamless part of the learning process in Coppell ISD and Plano ISD, one educator acknowledged that technology integration is an ongoing and "evolving" process, as there is "something new each year."

Teacher observation and evaluation

Without exception, teachers indicated having expectations to meet certain levels of technology proficiency. Teachers are also required to demonstrate effective use of technology to support learning in one of the annual lessons their school administrator observes. One teacher explained, "That is a domain of our appraisal system. It's through observation. You get four walkthroughs a year and one formal observation." Another educator added that these observations aim to identify student perceptions of the impact of technology on the quality of teaching and learning as well. She further detailed that administrators assess how students

interact with the technology, as well as how the use of technology benefits student learning. Also, educators are required to implement technology in a variety of ways. For example, one teacher in Coppell mentioned, "We have specific requirements, which differs by grade levels. You have to be on Istation 30 minutes a week, you have to be on DreamBox... Whatever the minutes are for each program." Other teachers indicated they are given flexibility in how they use technology to support learning, as another teacher shared, "One of my action steps this year is I will use Words Their Way to try to improve students' spelling ability. So, I know my principal will be evaluating whether that was effective."

Support services for implementation

All eight teachers spoke of having the training and support they need for effective technology integration to support student learning. Both districts appear to offer a variety of training around the different programs, tools, and platforms that the districts use, along with opportunities that help with aligning the technology to the needs of the curriculum. According to teachers in Coppell ISD, training is not only are offered at a staff meeting, after school, or in the summer, the district has a digital library of virtual training and webinars, "that you can say, 'Oh, I want to learn about this,' and you can find a course on it."

In addition to educators being provided opportunities to gain experience and confidence in using educational technology applications, educators across sites discussed multiple types of support that facilitate integrating educational technology into traditional classroom instruction. For example, one educator described having digital learning coaches (DLC) assigned to every campus. She explained, "When I'm having technical issues or even if I am like, 'Hey, I have this great idea for a lesson or an activity, but I'm not sure what the best way to do it is or what's the best app to use,' I know what DLC I can contact. They will meet with me and help me." Other

teachers detailed, "We have a help desk team. Parents, teachers, or kids can fill out a help desk ticket to say like, 'This is what's going on. This is what technology it is. This is what the problem is.' And they'll communicate with you through email first, if they can, to solve the problem, if not, they'll come out to your campus to help you troubleshoot." Overall, these responses indicate that teacher training and technical support play important role in technology integration and utilization in the classroom.

Results from Phase 2 – Quantitative Analysis of Responses to the Questionnaire

TRI scores for primary school teachers in CISD and PISD were computed using the average for the four sub-dimensions of the scale. An independent samples t-test was conducted to compare the technology readiness level of primary school teachers in CISD and PISD. Results indicated no significant difference in the scores for teachers in CISD (M=3.43, SD=.65) and PISD (M=3.30, SD=.57); t(38)=-.63, p = .53. Next, multiple linear regression analysis was used to examine the relationship between the demographics of the teachers such as age, gender, race/ethnicity, level of education, and years of teaching experience with their technology-readiness level. While the overall model was statistically significant (p = .03), teachers' age was the only predictor variable that reflected a statistically significant correlation with technology readiness level (β = -.548, p = .03). However, the relationship between teachers' age and technology readiness level is negative. These results indicate that as teachers' age increases technology readiness level decreases. Additionally, results of a Spearman's rank non-parametric correlation indicated that there is a significant positive association between teachers' technology readiness and their use of educational technology in their classroom (r(40) = .579, p <.001; rs(40) = .547, p <.001).

According to the qualitative findings in Phase 1 and based on the UTAUT framework and existing literature, four factors were created and a principal components factor analysis was performed to check the model. Three principal components were extracted, and initial eigenvalues indicated that the first three factors explained 71% of the variance respectively. Five items loaded on the first factor, and two items loaded on each of the remaining two factors. All items in this analysis had primary loadings over .6. The factor loading for the varimax rotated factors presented in Table 2. Internal consistency for each of the scales was examined using Cronbach's alpha. The alphas were acceptable: .81 for high technology use (five items), .78 for support services (2 items), and .65 for teacher engagement (2 items). No substantial increases in alpha for any scales could have been achieved by eliminating more items.

Table 3. *Principal Component Factor Analysis*

Items (*Abbreviated*)	**Principal Component Loadings**		
	High technology use	*Teacher engagement*	*Support services for implementation*
Encourages use in the classroom to support learning.	.828*	.291	-.118
Has become part of the everyday classroom.	.858*	.210	-.008
Works to ensure equity of access and use for all students.	.718*	-.023	.156
Encouraged me to participate in the planning process.	-.003	.925*	-.045
Collaborate and share ideas with other teachers.	.072	.251	.783*
Included as a criterion for assessing performance.	.720*	.178	-.311
Demonstrate effective use of technology to support learning.	.812*	-.030	.063
Offers professional development and training opportunities.	.339	.647*	-.164
Satisfied with the technical support services.	.005	.059	.949*

Composite scores were created for each of the three factors, based on the mean of the items which had their primary loadings on each factor. Higher scores indicated a greater belief that their school promotes and supports technology integration. Results of both the Pearson's correlation and a Spearman's rank non-parametric correlation indicated that there is a significant positive association between school culture and teachers' use of educational technology in their classroom ($r(40) = .381$, $p = .015$; $rs(40) = .381$, $p = .015$). Finally, a binary logistic regression

was conducted to test whether teachers' use of educational technology in their classroom is more a function of the school culture and climate than of their technology readiness. The overall model indicated that the independent variables significantly predicted the outcome, technology integration ($x^2 = 33.148$, df=7, N=40, p = .020). The results of the data analysis are presented in Table 3. The results of Cox & Snell and Nagelkerke R squared estimates indicated that the whole model explained between 16% and 22% of the variance that can be predicted from the independent variables. The model classified correctly 93.9% of the respondents who were likely to integrate technology into classroom instruction and 50% of those who were less likely, for an overall classification success rate of 87.2%. As shown in Table 3, none of the covariate variables, except age (OR=15.26), were significantly associated with the use of technology to support learning. While technology readiness (OR=53.68) showed a strong relationship with the use of educational technology in the classroom, the strongest predictor of technology integration into the classroom was school culture (OR=77.22). As indicated by the odds ratio, when holding all the other predictors constant, teachers were 77 times more likely to use technology to support learning when their school and school districts have policies, practices, support services, and evaluation systems for technology implementation than teachers in schools without these opportunities. Also, younger teachers were fifteen times more likely to integrate technology into classroom instruction than older teachers all other things being equal.

Table 3. *Logistic regression predicting likelihood of technology integration*

Variables	B	SE	Wald	Df	Sig.	Exp(B)	95% CI for EXP(B) Lower	Upper
Age	-1.059	1.728	6.100	1	.027	15.258	1.755	132.650
Gender	-3.544	2.627	1.820	1	.177	-029	.000	4.976
Education level	-.244	.720	.115	1	.754	.783	.191	3.214
Teaching experience	.220	.701	.098	1	.734	1.246	.315	4.921
Technology readiness	3.983	1.618	6.062	1	.014	53.676	2.253	1278.747
School culture	4.347	1.657	6.884	1	.009	77.215	3.003	1985.471
Constant	-11.158	4.539	5.764	1	.016	.000		

Discussion

The results of this exploratory study describe teachers' perceptions of their school culture and climate concerning technology integration as well as whether teachers' use of educational technology in their classroom is more a function of the school's culture and climate in which they work than of their technology readiness. Technology integration was found to be a function of the school's culture and climate in which they worked and not of their experience, education level, race/ethnicity, or gender. Across sites, teachers described technology integration as valued and expected, as 1:1 student-to-device ratio was a related trend within CISD and PISD. As a result, teachers in both school districts had positive attitudes about the impact of technology on student learning and achievement. Information gathered in the qualitative interviews suggests that these positive attitudes about the impact of technology on teaching and learning could occur for three reasons. First, teachers indicated technology tools are frequently used and have become a seamless part of the learning process in CISD and PISD. Second, both districts offer adequate training opportunities and technical support for effective technology integration to support student learning. Third, teachers are encouraged to collaborate and share ideas and participate in their school's technology integration planning process.

Limitations

The results from this study are valuable despite some of its limitations. The study sample was relatively small, but it was a diverse sample in regard to age, level of education, and years of teaching experience. Participation was voluntary and research met with the challenges of conducting data collection during a pandemic, as pivoting to online learning was entirely new and challenging for many schools and educators. This study lacked a traditionally taught comparable control group, as both school districts included in this sample are using a 1:1

student-to-device model. Lastly, the survey was a self-report tool; it was a subjective measure. Therefore, it is difficult to generalize the findings to primary school teachers and students across these districts or suggest any policy or practice changes, however, these valuable findings warrant further study. Moreover, these limitations reinforced the use of both qualitative and quantitative methods to triangulate the data.

Conclusion

While there recently been a pivot in the technology adoption and utilization discussion that looks at the influence on teachers' preparedness, such as their technical skills as well as their attitudes and beliefs about technology, on the use of technology in the classroom, evidence indicates that school culture and climate also play important roles in teachers' use of technology in their classroom. Therefore, it is argued that effective technology integration depends on the perceptions and visions of school leaders rather than teachers' technology skills. Additionally, school social workers work collaboratively with school administration and personnel to develop a positive school climate and promote optimal learning. This study is important as it provides more insights by presenting an understanding of the culture and climate of technology-rich primary schools in CISD and PISD as well as the technology readiness of the teachers within these schools and their influences on technology integration in the classroom.

References

Arlington Independent School District. (2019). About the Arlington ISD. Retrieved from

https://www.aisd.net/district/about/

ChanLin, L. (2007). Perceived importance and manageability of teachers toward the factors of

integrating computer technology into classrooms. *Innovations in Education and Teaching*

International, 1 (44), 45-55.

Eteokleous, N. (2008). Evaluating computer technology integration in a centralized school

system. *Computers & Education, 51*(2), 669–686. doi:10.1016/j.compedu.2007.07.004

Ertmer, P. A., & Ottenbreit-Leftwich, A. T. (2010). Teacher technology change: How

knowledge, confidence, beliefs, and culture intersect. *Journal of Research on Technology*

in Education, 42(3), 255-284.

Fairlie, R. W. (2012). Academic achievement, technology and race: Experimental evidence.

Economics of Education Review, 31(5), 663-679.

Fu, J. S. (2013). ICT in education: A critical literature review and its implications. *International*

Journal of Education and Development using Information and Communication

Technology, 9(1), 112-125.

Hew, K. F., & Brush, T. (2007). Integrating technology into K–12 teaching and learning: Current

knowledge gaps and recommendations for future research. *Educational Technology*

Research and Development, 55(3), 223–252. doi:10.1007/s11423-006-9022-5

Hopson, L. M. & Lawson, H. A. (2011). Social workers' leadership for positive school climates

via data-informed planning and decision making. *Children and Schools, 33*(2), 106-118.

doi:10.1093/cs/33.2.106

Inan, F. A., & Lowther, D. L. (2010). Factors affecting technology integration in K-12

    classrooms: A path model. *Educational Technology Research and Development, 58*(2),

    137-154. doi:10.1007/s11423-009-9132-y

Jones, S. J. (2017). Technology in the Montessori classroom: Teachers' beliefs and technology

    use. *Journal of Montessori Research, 3*(1), 16-29. doi:10.17161/jomr.v3i1.6458

McCulloch, A. W., Hollebrands, K., Lee, H., Harrison, T., & Mutlu, A. (2018). Factors that

    influence secondary mathematics teachers' integration of technology in mathematics

    lessons. *Computers & Education, 123*, 26-40. doi:10.1016/j.compedu.2018.04.008

Mick, D. G. & Fournier, S. (1998). Paradoxes of technology: consumer cognizance, emotions,

    and coping strategies. *Journal of Consumer Research, 25*(2), 123-144.

Mouza, C. (2008). Learning with laptops: Implementation and outcomes in an urban, under

    privileged school. *Journal of Research on Technology in Education, 40*(4), 447-472.

National Association for Social Workers. (2012). *NASW standards for school social work*

    services. Washington, DC: National Association for Social Workers.

National Center for Education Statistics. (2015). *Achievement Gaps*. Retrieved from

    https://nces.ed.gov/nationsreportcard/studies/gaps/

Parasuraman, A. (2000) Technology readiness index (Tri): A multiple-item scale to measure

    readiness to embrace new technologies. *Journal of Service Research, 2*(4), 307-320.

Pasco, B., & Adcock, P.G. (2007). New rules, new roles: Technology education standards and

    teacher education. *Educational Considerations, 2*(34) 29-31.

Perkmen, S. (2014). The role of personality and school climate on pre-service teachers'

    motivation towards technology integration in education. *Education Sciences, 9*(4), 380-

    393. doi:10.12739/NWSA.2014.9.4.1C0625

Pew Research Center. (2016) *Digital readiness gaps*. Washington, DC: Horrigan

Potter, S., & Rockinson-Szapkiw, A. (2012). Technology integration for instructional

improvement: The impact of professional development. *Performance*

Improvement, 51(2), 22–27. doi:10.1002/pfi.21246

Shifflet, R. & Weilbacher, G. (2015). Teacher Beliefs and Their Influence on Technology Use: A

Case Study. *Contemporary Issues in Technology and Teacher Education, 15*(3), 368-394.

Somekh, B. (2008). Factors affecting teachers' pedagogical adoption of ICT. In J. Voogt & G.

Knezek (Eds.), *International handbook of information technology in primary and*

secondary education (449–460). New York, NY: Springer.

The Texas Tribune. (2019). Arlington ISD. Retrieved from

https://schools.texastribune.org/districts/arlington-isd/

U.S. Department of Education. (2016). *Future ready learning: Reimaging the role of technology*

in education. Washington, DC: U.S. Department of Education, Office of Educational

Technology.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of

information technology: Toward a unified view. MIS Quarterly, 27(3), 425–478.

Venkatesh, V., & Zhang, X. (2010). Unified theory of acceptance and use of technology: U.S. vs.

China. *Journal of Global Information Technology Management, 13*(1), 5-27.

Zimlich, S. (2015). Using technology in gifted and talented education classrooms: The teachers'

perspective. *Journal of Information Technology Education: Innovations in Practice, 14*,

101-124. doi:10.28945/2209

Chapter 6: Summary

Summary of Project

Education plays a critical role in the advancement and survival of ethnic minority children and youth. However, access to quality education still eludes many ethnic minority children as a result of instances of prejudice, institutional racism, and structural discrimination. When issues of discrimination are coupled with factors such as fewer educational opportunities, some ethnic minority youth face a dual degree of vulnerability that places them at greater risk for negative outcomes. Due to these obstacles, ethnic minority children and youth often lag behind their white peers in many social indicators including higher rates of poverty and lower educational attainment, which impedes their academic success and upward mobility. As stewards of social justice, social workers have a great interest in attempts to eliminate injustices and racial inequalities in education. Additionally, as a result of the key roles that social workers play in schools, social work is well-positioned to address educational disparities and advocate for change and social justice in the education of ethnic minority students. Therefore, it is incumbent on school social workers to be knowledgeable of intervention strategies that promote and advance educational opportunities of ethnic minority students and address major issues of education reform. Several studies have applied educational technology interventions to address educational achievement equity issues. This research examined the role of educational technology in helping to reduce educational disparities by providing greater equitable opportunities and access to resources and, thus, offers an innovative approach to promoting academic achievement in ethnic minority students.

Overall Findings

Much has been written in the field of educational technology in regard to the positive effects of educational technology on students' problem-solving, critical thinking, and collaboration. Other empirical research within educational technology has focused on the role of technologies in promoting the efficiency of educational processes, such as formative assessments, grading, and tracking. Despite the favorable impacts of technologies on educational excellence and efficiency, less attention has been paid to issues of equity. Along these lines, the field of educational technology often does not address key equity problems such as academic achievement and attainment gaps, and inequality of educational access and opportunity. While evidence supports a rise in the use of computers and other devices to enhance student outcomes, this rise parallels a rise in the digital divide and little research has been done to determine how technology has targeted students from underserved backgrounds and their unique needs. Therefore, further exploration on how technological innovation might help to overcome learning gaps is needed. Also, future studies should explore the intersection of educational technology and equity, and the role of educational technology in mitigating existing educational inequalities. Moreover, as technology becomes more pervasive and accessible to a wider audience, further attention is needed to understand the varying degree of impact to different demographics. It is also argued that researchers and practitioners consider that educational technologies should balance the broader importance of inequality of access and opportunity within the scope of research.

Equitable access to technology is worth fighting for, as technology can empower students and enhance their learning. Despite available government funding, many schools have a shortage of adequate digital resources available for students to use. School social workers can develop

partnerships between schools and external organizations or other schools in the community to help educators bridge their gap in funds for technology and provide greater equitable opportunities and access to digital resources and supports that poor school districts are often unable to offer.

Appendices

Appendix A. Interview Question Guide

1. Describe your experiences with using educational technology in the classroom.

2. Describe your perception of integration of technology in your school.

    a. Probe: Describe your district or school's technology plan and implementation efforts.

3. Tell me about the specific types of educational technology are you currently using in your classrooms.

    a. Probe: For what purposes do you use each technology or application during classroom instruction?

    b. Probe: For what purposes do students use each technology or application during classroom instruction?

    c. Probe: How often do you use each technology or application each week?

    d. Probe: How long do the students spend utilizing each technology or application when used?

4. What factors affect the use and integration of technology in your class?

    a. Probe: How do school administrators ensure equity of technology access and use in your school?

5. Tell me how educational technology impacts your teaching methods and strategies.

    a. Probe: Has anything changed in the way you teach since you started integrating educational technology into your curriculum?

6. In your opinion, how does educational technology impact student learning and achievement?

a. Probe: In your opinion, how does educational technology influence classroom engagement?

b. In your opinion, how does educational technology influence students' attitudes and motivation to learn?

7. Describe how educational technology facilitates and supports learning and achievement for students.

a. Probe: Describe the specific features and attributes of educational technology applications that have had the greatest effect on student learning and achievement.

b. Probe: What specific skills, knowledge, or learning objectives are achieved when educational technology is incorporated into your specific curriculum?

c. Probe: Have you witnessed any differences in the impact of educational technology applications on learning and achievement among students with different academic skills and abilities (i.e. traditional students, at-risk/low-achieving students, high-achieving students)? Please explain.

d. Probe: Have you witnessed any differences in the impact of educational technology applications on learning and achievement among students based on race or ethnicity? Please explain.

e. Probe: Have you witnessed any differences in the impact of educational technology applications on learning and achievement among students based on socioeconomic status? Please explain.

f. Probe: How does the use of educational technology assist in the delivery of individualized instruction to meet the educational needs of all students?

8. Do some students appear more or less comfortable with using technology?

9. What student concerns do you have when using technology in your classroom?

10. What specific problems do you face when using technology in your classroom?

    a. Probe: How does your district provide technical support to address these

       problem?

11. What barriers to using educational technology in your classroom do you experience?

12. What training and professional development opportunities are provided by your school

    district to support the integration of technology in the classroom?

    a. Probe: How do these opportunities facilitate the aligning of technology to the

       curriculum?

    b. Probe: How do your school administrators evaluate or assess effective use of

       technology for teaching and learning?

13. Do you have any additional information or experiences that you would like to share?

14. In closing, identify one word that captures technology integration in your district.

Appendix B. Survey Questions

Age (in years): _____

Gender	(Check one):
Male	
Female	
Other (please specify):	
Prefer not to say	

Race	(Check all that apply):
White	
African American or Black	
Hispanic or Latino	
Asian	
American Indian/Alaska Native	
Native Hawaiian or Other Pacific Islander	

Highest level of education completed	(Check one):
Some college	
Bachelor's degree	
Some graduate school	
Master's degree	
Post master's course work	
Doctorate	

Years of teaching experience	(Check one):
0 – 2	
3 – 5	
6 – 10	
11 – 20	
20 or more	

Grade levels taught	(Check all that apply):
Kindergarten	
1st grade	
2nd grade	
3rd grade	
4th grade	
5th grade	
6th grade	
7th grade	
8th grade	

Grade level you currently teach: _____

Subject areas you currently teach	(Check all that apply):
English/Language Arts	
Mathematics	
Science	
Social Studies/History/Geography	
Other (please specify):	

Where do your students mainly use computers?	(Check one):
Classroom	
Computer lab or library	

Number of Computers	(Fill in #):
Number of computers (including laptops available on a daily basis) that are located in your **classroom** and have access to the Internet:	
Number of computers located in your **computer lab or library** that have access to the Internet:	

Which setting **best** describes the student/computer ratio in your classroom?		(Check one):
(0:0)	**No computers** in the classroom; students use computers in a lab	
(1:0)	Only computer in classroom is for **teacher use**; students use computers in a lab	
(1:4-6)	1 classroom computer for **every 4-6 students**	
(1:2-3)	1 classroom computer for **every 2-3 students**	
(1:1)	1 classroom computer for **every student**	
Other (please specify):		

How would you rate your computer skills?	(Check one):
Awesome, power user	
Proficient, regular user	
Novice, infrequent user	
Beginner, just started user	
Non-user	

Do you use computers and internet at least once a week for classroom instruction?	(Check one):
Yes	
No	

Years you've been using computers and internet for classroom instruction	(Check one):
Not at all	
Less than 1 year	
1 – 2 years	
3 – 4 years	
5 or more years	

How prepared do you feel to use computers and internet for classroom instruction?	(Check one):
Not at all prepared	
Somewhat prepared	
Not sure	
Well prepared	
Very well prepared	

Does your school or district require technology training for teachers?	(Check one):
Yes	
No	

Do you have a technology/computer support person to assist you in implementing instructional technologies in your classroom curriculum?	(Check one):
Yes, in my school	
Yes, in my district	
No	

Please list below any other technology you have available in your classroom (for example: LCD projector, Smartboard, large TV monitor for displaying computer images, etc.):

We are interested in your views on how technology influences your life. Please indicate how much you agree with the following statements.

Technology gives me more freedom of mobility.	(Check one):
Strongly disagree	
Somewhat disagree	
Neutral	
Somewhat agree	
Strongly agree	

Technology makes me more productive in my personal life. (Check one):

Strongly disagree	
Somewhat disagree	
Neutral	
Somewhat agree	
Strongly agree	

Other people come to me for advice on new technologies. (Check one):

Strongly disagree	
Somewhat disagree	
Neutral	
Somewhat agree	
Strongly agree	

In general, I am among the first in my circle of friends to acquire new technology when it appears. (Check one):

Strongly disagree	
Somewhat disagree	
Neutral	
Somewhat agree	
Strongly agree	

I keep up with the latest technological developments in my areas of interest. (Check one):

Strongly disagree	
Somewhat disagree	
Neutral	
Somewhat agree	
Strongly agree	

Technical support lines are not helpful because they don't explain things in terms I understand. (Check one):

Strongly disagree	
Somewhat disagree	
Neutral	
Somewhat agree	
Strongly agree	

Sometimes, I think that technology systems are not designed for use by ordinary people. (Check one):

Strongly disagree	
Somewhat disagree	
Neutral	
Somewhat agree	
Strongly agree	

People are too dependent on technology to do things for them.	(Check one):
Strongly disagree	
Somewhat disagree	
Neutral	
Somewhat agree	
Strongly agree	

Too much technology distracts people to a point that is harmful.	(Check one):
Strongly disagree	
Somewhat disagree	
Neutral	
Somewhat agree	
Strongly agree	

Technology lowers the quality of relationships by reducing personal interaction.	(Check one):
Strongly disagree	
Somewhat disagree	
Neutral	
Somewhat agree	
Strongly agree	

We are interested in your views on your school's culture and climate concerning technology integration. Please indicate how much you agree with the following statements.

My school encourages the use of technology in the classroom to support learning.	(Check one):
Strongly disagree	
Somewhat disagree	
Neutral	
Somewhat agree	
Strongly agree	

Technology has become part of the everyday classroom in my school.	(Check one):
Strongly disagree	
Somewhat disagree	
Neutral	
Somewhat agree	
Strongly agree	

My school works to ensure equity of technology access and use for all students.	(Check one):
Strongly disagree	
Somewhat disagree	
Neutral	
Somewhat agree	
Strongly agree	

My school or district encouraged me to participate in the technology planning and implementation process.	(Check one):
Strongly disagree	
Somewhat disagree	
Neutral	
Somewhat agree	
Strongly agree	

I collaborate and share ideas with other teachers in my school/district concerning best practices for integrating educational technology into traditional classroom instruction.	(Check one):
Strongly disagree	
Somewhat disagree	
Neutral	
Somewhat agree	
Strongly agree	

The effective use of technology is included as a criterion for assessing performance at my school.	(Check one):
Strongly disagree	
Somewhat disagree	
Neutral	
Somewhat agree	
Strongly agree	

I am expected to demonstrate effective use of technology in the classroom to support learning.	(Check one):
Strongly disagree	
Somewhat disagree	
Neutral	
Somewhat agree	
Strongly agree	

My school or district offers professional development and training opportunities for effective technology integration.	(Check one):
Strongly disagree	
Somewhat disagree	
Neutral	
Somewhat agree	
Strongly agree	

I am satisfied with the technical support services provided by my school/district to facilitate integrating educational technology into traditional classroom instruction.	(Check one):
Strongly disagree	
Somewhat disagree	
Neutral	
Somewhat agree	
Strongly agree	

Appendix C.

The University of Texas at Arlington (UTA)

Informed Consent for Minimal Risk Studies with Adults

My name is Kelli Rogers, and I am asking you to participate in a UT Arlington research study titled, "A Qualitative Phenomenological Exploration of Teachers' Perceptions of the Impact of Educational Technology on Teaching and Learning." This research study is about the role of educational technology in helping to reduce educational disparities by providing greater equitable opportunities and access to resources. The purpose of this study is to better understand the types of educational technology currently being used by primary school teachers while examining the impact that these technology applications have on student academic achievement. You can choose to participate in this research study if you are at least 18 years old and a primary school teacher within Coppell ISD or Plano ISD; have experience using any type of educational technology, including computers, multimedia, interactive whiteboards, and other technology applications used to enhance teaching and learning; are English-speaking; and you can provide voluntary informed consent.

You might want to participate in this study if you want to contribute your perspective to a scientific study involving evidence-informed approaches to incorporate various educational technology applications into course curriculum to provide effective teaching and better learning opportunities, especially for low-income and minority children. However, you might not want to participate if you are not able to commit to completing a telephone interview (during off-contract hours) that may last approximately 45 to 60 minutes. Your decision about whether to participate is entirely up to you. If you decide not to be in the study, there won't be any punishment or penalty; whatever your choice, there will be no impact on any benefits or services that you would normally receive. Even if you choose to begin the study, you can also change your mind and quit at any time without any consequences.

If you decide to participate in this research study, you will be asked to complete a telephone interview about your perception of the use of technology to support learning and teaching and the effect of educational technology applications on students' academic achievement. Telephone interviews last approximately 45 to 60 minutes. You will also be contacted by email potentially 2-4 months after the telephone interview to electively participate in member-checking where you will be asked to read your transcript and a summary of the themes developed and provide feedback. Member-checking may take an additional 30 minutes. You do not have to participate in member-checking to participate in the telephone interview. These research findings will provide shared experiences and commonalities among teachers who use technology effectively in their practice, thus, providing evidence-based approaches to technology integration, which could ensure that all students have equal access to educational

resources and opportunities that support academic success, regardless of their cultural and socioeconomic background. Additionally, the study activities are not expected to pose any additional risks beyond those that you would normally experience in your regular everyday life.

Taking part in this study is voluntary. If you agree to take part and then change your mind, you can withdraw for any reason. Declining to participate and/or withdrawing will not prejudice your present or future relations with Coppell ISD, Plano ISD, or UT Arlington. In case you would like to withdraw, you may notify the primary investigator by email. If you decide to do this, all of your information will be destroyed. You will not be paid for completing this study. There are no alternative options to this research project.

The research team is committed to protecting your rights and privacy as a research subject. Telephone interviews will be audiotaped for accuracy but will be destroyed after transcribed by the researcher. We may publish or present the results, but your name will not be used. While absolute confidentiality cannot be guaranteed, the research team will make every effort to protect the confidentiality of your records as described here and to the extent permitted by law. If you have questions about the study, you can contact me at kelli.rogers@uta.edu. For questions about your rights or to report complaints, contact the UTA Research Office at 817-272-3723 or regulatoryservices@uta.edu.

You are indicating your voluntary agreement to participate by answering "yes" to the following statements. By answering "yes," you have not given up any of your legal rights or released anyone from liability for negligence, and you are at least 18 years of age.

☐ I have been read this consent form.

☐ I have been given a chance to ask questions about the research study and the procedures involved. I believe that I have enough information to make my decision.

☐ I understand that, while this project has been reviewed by CISD and PISD, neither CISD nor PISD is conducting the project activities.

☐ I agree to give my consent to take part as a subject in this research project.

☐ I give my permission to be audio recorded.

Appendix D.

The University of Texas at Arlington (UTA)

Informed Consent for Minimal Risk Studies with Adults

My name is Kelli Rogers, and I am asking you to participate in a UT Arlington research study titled, "A Qualitative Phenomenological Exploration of Teachers' Perceptions of the Impact of Educational Technology on Teaching and Learning." This research study is about the role of educational technology in helping to reduce educational disparities by providing greater equitable opportunities and access to resources. The purpose of this study is to better understand the types of educational technology currently being used by primary school teachers while examining the impact that these technology applications have on student academic achievement. You can choose to participate in this research study if you are at least 18 years old and a primary school teacher within Coppell ISD or Plano ISD; have experience using any type of educational technology, including computers, multimedia, interactive whiteboards, and other technology applications used to enhance teaching and learning; are English-speaking; and you can provide voluntary informed consent.

You might want to participate in this study if you want to contribute your perspective to a scientific study involving evidence-informed approaches to incorporate various educational technology applications into course curriculum to provide effective teaching and better learning opportunities, especially for low-income and minority children. However, you might not want to participate if you are not able to commit to taking an online survey that will take up to 15 minutes to complete. Your decision about whether to participate is entirely up to you. If you decide not to be in the study, there won't be any punishment or penalty; whatever your choice, there will be no impact on any benefits or services that you would normally receive. Even if you choose to begin the study, you can also change your mind and quit at any time without any consequences.

If you decide to participate in this research study, you will be asked to complete an online survey that should take no longer than 15 minutes. These research findings will provide shared experiences and commonalities among teachers who use technology effectively in their practice, thus, providing evidence-based approaches to technology integration, which could ensure that all students have equal access to educational resources and opportunities that support academic success, regardless of their cultural and socioeconomic background. Additionally, the study activities are not expected to pose any additional risks beyond those that you would normally experience in your regular everyday life. You will not be paid for completing this study. There are no alternative options to this research project.

The research team is committed to protecting your rights and privacy as a research subject. We may publish or present the results, but your name will not be used. While absolute confidentiality

cannot be guaranteed, the research team will make every effort to protect the confidentiality of your records as described here and to the extent permitted by law. If you have questions about the study, you can contact me at kelli.rogers@uta.edu. For questions about your rights or to report complaints, contact the UTA Research Office at 817-272-3723 or regulatoryservices@uta.edu.

You are indicating your voluntary agreement to participate by clicking on the "Accept" button below.