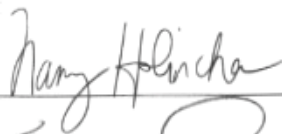


EMERGENT DIGITAL EQUITY: EXPLORING EDUCATORS' PERSPECTIVES
AND APPLICATIONS IN LEARNING TECHNOLOGIES AND MULTICULTURAL
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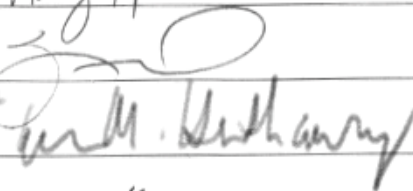
by

Laura L. Godlewski-Faltynski
A Dissertation
Submitted to the
Graduate Faculty
of
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in Partial Fulfillment of
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of
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Education

Committee:



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Emergent Digital Equity: Exploring Educators' Perspectives and Applications in
Learning Technologies and Multicultural Education

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Doctor of Philosophy at George Mason University

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Dedication

This dissertation is dedicated to my faith and family. Specifically:

To my four beautiful children: David, Eleanor, Abigail, and Katherine. You were only twinkles in my eyes when I started this dissertation almost seven years ago and though you did not earn any official college credit, you were a big part of the journey from attending classes with me to “helping” me with my homework. I dream that the field of critical theory continues to grow, and you play a role in pushing our world to become a more inclusive place for all.

To my parents, Ann and David. Your boundless encouragement continues to inspire me every day.

To my sisters, Sarah and Ana, as they have always championed me on.

To my former students. You were the inspiration that started all this and kept me motivated.

To my husband, Matthew John. Words cannot express my appreciation for your love and support to accomplish my dreams.

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List of Abbreviations

Professional Learning Experience	PLE
Critical Race Theory	CRT
Latino/Latina Critical Theory	LatCrit
National Center for Education Statistics	NCES
Culturally Relevant Pedagogy	CRP
Critical Multicultural Education Competencies Scale	CMECS
Technology Proficiency Self-assessment Questionnaire for 21 st Century Learning .	TPSA-
C21	
Science Technology Engineering and Math	STEM
Guided Language Acquisition Design	GLAD
English Learner	EL
Individualized Education Plan	IEP

Abstract

EMERGENT DIGITAL EQUITY: EXPLORING EDUCATORS' PERSPECTIVES AND APPLICATIONS IN LEARNING TECHNOLOGIES AND MULTICULTURAL EDUCATION

Laura L. Godlewski-Faltynski, Ph.D.

George Mason University, 2023

Dissertation Director: Dr. Nancy Holincheck

This dissertation is a multiple-case study that examines educators' perspectives and applications in learning technologies, multicultural education, and how they intersect to support digital equity. Technology is evolving and has become essential in a learning environment (e.g., Graham et al., 2019; Gronseth et al., 2020; Howard et al., 2018). As classrooms in the United States become increasingly more diverse, there is a need to understand how educators are applying equity and technology together (e.g., Burbules et al., 2020; Dolan, 2016; Gorski, 2009; U.S. Department of Education, 2020). Digital equity is an equity-centered approach that seeks to improve students' access to learning technologies, and advance classroom practices, curriculum applications, and educator beliefs with the intent to resolve the digital divide and prepare students to succeed in a technology-driven society. There has been little empirical research on multicultural education, learning technologies, digital equity, and the relationships between them. Four

current educators participated in interviews on how they view and incorporate multicultural education, learning technologies, and digital equity. Key findings include: (1) digital equity was defined and applied as equal access to resources, (2) learning technologies and multicultural education were viewed separate from digital equity, (3) the relationship between learning technologies and multicultural education was challenging to describe, and (4) learning technologies and multicultural education intersected, but not with the purpose to support digital equity. The data indicate that digital equity is emerging as it is partially implemented in the classroom, and there is a need to modernize and expand professionally learning experiences (PLEs) as educators require more support and guidance to transform their knowledge and skills in multicultural education, learning technologies, and digital equity.

Chapter One

As U.S. classrooms become increasingly diverse and technology-centric, there is a pressing need for education researchers to examine how teachers understand and apply equity and technology in the classroom. Critical theories, digital equity, multicultural education, and learning technologies are rarely examined in tandem, but this examination must be done to understand the complexities of teaching and learning in the 21st century.

Critical theories are foundational components to creating equity in education, and numerous theories are founded in critical theory, such as culturally sustaining pedagogy (CSP) or multicultural education (e.g., Freire, 1970; Ladson-Billings & Tate, 1995; Nieto & Bode, 2018; Paris & Alim, 2017). Similar to critical theories, learning technologies are essential in transforming education for students (e.g., Graham et al., 2019; Gunkel, 2003; Howard et al., 2018; Larson & Miller, 2011; Patterson, 2005; Ravi, 2018). Researchers have identified a need to integrate both critical theories and learning technologies into the classroom as they both have been found to positively impact students; technology scholars have been called on to take a critical perspective on their field by considering how through technology and technology education they can honor other cultures, assess power structures, and foster multiple perspectives (e.g., Darling & Irvin, 2005; Glassett & Schrum, 2009; Gorski, 2009; Gronseth et al., 2020; Patterson, 2005).

Despite the need to integrate both technology and critical theories into the curriculum, they are often viewed as separate areas of study and there are significant gaps in access to technology and how it is being applied in the classroom (e.g., Howard et al., 2018; Judge et al., 2004; Resta & Laferrière, 2015). The concept of *digital equity* (e.g., Howard et al., 2018; Judge et al., 2004; Resta et al., 2018) may support bridging those gaps by addressing how technology is distributed and integrated into the classroom—however, there are dimensions that have been identified as crucial to digital equity that have not yet been explored deeply, such as multicultural education (e.g., Gorski, 2009; Gronseth et al., 2020; Resta et al., 2018). The purpose of chapter one is to provide background information on the concepts of multicultural education, critical theory, and learning technologies, and to identify the purpose and scholarly significance of a research study on digital equity.

Background of the Problem

Major transformations in U.S. politics, technology, and student demographics have led to the paradigm shift occurring in education (e.g., Burbules et al., 2020; U.S. Department of Education, 2020). The U.S. is experiencing multiple policy changes in health and education. Student demographics are becoming more diverse, and technology is rapidly evolving. Numerous scholars have argued the best way to support our students in this changing climate is through asset-based pedagogies, digital equity, and critical cultural-competency-focused strategies (e.g., Gorski, 2016; Howard et al., 2018; Paris & Alim, 2017).

Changes to Student Demographics and the Call for Cultural Competency

According to a 2020 report from the Department of Education, 41% of the U.S. student population is Black or Latinx and they predict this to increase to 44% of the student population by 2028 (U.S. Department of Education, 2020). The National Center for Education Statistics (U.S. Department of Education, 2020) expect the percentage of White students will continue to decrease and the percentage of students of color will increase. The U.S. Department of Education (2019a) identified that 80% of public-school teachers are White, and while the student population is evolving, the demographics of teachers have not changed as most teachers are still predominantly White (U.S. Department of Education, 2019b). When isolated, a mismatch of teacher and student demographics does not automatically indicate a problem, but multiple research studies have found preservice and current teachers feel unprepared to teach students with backgrounds different from their own (e.g., Achinstein & Athanases, 2005; Marshall, 2001).

Many scholars have argued that White teachers have not received the appropriate training to effectively teach students with different backgrounds other than their own, which results in lower performance scores (e.g., Haberman, 1995; Hirsch, 2005; Redding, 2019). A plethora of cultural competency approaches and teacher learning experiences have been identified to mitigate these concerns and improve teachers' ability to integrate students' culture into the classroom (e.g., Banks, 1996; Oats, 2003; Paris & Alim, 2017). Examples of cultural competency approaches include culturally responsive pedagogy,

social-justice practices, and multicultural education (Darling-Hammond et al., 2002; Gay, 2002; Nieto, 1996).

Cultural Competency and Critical Theory

Cultural competency approaches stem from critical theories. Critical theory is an expansive area of study with many different branches, definitions, terms, and applications from property rights to education (e.g., Butler, 2009; Dixson & Rousseau, 2005; hooks, 1994). Despite the comprehensive range of critical theories, they all focus on investigating inequities, questioning policies and processes, and interrogating systems of power. (e.g., Delgado Bernal, 2002; Kendi, 2019; Lynn et al., 2013). The purpose of applying critical theories in education is to continually examine bias and injustice and to then take that knowledge to disrupt current power structures to improve education and society (e.g., Freire, 1998; hooks, 1994; Lynn et al., 2013). The goal of cultural competency approaches is centralized around the same objectives as critical theories but with specific techniques that teachers can apply to their classrooms to positively impact their students and student achievement (e.g., Grant & Sleeter, 2011; Moore, 2010; Paris & Alim, 2017). Since cultural competency approaches are founded in critical theories, the term *critical theories* will be used when referencing both cultural competency approaches and critical theories.

Approaches to Cultural Competence in Education. CSP, social justice, and multicultural education are the three main types of cultural competency approaches explored within this research (e.g., Coppola et al., 2019; Drago-Severson & Blum-DeStefano, 2017; Gay, 1994). CSP is a type of student-centered, cultural competency

approach that positively integrates students' culture in the classroom with goals to continuously identify inequities, address deficit beliefs, and transform society (e.g., Ladson-Billings, 2014; Paris & Alim, 2017). The purpose of CSP is to integrate students' cultures into the curriculum and challenge students to identify and address inequities in society (Paris & Alim, 2017). Social justice is a type of student-centered, cultural competency approach with the goal of empowering students for social change by teaching them about inequities and how to resolve them (e.g., Carlisle et al., 2006; Grant & Gibson, 2013; Nieto, 2013). The goal of social justice in education is to teach students about injustices and encourage students to find solutions (Darling-Hammond et al., 2002). Multicultural education is a type of student-centered, cultural competency approach with the goal of maximizing student achievement with a focus on learning and celebrating different backgrounds to promote tolerance and advocate for social justice (e.g., Gay & Howard, 2000; May & Sleeter, 2010). The objective of multicultural education includes building acceptance by learning about other cultures and effective activism (e.g., Banks, 1989; Gay & Howard, 2000; Nieto, 1996). Several scholars have specifically identified that multicultural education is critical for the achievement and advancement of students due to the increase in diversity in the U.S. school population and the U.S. becoming a more globalized society (e.g., Banks, 2019; May & Sleeter, 2010; Nieto & Bode, 2018). There are similarities between CSP, social justice, and multicultural education, but there are also distinct differences. Multicultural education will be the primary cultural-competency strategy explored in this dissertation because

numerous scholars have identified that it positively impacts students, and it incorporates many aspects of CSP and social justice.

Equity is a term used by some researchers to refer to all concepts surrounding culture and social justice, including multicultural education or CSP (e.g., Gorski, 2016; Smith et al., 2017). For the remainder of this paper, the term *equity* will be used to collectively describe all cultural competency approaches as it embodies the idea that an equitable classroom creates a space where all students succeed and inequities are addressed (e.g., Gorski, 2016; Smith et al., 2017).

Numerous research studies have established that it is challenging to understand and analyze critical theories and apply cultural competency approaches into the classroom (e.g., Matias & Mackey, 2016; Philip, 2014; Tatum, 1992). Researchers have found that teachers who struggled with critical theories and cultural competency approaches were reluctant to believe inequities existed in society, or they understood them but were unwilling to apply them in the classroom (e.g., Drago-Severson & Blum-DeStefano, 2017; Matias & Mackey, 2016; Nash, 2013). Though building a critical mindset and curriculum is difficult work, professional learning can help preservice and current teachers comprehend and integrate critical theories into the classroom (e.g., Bustos Flores et al., 2018; Jacob et al., 1996; Lin et al., 2008). *Professional development* is a common term to describe required learning opportunities for educators, but for the purpose of this paper, the term *professional learning experiences* (PLEs) will be used as Prestridge (2019) argued professional development is typically in person and required training on any topic, but professional learning is a more comprehensive term to describe

any educational experience that may be autonomous and includes online and in-person opportunities. According to the literature, specific PLEs or strategies that have been found to support teacher growth include self-reflection, classroom practice experiences, and collaboration (e.g., Howard & Navarro, 2016; Philip, 2014; Rice Doran, 2010).

Changes to Learning Technologies and the Call for Digital Equity

Technology and learning technologies are evolving in the classroom. Technology is considered an essential component to the classroom as it increases student achievement (by improving student engagement, enhancing learning efficiencies, and creating a more individualized learning environment), provides opportunities for digital citizenship, prepares students for workforce readiness, and provides personalized learning experiences (e.g., Eyyam & Yabatan, 2014; Gronseth et al., 2020; Howard et al., 2018). Many terms are used when describing technology in the classroom, and all digital technology used for educational purposes will be referred to as *learning technologies* in this paper (e.g., Oliver, 2000; Rushby & Surry, 2016). Although many teachers effectively integrate learning technologies in the classroom, some teachers resist incorporating learning technologies into the classroom as they may not believe such technologies will positively impact student learning or they may not feel comfortable with managing the technology (e.g., Bame et al., 1993; Ertmer & Ottenbreit-Leftwich, 2010; Lindberg et al., 2017). Teachers who do not believe in the impact of technology or struggle with *digital competence* are less likely to use it in their classroom (e.g., O'Dwyer, 2004; Ravitz et al., 2000). There are other terms to describe digital competence, such as digital literacy or digitally skilled, but for this paper the term *digital*

competence will be used, as the definition is more extensive and includes perceptions as well as information (Aesaert et al., 2013; Ferrari, 2012; McGarr & McDonagh, 2019).

Inequities exist in other areas of education, including access to funding, more experienced teachers, and technology (Irwin et al., 2021; Knight, 2019). The term *digital divide* refers to technology inequities that persist between districts and states, including access to computers, the internet, and the quality of technology instruction received (e.g., Dolan, 2016; Howard et al., 2018; Willems, 2019). The unexpected change to virtual learning in 2020, prompted by the COVID-19 pandemic, led to most U.S. students being provided computers by their schools, though there was still evidence of inequities in terms of access to the internet (Irwin et al., 2021; National Center for Educational Statistics, 2006).

Problems with access to technology is not limited to students' connections to computers or the internet, but they also include inequitable incorporation of technology as students are not always engaging with technology in creative and meaningful ways (e.g., Judge et al., 2004; Resta et al., 2018). Technology can positively impact students when teachers effectively integrate it into the classroom, such as creating with a computer instead of using it to review content (e.g., Eyyam & Yaratan, 2014; Ravitz et al., 2000). Teachers are more likely to create meaningful encounters with technology when they believe in the importance of technology and have developed digital competence (e.g., Falloon, 2020; O'Dwyer, 2004). Digital equity embraces both aspects of the digital divide and digital competence, as it calls for equity in all areas of learning technologies including access, classroom practices, curriculum applications, and teacher beliefs (e.g.,

Howard et al., 2018; Ravi, 2018). Researchers have identified that digital equity should be integrated into classroom practices and curriculum applications through the cultural competency approaches of digital citizenship, CSP, and multicultural education (e.g., Gronseth et al., 2020; Howard et al., 2018; Normore & Issa Lahera, 2019).

The literature on digital equity has defended and explained the importance of students obtaining access to high-quality technology and instruction as they can improve student achievement, digital citizenship, workforce readiness, and personalized learning opportunities (e.g., Bevins et al., 2012; Gronseth et al., 2020; Howard et al., 2018).

Despite this established need for digital equity in the classroom, there is limited empirical research on this topic.

Purpose of the Study

Marshall (2001) investigated the relationship between multicultural education and learning technologies and commented that multicultural education may conflict or enrich when merged with technology but felt it was too early to tell. Now decades later, there are significant calls in the research to better understand digital equity, specifically on how it is being implemented into the classroom (e.g., Dolan, 2016; Gorski, 2009). Darder (2012) stated that “educators also need to become more critical in their assessment of multicultural curricula and activities with respect to the consequences of their use in the classroom” (p. 287). Based on the minimal research on the application of digital equity in educational settings, there appears to be a need to conduct additional studies on multicultural education and learning technologies in the classroom with numerous future

research opportunities that could include understanding teachers' perspectives, students' perspectives, or how they impact student learning.

The purpose of this dissertation is to expand the literature on digital equity by exploring teachers' perspectives and applications on learning technologies and multicultural education. With a goal of understanding how multicultural education in learning technologies extends beyond issues of access, I interviewed educators, evaluated learning technologies, and identified how learning technologies and multicultural education are viewed and applied in the classroom. This dissertation contributes to the work done at the intersection of critical theories, learning technologies, and digital equity as it investigates current technology classroom applications and creating equitable education through technology and multicultural education.

Research Questions

The following research questions will be addressed in this study:

1. How do educators perceive multicultural education, learning technologies, and digital equity in education?
2. How do educators incorporate multicultural education, learning technologies, and digital equity into the classroom?
3. How do learning technologies and multicultural education intersect to support digital equity?

Significance of the Study

The U.S. student population is becoming more diverse, and technology is continuously becoming a more integral part of society (e.g., Gorski, 2009; Trust, 2018;

U.S. Department of Education, 2019a). Students must engage with learning technologies within their schools to understand how to navigate and manage technology in their daily lives. The goals of digital equity can prepare students for 21st-century living by providing them access to learning technologies, advancing classroom practices and curriculum applications, and expanding teacher beliefs (e.g., Judge et al., 2004; Howard et al., 2018; Resta et al., 2018). Multicultural education is vital when supporting students in this changing environment as it celebrates differences, promotes tolerance, and advocates for social justice (e.g., Banks, 2019; Nieto & Bode, 2018). Multicultural education is one of digital equity's classroom practices and curriculum applications, but there is a lack of empirical studies examining current teachers' perspectives on multicultural education within digital equity and learning technologies.

The purpose of this dissertation is to explore educators' perspectives and applications of digital equity through learning technology and multicultural education theory. These areas of study are interconnected, but they have never been researched together. There is a growing need to understand digital equity, and this dissertation provides insight into an area that has never been researched before—how educators are engaging with multicultural education and learning technologies within their classroom. The findings and conclusions of this study have numerous implications on digital equity, multicultural education, learning technologies, and the relationships between them.

Definition of Terms

- **Culturally Sustaining Pedagogies (CSP):** A type of student-centered, cultural competency approach that positively integrates students' culture in

the classroom with goals to continuously identify inequities, address deficit beliefs, and transform society.

- **Digital divide:** The difference in access between individuals or groups of people with any type of technology (Ravi, 2018).
- **Digital equity:** An equity-centered approach that seeks to improve students' access to learning technologies and advance classroom practices, curriculum applications, and teacher beliefs with the intent to resolve the digital divide and prepare students to succeed in a technology-driven society.
- **Equity:** A term that includes all student-centered, cultural-competency educational theories that focus on addressing inequalities and empowering all students to succeed.
- **Learning technology:** Any piece of digital technology used for learning purposes to transform students' educational experience (e.g., the internet, computers, program applications).
- **Multicultural education:** A type of student-centered, cultural competency approach with the goal to maximize student achievement that focuses on learning and celebrating different backgrounds to promote tolerance and advocate for social justice.
- **Professional learning:** Any educational opportunity that supports teacher learning. This learning can occur at any time and in any environment (e.g., required in-person professional development or self-teaching through an online platform).

- **Social justice:** A type of student-centered, cultural competency approach with the goal to empower students for social change by teaching them about inequities and how to resolve them.

Chapter Two

Critical theory and learning technologies are not frequently studied together, but both are considered essential to supporting students and student achievement (e.g., Hirsch, 2005; Nieto, 2013; Wassell & Crouch, 2008). Understanding the relationships between critical theory and learning technologies will provide insight into digital equity and how teachers can optimize learning technologies in their classrooms. The purpose of chapter two is to investigate critical theories, learning technologies, and digital equity; the relationships between them; and gaps in the research. This chapter is divided into seven major sections: (1) critical theories, (2) critical theory and professional learning, (3) learning technologies and education, (4) the digital divide, (5) digital equity, (6) critical theory and learning technologies connections, and (7) digital equity gaps. Each section will provide foundational information and explore the research to understand critical theory, digital equity, and the interactions between them.

Critical Theories

As identified earlier in chapter one, critical theory is an expansive area of study with many different branches, definitions, terms, and applications from property rights to education (e.g., Butler, 2009; Dixson & Rousseau, 2005; hooks, 1994). The extensive list of critical-theory branches includes Critical Race Theory (CRT), Latino/Latina Critical Theory (LatCrit), and feminist theory, and the definitions change depending on the branch (e.g., Butler, 2009; Delgado Bernal, 2002). For example, one area of critical theory is critical race pedagogy (Lynn, 1999). Critical race pedagogy stems from multiple

critical theories, including CRT, CRT in education, and critical pedagogy (e.g., Freire, 1970; Ladson-Billings & Tate, 1995; Matsuda et al., 1993). Lynn (1999) defined critical race pedagogy as “as an analysis of racial, ethnic, and gender subordination in education that relies mostly on the perceptions, experiences, and counterhegemonic practices of educators of color” (p. 615). Though there are many different critical-theory definitions, they centralize around examining power structures, asking questions, identifying inequities, and actively resisting inequalities to improve education and society (e.g., Delgado Bernal, 2002; Lynn et al., 2013; Matias et al., 2014). Critical terms such as *positionality*, *conscientization*, *self-actualization*, and *critical consciousness* describe perspectives and actions that can be taken. There are four main themes seen throughout the literature on critical theory in education that will be explored in more detail below: (1) narratives and storytelling in critical theories, (2) challenges with understanding and applying critical theory, (3) critical theories call to action, and (4) critical theories diverse applications.

Narratives and Storytelling in Critical Theories

Narratives, personal stories, counternarratives, and counter stories are significant in critical theory, and it is imperative to listen deeply with intent to learn from other people’s stories (e.g., Delgado Bernal, 2002; Dixson & Rousseau, 2006; Freire, 1998; Stovall, 2016). Freire (1998) argued the importance of listening and there is “no teaching without learning” (p. 31). Cervantes-Soon (2012) used *testimonios* of two high school females in Ciudad Juárez, México, to shed light on their identity development and

experiences growing up. By exploring their stories, Cervantes-Soon (2012) exposed the failures of the schools and identified ways to improve them.

Challenges With Understanding and Applying Critical Theory

It is essential for teachers to integrate critical theories into the classroom, but critical theories and critical-theory work is challenging to understand and apply (e.g., Matias & Mackey, 2016; Philip, 2014; Tatum, 1992). Researchers that studied the outcome of professional learning experiences (PLEs) have found that some individuals may experience resistance to or dissonance with critical theories (e.g., Dodman et al., 2018; Matias & Mackey, 2016; Tatum, 1992). For example, Matias et al. (2014) conducted a study with preservice teachers to develop a better understanding of their whiteness. The participants completed a mandatory course on CRT, and Matias et al. (2014) found the preservice teachers continually resisted their participation in their whiteness. The researchers suggested that future preservice programs need to include ongoing opportunities that continue throughout the program to deeply interrogate preservice teachers' whiteness and incorporate social justice. This resistance is noted in other research as well when Philip (2014) conducted a study with Asian American preservice teachers that were in a social-justice-focused education program. Philip (2014) identified that the education courses were not successful in advancing the perspectives of the preservice teachers and their identity development as Asian Americans did not change. Each preservice teacher demonstrated different challenges with their identity development, such as Brook who had not yet "problematized her identity as a 'White Asian'" (p. 235). Philip (2014) argued this lack of racial-identity growth within the

participants was due to the curriculum's focus on interrogating White preservice teachers' identity and did not provide opportunities or discussions for Asian American preservice teachers to explore their racial-identity.

Critical Theories Call to Action

A theme throughout the literature on critical theory is calling others to act and address inequities in society, though the specific actions called for may differ (e.g., Freire, 1998; Kendi, 2019; Rodríguez, 2012). For example, Kendi (2019) called for people to actively engage and be an antiracist. Freire (1998) challenged educators with many actions, including critical reflection, becoming lifelong learners, and the importance of vulnerability. Critical reflection is noted as an important aspect in educator development as the literature repeatedly claims that teachers cannot create an equity classroom without first reflecting upon and addressing their own biases (e.g., Drago-Severson & Blum-DeStefano, 2017; Hayes & Juárez, 2012; Howard, 2003; Puzio et al., 2017). Critical self-reflection is also challenging due to a person's racial awareness and fear around addressing biases, specifically with White teachers who do not want to be labeled as racist or intolerant (e.g., Helms, 1990; Howard & Navarro, 2016; Trzupek, 2018).

Critical Theories Diverse Applications

Critical theories are applied and used in educational research in a variety of ways, including as theoretical perspectives, analytical frameworks, or a methodology (e.g., Cervantes-Soon, 2012; Lynn, 1999; Solórzano & Yosso, 2002). It is crucial to understand critical theories and their histories as they are the foundation for many other theories in

culture and education, such as CSP or critical multicultural education. The following sections will explore these theories and research applications.

Critical Theories on Education and Culture

Education is centered around the concepts of teaching and learning, and there are a variety of opinions and contrasting explanations of what teaching and learning should be (Biesta & Stengel, 2016; Kafka, 2016). Dewey (2017) believed that students are dynamic with individual characteristics influenced by the society around them; therefore, schools must replicate the lives of the students, and the education provided should focus on the advancement of our society. Since the early 1900s, this belief in student-centered learning has been expanded to other cultural-competency educational applications such as CSP (Paris & Alim, 2017), funds of knowledge (González et al., 2005), and critical multicultural education (May & Sleeter, 2010).

Numerous educational experts have argued the key to student success is through student-centered, cultural strategies such as CSP, critical multicultural education, or social justice (e.g., Delpit, 2006; May & Sleeter, 2010; Nieto, 2013; Paris & Alim, 2017). This is of particular importance to student achievement, especially when considering student-teacher demographics (May & Sleeter, 2010). As previously identified in chapter one, the National Center for Education Statistics (NCES) reports the majority of teachers are White (U.S. Department of Education, 2019a), and in contrast, the majority of students are students of color (U.S. Department of Education, 2019b). The NCES expects student demographics to become increasingly more diverse each year but anticipates teacher demographics to remain the same (U.S. Department of Education, 2019a; U.S.

Department of Education, 2019b). Teachers have reported being resistant to cultural strategies or feeling unprepared to teach students from diverse backgrounds (e.g., Ndemanu, 2018; Nieto, 2013). Numerous scholars have argued the best way to support our students in this changing climate is through asset-based pedagogies and equity-focused strategies (e.g., Emdin, 2011; Gorski, 2016; Howard, 2001; Ladson-Billings, 2009; Paris & Alim, 2017). CSP, social justice, and critical multicultural education are three main areas in the literature that address critical theories on culture in education and will be explored in the following paragraphs.

Culturally Sustaining Pedagogy. In 1995, Ladson-Billings published her work on *culturally relevant pedagogy* (CRP). CRP is focused on viewing students' cultures as assets and incorporating them into the classroom so that students will be engaged and successful. CRP has expanded into other asset-based pedagogies, including *culturally responsive pedagogy* (Gay, 2002) and *funds of knowledge* (González et al., 2005). It has been more than 20 years since the introduction of CRP and there became a need to modernize CRP due to misinterpretations of its objectives and changes in the educational system (e.g., Ladson-Billings, 2014; Puzio et al., 2017). In 2017, Paris and Alim updated CRP with CSP. Paris and Alim (2017) explained, "CSP seeks to perpetuate and foster—to sustain—linguistic, literate, and cultural pluralism as part of schooling for positive social transformation" (p. 1). CSP still incorporates students' cultures into the classroom, but Paris and Alim (2017) expanded CSP to focus on the impact of *White gaze* (Public Broadcasting Service, 2020) and the need to restructure the entire educational system to create learning environments that are dynamic and evolve according to the students'

needs. White gaze “assumes whiteness as the primary referent of power, prestige, and progress across the world” (Pailey, 2020, p. 733). CSP believes it is crucial for students to examine cultures critically, identify the inequities that exist (e.g., hip-hop culture is extremely male-centric), and tackle those inequities (Paris & Alim, 2017). CSP has taken the critical foundational components of CRP and expanded them to help transform education and U.S. culture to create a more equitable society (Paris & Alim, 2017).

Social Justice. The purpose of social justice in education is to empower students for social change by teaching them about inequities and how to resolve them (Darling-Hammond et al., 2002). Nieto (2013) argued that “teachers often feel unprepared to teach students of diverse backgrounds ... what is often missing is teaching from a social justice perspective” (p. 2). In academia, social justice is theorized and studied as its own student-centered, cultural-competency educational approach, but it is also used as an action to support other cultural-competency educational approaches, such as multicultural education (e.g., Cameron & Humbert, 2020; Gorski & Parekh, 2020; Grant & Gibson, 2013; Zajda et al., 2006). Carlisle et al. (2016) conducted a study in which they explored key principles of social justice in education and defined social-justice education “as the conscious and reflexive blend of content and process intended to enhance equity across multiple social identity groups (e.g., race, class, gender, sexual orientation, ability), foster critical perspectives, and promote social action” (p. 57). Carlisle et al. (2016) viewed and studied social justice as its own cultural-competency educational approach, but there are other cultural-competency educational approaches that use social justice as part of its descriptions. Multicultural education is one of the more popular cultural-competency

educational approaches and uses social justice as part of its descriptions (e.g., Banks, 2019; Nieto & Bode, 2018). For example, Nieto and Bode (2018) identified seven characteristics to multicultural education, and one of them is “multicultural education is education for social justice” (p. 32). Social justice may be defined or applied in education in different ways, but scholars consistently agree throughout the literature that social justice is critical to the development of students, and teachers must be able to reflect upon and challenge their own biases to effectively teach social justice in the classroom (e.g., Drago-Severson & Blum-DeStefano, 2017; Nieto, 2013).

Critical Multicultural Education. Critical multicultural education is a type of student-centered, cultural-competency educational approach with the goal to maximize student achievement (e.g., Gay & Howard, 2000; May & Sleeter, 2010). *Critical Multicultural Education* (May & Sleeter, 2010) is an updated term from multicultural education (e.g., Banks, 1989; Nieto, 1996; Sleeter, 2005). Critical multicultural education is when a teacher integrates multiple cultures into the classroom so that students may understand and celebrate different backgrounds to promote tolerance and learn how to advocate for social justice (May & Sleeter, 2010). Researchers have identified that it is essential for preservice teachers and current educators to understand and implement multicultural education into the classroom, and it is a key characteristic of excellent teaching due to the positive impact it has on students and student achievement (e.g., Gay, 1994; Grant & Sleeter, 2011). Nieto and Bode in 2018 defined multicultural education as:

A process of comprehensive school reform and basic education for all students. It challenges and rejects racism and other forms of discrimination in schools and

society and accepts and affirms the pluralism (ethnic, racial, linguistic, religious, economic, gender, and sexual orientation, among others) that students, their communities, and teachers reflect. Multicultural education permeates the school's curriculum and instructional strategies as well as interactions among teachers, students, and families and the very way that schools conceptualize the nature of teaching and learning. Because it uses critical pedagogy as its underlying philosophy and focuses on knowledge, reflection, and action (praxis) as the basis for social change, multicultural education promotes democratic principles of social justice. (p. 32)

Nieto and Bode (2018) identified the seven characteristics of multicultural education:

“Multicultural education is antiracist education. Multicultural education is basic education. Multicultural education is important for all students. Multicultural education is pervasive. Multicultural education is education for social justice. Multicultural education is a process. Multicultural education is critical pedagogy” (p. 32).

Multicultural education has been misunderstood and misapplied in the classroom, as educators will frequently reinforce stereotypes and limit the study of other cultures to only learning about different foods and festivities (May & Sleeter, 2010). Researchers have different beliefs about the causes behind educators' misinterpretations of multicultural education (e.g., Gorski, 2016; May & Sleeter, 2010). For example, May and Sleeter (2010) argued that critical multicultural education is implemented into the classroom incorrectly because it requires educators to be aware of inequities and power struggles, and instead, educators use multicultural education as a tool to assimilate

students to the majority culture. Gorski (2016) identified the application problem with multicultural education is due to the limitations of the term *culture*. According to Gorski (2016), culture is just “one dimension of people’s complex identities” (p. 223) and encouraging educators to focus on culture is narrowing their perspectives to just one aspect of a student. Gorski (2016) recommended instead to focus on the student’s entire identity to address inequalities.

May and Sleeter (2010) claimed these misinterpretations can be addressed by clarifying the objectives behind multicultural education through rebranding multicultural education with the name *critical multicultural education*. Critical multicultural education should teach students not only about cultures different than their own but also incorporate direct conversations about inequities, the role of power, and social-justice actions to ensure the true objectives of multicultural education are achieved (May & Sleeter, 2010). For the purpose of this dissertation, the term *multicultural education* will be used to describe both critical multicultural education and multicultural education because it is the most commonly used term in the field (e.g., Nieto & Bode, 2018; Wassell & Crouch, 2008).

Multicultural Education Competency Scales. Multicultural education is a foundational element to achieving teacher excellence and student achievement (e.g., Nieto & Bode, 2018), so it is important to have established evaluations that measure multicultural education to ensure the objectives are being met (e.g., Jones & Walker, 2017). There are multiple methods to measure teachers’ multicultural competence as numerous researchers have been studying various instruments and tools to evaluate

multicultural education (e.g., Acar-Ciftci, 2016; Jones & Walker, 2017; Monroe & Pearson, 2006). For example, Spanierman et al. (2011) developed a Multicultural Teaching Competency Scale that measures teachers' multicultural competency. To assess this scale, Spanierman et. al (2011) collected data from 506 preservice and current teachers using three connecting studies: an exploratory analysis with about half the participants, a confirmatory factor analysis with the other half, and a survey with a subsample to address construct validity. Spanierman et. al (2011) found the internal consistency and validity measures were acceptable, and the scale was appropriate for evaluating multicultural competency. Another evaluation tool, the Critical Multicultural Education Competencies Scale (CMECS), measures a person's multicultural competencies using the works of CRT and critical multicultural education (Acar-Ciftci, 2016). The purpose of the CMECS is to measure a teacher's awareness, attitude, knowledge, and skill on critical multicultural education (Acar-Ciftci, 2016).

Multicultural Education Information Material Checklist. Teachers feel unprepared to teach students with backgrounds different from their own, and yet there are numerous resources available to teachers on how to integrate multicultural education into the classroom (e.g., Achinstein & Athanases, 2005; Marshall, 2001; May & Sleeter, 2010). Banks (2019) developed a "Checklist for Evaluating Informational Materials" to help evaluate educational materials (pp. 158-159). The checklist included 17 criteria questions on multicultural education and used a rating scale from one to six; one was "hardly at all" and six was "extensively" (Banks, 2019, pp. 158-159). Banks (2019) identified that it is important for teachers to select materials for the classroom that

incorporate a wide selection of histories and cultures that challenge stereotypes and misconceptions and that the checklist will help review those materials.

Research on Culture and Education Theories

Regardless of the critical theory, research has identified that viewing students' culture as an asset and continuously integrating them into the classroom improves student outcomes and achievement (e.g., Darling & Irvin, 2005; Hirsch, 2005; Ladson-Billings, 1995). This link between culture theories and positive outcomes, such as student achievement, emphasizes a need for teachers to understand and integrate their students' culture into the classroom (e.g., Haberman, 2005; Hirsch 2005; Ladson-Billings, 1995). Providing educational opportunities to all teachers to learn about cultural theories is a critical component—however, cultural educational experiences must be handled carefully and with a thorough plan because when done incorrectly, they can increase stereotypes and decrease teacher quality (e.g., Brown et al., 2016; Guerrero et al., 2016-2017; Jackson, 1994; Moore, 2010).

For example, Moore (2010) conducted an intervention study, approved by an institutional review board, with 12 math teachers and the impact on the standardized test scores of African American students. The math teachers were evenly broken into a control group and a treatment group. The treatment group (six teachers) received professional development on culturally relevant practices and the control group (six teachers) did not receive any professional development (Moore, 2010). After the second year, the students in the treatment group had statistically significant higher test scores

than the control group (Moore, 2010). Moore (2010) concluded that cultural professional development improved student achievement.

Coleman (2014) analyzed the outcome of cultural-competency professional development that occurred in 62 schools in Virginia over two years. Coleman (2014) surveyed the professional development trainers about their perspectives on the outcomes of the professional development. Although the trainers identified some areas of improvement, constructive conversations about race did not occur and teachers were unable to apply the cultural content into the curriculum (Coleman, 2014). Considering teachers were unable to implement the strategies in the classroom, Coleman (2014) concluded that the professional development was not successful. Sleeter (2001) found similar results to Coleman (2014) when she analyzed numerous outcomes of multicultural courses for preservice teachers and identified there were studies that positively influenced the participants, but there were others that were counterproductive and ended up reinforcing negative stereotypes.

There are many explanations for why these preservice and professional teacher learning experiences were not as successful as anticipated, and the next section will identify and explain the professional-learning best practices that support teachers' understanding and application of critical theories (e.g., Coleman, 2014; Colombo, 2004; Utt & Tochluk, 2020).

Critical Theory and Professional Learning

There were five themes identified in the literature on successful critical-theory PLEs, and each will be explored in the proceeding sections: (1) differentiated training to

address bias and racecraft, (2) dedicated time for critical self-reflection, (3) high quality, continuous professional learning, (4) professional learning with a support system, and (5) guided classroom applications.

Differentiated Training to Address Bias and Racecraft

Researchers have emphasized the importance of critical-theory professional learning to include opportunities to address biases and learn how to view all cultures as an asset (e.g., Colombo, 2004; Drago-Severson & Blum-DeStefano, 2017; Ladson-Billings, 2014). In order to begin to address biases, teachers need to first learn about racecraft (Fields & Fields, 2014) and then be provided differentiated training based on their racial-identity stage. Racecraft is the practice of racism that results in people being sorted into specific racial groups, and the practice of racecraft is so intricately entwined in American culture that it goes unnoticed (Fields & Fields, 2014). When teachers understand the theory of racecraft, they can begin to understand their biases and look at the ways racecraft is integrated into their lives and classrooms.

The integration of racecraft into professional learning alone will not help teachers begin to overcome stereotypes, but cultural professional development must also be differentiated based on the teacher's racial-identity development. Racial-identity development is how one perceives their and other races (Helms, 1990). White racial identity directly influences how White people perceive people of color and understand racism, and according to Helms (1990), if a person is still in the early stages of their racial-identity development, they may not be able to understand the concept of racecraft or racism. When teachers are at different stages in their racial-identity development, then

differentiated training must be provided to support the teachers' current racial developmental needs (Colombo, 2004).

Colombo (2004) identified the need for differentiated training when evaluating the outcome of a literacy professional-learning opportunity on cultural awareness. The 16 workshops were designed to not be lecture-based and included field experiences, but the outcome was mixed as some teachers were able to demonstrate connections to cultural awareness and others did not (Colombo, 2004). Colombo (2004) analyzed the quantitative and qualitative data collected using multiple correlation and comments from the participants. After reviewing all the data results, Colombo (2004) determined that for cultural professional-development experiences to be successful, they must be differentiated based on the teacher's current cultural-awareness stage and include time for self-reflection and challenging cultural misconceptions.

Dedicated Time for Critical Self-Reflection

Dedicated time for critical self-reflection is the second critical-theory professional-learning theme. In addition to incorporating differentiated bias training into the cultural training, teachers should be given time to critically self-reflect on the information. Biases exist in every person, including teachers, and if teachers do not take the time to uncover their beliefs on other cultures (e.g., race, religion, language, gender), they will bring those prejudices into their classroom (e.g., Haynes, 2020; Puzio et al., 2017). Teachers unconsciously bringing their biases into the classroom results in deficit thinking and perpetuates dominant cultural norms and expectations (e.g., Bustos Flores et al., 2018; Paris & Alim, 2017). As addressed in earlier sections, students thrive in

culturally sustaining and multicultural environments, so if a teacher can view and incorporate students' cultures positively into the classroom, they are setting up their students for success and their potential to achieve (e.g., Ladson-Billings, 2014; Smith et al., 2017). Based on Colombo's (2004) research, teachers required time to journal in order to properly process the information provided in the cultural training they received. Journaling, working with colleagues in critical-inquiry groups, and providing time to ask questions in a safe space are essential for supporting teachers in their understanding of bias and culture (e.g., Colombo, 2004; Nieto et al., 2002; Rice Doran, 2010). Time for critical self-reflection must be included in professional learning so that teachers can progress and move forward appropriately.

High Quality, Continuous Professional Learning

The third successful professional-learning theme is delivering high-quality instruction with a support system. High-quality professional learning strives to be engaging, relevant, and applicable to teachers (e.g., Evans, 2010; Hallinger et al., 2014; Singh & Shifflette, 1996; Stewart, 2014; Yoo, 2016). Teachers must trust the content will help improve their teaching in order for it to be considered high quality. If teachers do not believe the training to be relevant or applicable to the classroom, they are less likely to implement it (Evans, 2010). Loeb et al. (2009) stressed that professional learning needs to also be high quantity. This means the professional learning should not occur once in isolation—instead, the training objectives should be revisited, expanded, applied, and discussed for an extended period of time (e.g., one school year). When Evans (2010) conducted a professional-development intervention, she identified a link between

professional development and increased student achievement. One of the key components Evans (2010) contributed to the success of the intervention was the fact that it was ongoing. To ensure professional learning is impactful, the professional-learning environment must include well-developed educational experiences that are implemented throughout the school year.

Professional Learning With a Support System

Teacher growth is not done in isolation and requires collaboration with others (e.g., Evans, 2010; Howard & Navarro, 2016; Singh & Shifflette, 1996; Stewart, 2014; Wylie et al., 2009). The fourth successful professional-learning theme is professional learning with a support system. Teacher collaboration comes in a variety of forms, but most commonly teacher collaboration is done through mentoring and/or professional learning communities (PLCs). A variety of available research shows that teachers experience greater improvements in their teaching when professional development is tied to a support system (e.g., Evans, 2010; Singh & Shifflette, 1996; Stewart, 2014; Wylie et al., 2009). For example, Wylie et al. (2009) conducted a study on the impact of professional development and found that PLCs are critical to the success of the training provided. However, the presence of PLCs alone cannot simply improve the impact of professional learning; they must also be well developed. An effective PLC establishes respectful spaces between members, reviews student work together, brainstorms lessons as a team, and provides constructive feedback (e.g., Blitz & Schulman, 2016; Stewart, 2014). Howard and Navarro (2016) found professional learning on cultural awareness was only successful when teachers came together for critical-inquiry groups to be able to

talk about race, ask questions, and collaborate. Mentoring occurs frequently within PLCs but is also found to be successful separately when teachers meet with other teachers to work on improving their teaching (e.g., DeCesare et al., 2017; Singh & Shifflette, 1996). Professional learning paired with a strong teacher support system can make significant impacts on the teacher and on student achievement (e.g., Stewart, 2014; Wylie et al., 2009).

Guided Classroom Applications

The final theme for successful critical-theory professional learning is guided classroom application. The research identified that teachers struggled to apply cultural training concepts into the classroom (e.g., Billingsly, 2015; Colombo, 2004; Rice Doran, 2010). To ensure critical-theory professional learning is effective, it must include real-life classroom examples and time to develop classroom applications such as behavior management plans and lesson plans (e.g., Colombo, 2004; Rice Doran, 2010). If teachers cannot directly integrate the concepts from the cultural training with their students, then the experience will be ineffective. To guarantee the most effective cultural training is implemented, time must be designated to explaining and exploring direct classroom applications.

Learning Technologies and Education

Technology is everywhere, from transportation to communication to education, and when technology is integrated into the classroom, it should be used to “redefine and transform learning, not just enhance it” (Trust, 2018, p. 54). Learning technologies are

essential to the curriculum and student achievement as the U.S. Department of Education Office of Educational Technology stated in their 2017 plan:

Technology can be a powerful tool for transforming learning. It can help affirm and advance relationships between educators and students, reinvent our approaches to learning and collaboration, shrink long-standing equity and accessibility gaps, and adapt learning experiences to meet the needs of all learners. (p. 3)

Learning technologies, when implemented effectively, can transform learning by increasing student achievement, integrating digital citizenship, preparing students for workforce readiness, and providing personalized learning. The first way that learning technologies transform learning, by increasing student achievement, has been linked to students having access to technology that has been properly integrated into the classroom through student-centered learning that requires higher-order thinking skills (e.g., Bevins et al., 2012; Eyyam & Yaratan, 2014; Glassett & Schrum, 2009; Patterson, 2005). For example, Eyyam and Yaratan (2014) conducted a study comparing the achievement scores of students who participated in lessons using technology to students who participated in lessons without the technology. Students who completed the technology-focused lessons had significantly higher post-scores than the students who did not. Eyyam and Yaratan (2014) argued technology enhances student achievement because it increases students' engagement in the learning and provides a media that enables teachers to create differentiated materials based on their students' needs.

A second major way learning can be transformed through technology is by promoting digital citizenship so that students understand the ethics and safety of the web along with how to engage with society as a global citizen (e.g., Falloon, 2020; Howard et al., 2008; Poth et al., 2018). Technology is also prevalent in today's workforce, so students must develop expertise to be successful and stay competitive (e.g., Bevins et al., 2012; Bybee & Fuchs, 2006; Larson & Miller, 2011). A final way technology influences learning is through personalized learning as technologies in the classroom can be customized based on students' needs or give students choices based on their interests (e.g., Graham et al., 2019; Gronseth et al., 2020; Michela, 2018).

Learning Technologies in the Classroom

Learning technologies in a classroom can greatly vary depending on the availability of four major learning technologies components: physical devices, software, instructional methods, or classroom applications (e.g., Falloon, 2015; Tondeur et al., 2017; Varier et al., 2017). There are numerous considerations when discussing education and technology, and it is necessary to understand all the different components that make up learning technologies in the classroom. Physical devices, software, instructional methods, and classroom applications are four major learning technologies components. It is important to take into consideration that technology is constantly evolving, so the information provided on what learning technologies look like today may be different tomorrow (e.g., Goddard, 2002; Tondeur et al., 2017). This section will provide foundational information on learning technologies in the classroom, with the expectation

that these examples, standards, methods, and applications are continuously updating and changing.

Classroom Technology Physical Devices. A classroom technology physical device is a piece of equipment or hardware that takes up a designated space, such as interactive whiteboards (also known as a SMART Board), computers, tablets, or mobile devices (e.g., Garavaglia & Ferrari, 2012; Tondeur et al., 2017; Varier et al., 2017). It is important to define and distinguish classroom technology physical devices because they are part of the discussion and research on learning technologies, and there is a variety of research on physical devices in the classroom (e.g., Garavaglia & Ferrari, 2012; Varier et al., 2017). For example, Fisher et al. (2013) conducted a study comparing the outcome of student collaboration based on students' use of a traditional laptop or a tablet. Research on physical devices may also be related to technology policy or programs, as the concept of *one-to-one computing* is frequently explored in educational technology research (e.g., Hershkovitz & Karni, 2018; Lei & Zhao, 2008; Varier et al., 2017). One-to-one computing occurs when one student is provided with one physical device so that every student has access to learning technology (Varier et al., 2017).

Classroom Technology Software. Software is a program, application, or website that a person engages with on a physical device, such as Twitter on a laptop, the Endless Alphabet app on a tablet, or the Lumio application on SMART Boards (e.g., Falloon, 2015; Powell, 2014; Yamanaka, 2015). Software is the second component to engaging with learning technologies in the classroom because learning-technology literature includes discussions and explorations on software in addition to physical devices (e.g.,

Domingo & Garganté, 2016; Falloon, 2015; Yamanaka, 2015). Examples of classroom technology software research include studies on the outcome of its use, such as Falloon's (2015) study on the impact of iPads and apps on student learning and collaboration.

Learning Technology Instructional Methods. Educators use a variety of instructional methods when using learning technologies with their students; the three main instructional methods in the literature include blended learning, flipped classrooms, and personalized learning (e.g., Trogden, 2015; Vanbecelaere & Benton, 2021). A plethora of other learning-technology instructional methods exist, but these three are frequently discussed and investigated by other researchers.

Blended Learning. Blended learning is a type of instructional method that mixes synchronous instruction with asynchronous instruction, and this approach has been found to increase student interactions and student performance (e.g., Gross et al., 2015; Hijazi & AlNatour, 2020; Serrano et al., 2019). Most of the research on blended learning has analyzed the outcome of a blended-learning course or compared the differences between in-person learning and asynchronous learning (e.g., Hijazi & AlNatour, 2020; Shu & Gu, 2018).

Flipped Classroom. A flipped classroom is a form of blended learning in which students complete the lecture outside of class as homework and class time is spent practicing and applying the new information (e.g., Wozny et al., 2018; Zheng et al., 2020). Flipped classrooms require a variety of hardware and software since the instruction occurs at home and may include laptops or tablets to view videos, 2D or 3D models, or a learning management system like Blackboard (e.g., Trogden, 2015; Wozny

et al., 2018). Flipped-classroom research has focused on student-learning outcomes and impactful strategies (e.g., Dierdorp, 2021; Trogden, 2015; Zheng et al., 2020).

Personalized Learning. Personalized learning uses hardware and software to adapt to a student's current instructional level (e.g., Major et al., 2021; Vanbecelaere & Benton, 2021). Teachers incorporate personalized learning into their instructional methods to address specific learning needs, allow opportunities for individual choices and areas of interest, or create appropriate groups based on students' skill levels (e.g., Major et al., 2021; Vanbecelaere & Benton, 2021). The research on personalized learning indicates that some students experience an increase in achievement and others do not (Prain et al., 2013; Vanbecelaere & Benton, 2021). As a result of these mixed outcomes, researchers have investigated what different characteristics, instructional methods, and approaches will help improve the impact of personalized learning (e.g., Major et al., 2021; Prain et al., 2013). Major et al. (2021) examined data from 53,029 students and found that when personalized learning used features that adapted to the learner, there was a significantly greater outcome than if only student interests and feedback were included.

Learning-Technology Classroom Applications. There are numerous ways technology can be applied into the classroom, and Bloom's Digital Taxonomy provides clear descriptions on different ways educators can incorporate technology into the curriculum (Sneed, 2016). Bloom's Digital Taxonomy breaks up different digital activities into six categories based on where they fall on a spectrum from lower- to higher-order thinking skills (Sneed, 2016). The Arizona State University Teach Online website, which provides online resources and tools for teachers, offers support in many

ways from articles to podcasts to a conference. In educational research, Bloom's Digital Taxonomy has been leveraged to measure and evaluate learning technologies in the classroom (e.g., Amin & Mirza, 2020; Crook & Sharma, 2013). Amin and Mirza (2020) used Bloom's Digital Taxonomy to measure how technology was understood and applied with students and teachers, and they recommended integrating Bloom's Digital Taxonomy into the classroom to improve learning and assessment. Figure 1 shows how these technology engagements are organized.



Note. Bloom's Digital Taxonomy provides examples of digital activity that require lower- or higher-order thinking skills. From Arizona State University Teach Online, by O. Sneed, 2016 (<https://teachonline.asu.edu/2016/05/integrating-technology-blooms-taxonomy/>).

Figure 1.

Bloom's Digital Taxonomy.

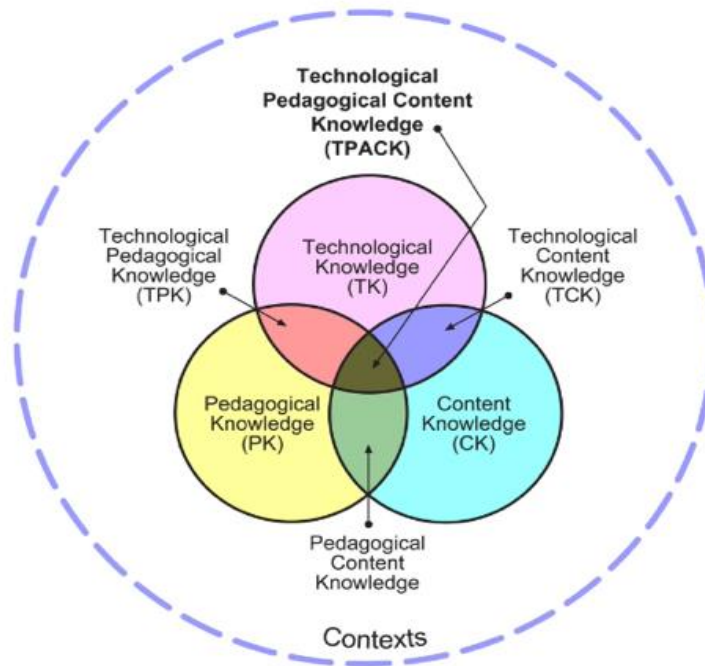
Learning technologies in the classroom utilize these four components of blended learning, flipped classrooms, personalized learning, and Bloom's Digital Taxonomy, but

they are not incorporated in isolation and are often used together (e.g., Falloon, 2015; Shu & Gu, 2018). For example, a teacher could use blended learning to support their flipped classroom while using laptops and a SMART Board to create a lesson through Lumio that has students search for examples of podcasts to create one of their own.

Learning Technology Frameworks

The literature has numerous models and frameworks to ensure learning technologies are successfully integrated into the classroom, and this section will focus on the major frameworks of the Technological Pedagogical Content Knowledge (TPACK) framework, Passive Interactive Creative Replaces Amplifies Transforms (PICRAT) matrix, and Universal Design for Learning (UDL) framework.

TPACK. The TPACK framework is a “technology integration model that illustrates the complex interplay between Technological Knowledge, Pedagogical Knowledge, and Content Knowledge” (Ottenbreit-Leftwich & Kimmons, 2018, p. 8). Content, pedagogy, and knowledge are the three major components of teacher knowledge, and where those components intersect is also critical to the teacher’s knowledge (Koehler & Mishra, 2009). Figure 2 illustrates the TPACK framework. The purpose of the TPACK framework is to help guide teachers to integrate technology deeply and meaningfully into their classroom (Koehler & Mishra, 2009).



Note. TPACK framework shows how technological content and knowledge is organized. From TPACK.org, by M. Koehler, 2011 (<http://www.tpack.org>). Reproduced by permission of the publisher, © 2012 by tpack.org.

Figure 2.

TPACK Framework.

TPACK has been used in numerous studies as an intervention tool, an evaluation tool, or as a framework for educational or professional-learning opportunities (e.g., Dalal et al., 2017; Harris & Hofer, 2017; Wang et al., 2018). Though TPACK is frequently used and applied in education, it has also been criticized by researchers as being difficult for teachers to transfer into practice (e.g., Dalal, 2017; Stoilescu, 2015). Harris and Hofer (2017) collected stories on how seven schools/districts in Canada and the U.S. used

TPACK for professional development and found that TPACK was understood and applied differently by teachers than how it was described and explained by scholars and researchers. Harris and Hofer (2017) identified that these various interpretations indicate a need for additional research to understand how TPACK is evolving in education.

PICRAT. The PICRAT matrix is a model to identify how the teacher and the students are engaging with technology (Ottenbreit-Leftwich & Kimmons, 2018). The PICRAT model is also used to evaluate the use of technology with student learning (Graham et al., 2019; Ottenbreit-Leftwich & Kimmons, 2018). As demonstrated in Figure 3, this matrix identifies different ways to engage students with technology with the rows evaluating the students' relations to technology and the columns evaluating how the technology is being used in practice (Graham et al., 2019). First published in 2018, PICRAT is relatively new in instructional technology research. One dissertation (Heberer, 2021) focused on the use of PICRAT within professional development, while other researchers have noted that PICRAT came out after they had started their research but that it would be a useful framework (Kilty & Burrows, 2021). Heberer's (2021) dissertation on the outcome of the PICRAT matrix found that the educators improved their awareness and increased their application of higher technology-integration levels.

P	PASSIVE	PR	PA	PT
	INTERACTIVE	IR	IA	IT
	CREATIVE	CR	CA	CT
STUDENTS' RELATIONSHIP TO TECH IS				
		REPLACES	AMPLIFIES	TRANSFORMS
		R	A	T

Note. PICRAT matrix on different ways teachers can use technology in the classroom. From The K-12 Educational Technology Handbook (1st ed.), by A. Ottenbreit-Leftwich, & R. Kimmons, 2018. EdTech Books. (<https://edtechbooks.org/k12handbook>).

Figure 3.

PICRAT Matrix.

UDL. The UDL framework is grounded in scientific research on how the brain functions during learning; the objective is to “support the variability of all learners by both proactively and iteratively designing learning with a focus on the integration of providing multiple means of engagement, representation of information, and action and expression of understanding” (Basham et al., 2016, p. 150). Multiple means of engagement, multiple means of representation, and multiple means of action and expression are the three guidelines for UDL (Michela, 2018). The UDL framework is frequently used as an educational tool to improve the quality of lessons (e.g., Coyne et

al., 2012; Lee & Griffin, 2021; Scott et al., 2019). Lee and Griffin (2021) provided three online modules on UDL to eight teacher candidates and found the teachers improved their learning and applied these modules to their lesson plans. The UDL model has been found to be impactful on designing lessons, but it has also been critiqued as not as adaptable and flexible to learner needs as it may appear (e.g., Alim et al., 2017; Griful-Freixenet et al., 2017). After conducting a qualitative study on whether UDL was accomplishing the needs of students with disabilities, Griful-Freixenet et al. (2017) found that certain lesson designs benefiting one learner could cause negative outcomes for a learner with different needs and thus recommended that the needs of students should be addressed individually and not only through the lesson design.

Challenges with Learning Technologies

Learning technologies are a critical component to the classroom, but it is not always easy to effectively implement technology with a teacher's curriculum or instructional practices. The literature has identified that teachers may experience challenges with believing and accepting technology, teachers may struggle with digital competence, technology is sometimes taught as an individual subject, and there is inequitable access to technology. Each of these challenges will be explained in more detail in the following paragraphs.

Teacher Beliefs and Technology Acceptance. Impactful technology integration begins with educators accepting and believing in the importance of technology (e.g., Bame et al., 1993; Ertmer et al., 2012). Teachers with more positive perspectives about technology are more likely to apply it in the classroom and challenge students to engage

and create with technology instead of passively using it to consume information (O'Dwyer, 2004; Ravitz et al., 2000). There are many factors that impact technology usage, including understanding of technology, comfort level, and community influences, but one of the most influential reasons teachers may be reluctant to use technology in the classroom is due to their beliefs (Ertmer & Ottenbreit-Leftwich, 2010). For example, Ertmer et al. (2012) interviewed 12 classroom teachers that demonstrated strong technology-integration strategies and found that the greatest barrier to incorporating technology was classroom teachers who did not believe that technology positively enhanced student learning.

There are numerous frameworks and models on technology acceptance; one of the most popular is the Technology Acceptance Model (TAM) (e.g., Schepers & Wetzels, 2007; Scherer et al., 2019). The TAM is structured around the concepts of “perceived usefulness” and “the perceived ease of use” and how these perceptions influence how people view and use technology (Schepers & Wetzels, 2007, p. 90). The TAM has been found to improve teachers’ acceptance of technology—however the TAM is not a perfect model and has received some critiques as well (e.g., King & He, 2006; Šumak et al., 2011). Scherer et al. (2019) conducted a systematic review on the TAM and identified that the model lacks specific guidance on what knowledge is required for teachers to integrate technology effectively. Scherer et al. (2019) recommended the gaps within the TAM can be supported by leveraging the TPACK model.

Though the TAM is still currently used to improve teachers’ technology acceptance, some recent research studies found that preservice teachers are already

coming into education programs with positive perspectives of technology (e.g., Lee et al., 2020; Scherer et al., 2019). Lee et al. (2020) provided a survey on the first day of their teaching program with over 900 preservice teachers on their viewpoints of technology and found the majority (84.9%) had entered the program with positive beliefs on technology. Lee et al. (2020) suggested the information in the survey was still helpful in identifying ways to differentiate the teaching program based on the preservice teachers' current perspectives.

Digital Competence. The research on learning technologies indicates that technology can be impactful when implemented effectively—however, some educators and preservice teachers consistently struggle with digital competence and accepting technology in the classroom (e.g., Foulger et al., 2017; Glassett & Schrum, 2009; Lindberg et al., 2017; McGarr & McDonagh, 2019). Digital competence is the “integrated and functional use of digital knowledge, skills, and attitudes” (Aesaert et al., 2013, p. 132). Researchers are continuously making arguments on which competency models should be used to ensure teachers are fully utilizing technology in their classrooms (e.g., Falloon, 2020; McGarr & McDonagh, 2019). The 2017 plan for the U.S. Department of Education Office of Educational Technology even identified a need to develop common technology competency requirements for educators and preservice teachers.

Learning-Technology Competency Models and Frameworks. Many learning-technology competency models and frameworks help build educators' knowledge and application of technology in the classroom (e.g., Aesaert et al., 2013; Ferrari, 2012;

McGarr & McDonagh, 2019). The technical skills, pedagogical skills, cyber-ethics, and attitudes, or PEAT, model includes four competencies: technical, ethical, pedagogical, and attitudinal (McGarr & McDonagh, 2019). Foulger et al. (2017) conducted an extensive study to identify all the competencies required for digital competence. In the end, they developed the Teacher Educator Technology Competencies, or TETCs, which include competencies that range from integrating technology to differentiating for diverse learning requirements to global engagement (Foulger et al., 2017). Ferrari (2012) synthesized 15 different competency models and identified seven components that were common across them: information management, collaboration, communication and sharing, creation of content and knowledge, ethics and responsibility, evaluation and problem solving, and technical operations.

The International Society for Technology in Education (ISTE) built upon prior research to develop their own five competencies for educators: computational thinking, equity leader, collaborating around computing, creativity and design, and integrating computational thinking (ISTE, n.d.). Though the ISTE is an organization, and their resources are not published in peer-reviewed journals, their standards and models are developed by practitioners, are present in the literature, and have been used to frame educational research studies (Aslam et al., 2020; Kimm et al., 2020).

Digital Competence Research. Numerous studies have explored educators' digital competence, and the literature suggests that integrating learning technologies into the classroom is challenging as many teachers experience low digital competence, use lower-order thinking skills, and struggle to keep up with the changes in technology (e.g.,

Brox, 2017; Lindberg et al., 2017; Taylor et al., 2020; Tondeur et al., 2017). Tusiime et al. (2019) conducted a study on how teachers build their digital competence and found that the teachers used both formal (e.g., ongoing professional development) and informal (e.g., self-teaching) opportunities to build their understanding of technology.

Digital Competence Scale. Measuring educators' digital competence can be difficult as the score may not reflect what is being applied in the classroom (McGarr & McDonagh, 2019). The Technology Proficiency Self-Assessment Questionnaire for 21st Century Learning (TPSA C-21) is a digital-competence scale (Christensen & Knezek, 2017) that is built upon the Technology Proficiency Self-Assessment (TPSA). The TPSA was developed from the ISTE standards and used for many years, but it did not include questions on more recent uses of technology (Christensen & Knezek, 2017). To address this application gap, the TPSA C-21 was developed with 14 additional questions from the TPSA survey (Christensen & Knezek, 2017). The purpose of the TPSA C-21 is to assess educators' "self-efficiency regarding skills for integrating classroom teaching and learning" (Christensen & Knezek, 2017, p. 20). Christensen and Knezek (2017) established the validity and reliability of the TPSA C-21 and found that it can be used to help current educators and preservice teachers apply technology for student learning. The TPSA C-21 has the potential to help current and preservice teachers with technology professional development to build their knowledge of technology integration and, as teachers enhance their technology curriculum, to advance student learning as well (Christensen & Knezek, 2017).

Technology as an Individual Subject. Technology should be integrated into all content areas, but it is often understood by teachers as its own subject matter (Foulger et al., 2017). The third challenge with learning technologies is implementing technology as an individual subject in the class curriculum (e.g., Foulger et al., 2017; Polly et al., 2010). The U.S. Department of Education Office of Educational Technology (2017) identified in their National Educational Plan that learning technologies should be used to improve learning and not viewed as an optional activity. Polly et al. (2010) studied the outcomes of an U.S. Department of Education initiative that worked on building preservice and current teachers' technology integration in the classroom. They found that teachers were integrating technology more after mentoring and field experience (Polly et al., 2010). Foulger et al. (2017) recommended that technology integration and how to effectively incorporate technology be well established through teacher education programs before teachers enter the classroom.

Inequitable Access to Technology. The fourth challenge with learning technologies is the inconsistent or limited access to technology for teachers and students (e.g., Dolan, 2016; Gunkel, 2003; Howard et al., 2018). There is inequity regarding access, applications to technology, or the internet inside or outside of the classroom (e.g., Dolan, 2016; Herro et al., 2013; Wood & Howley, 2012). In 2006, the NCES reported schools with less than 6% students of color had on average one computer to every 3.0 students. In contrast, schools in which students of color made up 50% or more of the school population had one computer to every 4.1 students. Most data collected on inequitable access to technology was gathered prior to 2019, but due to many classrooms

going virtual at the onset of the COVID-19 pandemic, the focus on recent technology data points have been on students' access from home (e.g., Dolan, 2016; Irwin et al., 2021). The NCES reported two-thirds of students were learning virtually, and identified that:

More than 90 percent of adults with children in their household reported that one or both of these resources were always or usually available to children for educational purposes in September 2020. At the same time, 59 percent of adults reported that computers were provided by the child's school or district, while 4 percent reported that internet access was paid for by the child's school or district. Although higher percentages of lower income adults reported such assistance, this did not eliminate inequalities in access to these resources by household income. (Irwin et al., 2021, pp. ii-iv)

Irwin et al.'s (2021) report showed a gap in access to both computers and the internet. Inequitable access to technology is a reported problem in the U.S. (e.g., Dolan, 2016; Irwin et al., 2021) for students' access to technology both at school and at home.

Teachers are also experiencing a lack of access to technology and technology professional learning (e.g., Dolan, 2016; Judge et al., 2004). Researchers have identified that teachers have struggled to gain access to technology or are not receiving technology training and that the access to these can vary between school districts (e.g., Hernandez-Ramos, 2005; Willems, 2019). These inequitable accesses experienced by students and teachers are often referred to as the *digital divide* (e.g., Dolan, 2016; Howard et al., 2018;

Ravi, 2018). The data and research on the digital divide will be explained in more detail in the following section.

Digital Divide

The term *digital divide* began appearing in the 1990s (Gunkel, 2003). It is defined as “a difference in access or participation via digital technologies experienced by two or more individuals or groups of people” (Ravi, 2018, p. 201). The digital divide is complex with varying levels, and Ravi (2018) noted there are two different levels of the digital divide that help explain and identify inequitable technology ownership and availability. The first level is when there is inequitable access to learning-technology hardware and software (Ravi, 2018). An example of a first-level divide is when one school has one laptop for every student and another school has a laptop for every nine students (van Dijk, 2020). The second level is when there is inequitable access to quality curriculum applications for students or professional learning for teachers (Ravi, 2018). An example of a second-level divide is when schools use technology for only lower-order thinking skills, such as understanding, but not for higher-order thinking skills, such as creating (Ravi, 2018).

The digital divide has been extensively investigated by many researchers (e.g., Dobransky & Hargittai, 2006; Judge et al., 2004; Watkins, 2018). Judge et al. (2004) conducted a review of technology access of 9,840 public-school students and found that students in higher-poverty schools had fewer computers and software programs than students in lower-poverty schools. Furthermore, Dobransky and Hargittai (2006) found people with disabilities are less likely to use computers, go online, or have a computer at

home. The 2017 National Education Technology Plan by the U.S. Department of Education stated:

Access to connectivity and devices does not guarantee access to engaging educational experiences or a 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. (p. 20)

There are numerous inequities contributing to the digital divide. In 2021, Franklin County, Ohio, developed a coalition framework to address some of these digital inequities in their county, which include, for example, working to access grants and collaborating with companies to ensure families could purchase a computer for \$20 or a laptop for \$50.

The digital divide is only one piece to the digital-inequity problem, and the digital divide expands beyond access to the concept of *digital equity* (e.g., Howard et al., 2018; Ravi, 2018; Resta & Laferrière, 2015). The next section will explore digital equity and its considerations (e.g., Gorski, 2009; Howard et al., 2018; Ottenbreit & Kimmons, 2018).

Digital Equity

Digital equity differs from digital divide; Judge et al. (2004) defined *digital equity* as “a social justice goal of ensuring that all students have access to information and communications technologies for learning regardless of socioeconomic status, physical disability, language, race, gender, or any other characteristics that have been linked with unequal treatment” (p. 383). Resta et al. (2018) identified five dimensions to digital equity:

(1) access to hardware, software, and connectivity to the Internet; (2) access to meaningful, high quality, and culturally relevant content in local languages; (3) access to creating, sharing, and exchanging digital content; (4) access to educators who know how to use digital tools and resources; and (5) access to high-quality research on the application of digital technologies to enhance learning. (p. 988)

Resta et al. (2018) focused the distinctions of digital equity around access, but other researchers have identified additional aspects to digital equity (e.g., Gronseth et al., 2020; Howard et al., 2018; Judge et al., 2004). Digital equity extends beyond the digital divide in that the digital divide focuses on access and digital equity focuses on access, classroom practices, curriculum applications, and beliefs with the intent to actively resolve the digital divide (e.g., Howard et al., 2018; Ravi, 2018).

Digital Equity Classroom Practices and Curriculum Applications

Digital equity is an equity-centered approach that seeks to improve students' access to learning technologies and advance classroom practices, curriculum applications, and teacher beliefs with the intent to resolve the digital divide and prepare students to succeed in a technology-driven society (e.g., Gorski, 2009; Ravi, 2018). The literature explores digital citizenship, CSP, and multicultural education as the three primary classroom practices and curriculum applications for digital equity.

Digital Citizenship. Digital citizenship “is the skills and knowledge students need to fully participate in society via online tools, including safe and respectful use” (Poth et al., 2018, p. 60). Applications of digital citizenship can vary from engaging in online environments safely to ethical behavior to communicating and collaborating with

others around the world (e.g., Falloon, 2020; Poth et al., 2018). The iCitizen Project, an example of digital citizenship in the classroom, has students use social media to explore and address cyberbullying on local and international levels (Howard et al., 2018). The research studies found around digital citizenship focus primarily on how teachers and students engage with and view digital citizenship (e.g., Choi et al., 2018; Gleason & von Gillern, 2018; Lauricella et al., 2020). Choi et al. (2018) and Lauricella et al. (2020) both identified that teachers understand some, but not all, of the elements of digital citizenships in their classrooms. For example, Choi et al. (2018) surveyed 348 teachers and found they had low levels of internet political activism and critical perspectives. Both Choi et al. (2018) and Lauricella et al. (2020) argued there is a need for additional growth in teachers' understanding of digital citizenship.

CSP and Classroom Technology. CSP is a modernized term that originated with Ladson-Billings' CRP (1995). As identified earlier in this paper, Paris and Alim (2017) explained "CSP seeks to perpetuate and foster—to sustain—linguistic, literate, and cultural pluralism as part of schooling for positive social transformation" (p. 1). This paper uses the terms *culturally relevant* or *culturally relevant pedagogy* when referring to CSP.

Judge et al. (2004) noted there are two dimensions to digital equity: (1) equal access to technology and (2) equal access to culturally sustaining curriculum applications (p. 383). Resta et al. (2018) confirmed this need for culturally sustaining material and described the second dimension of digital equity is "access to meaningful, high quality, and culturally relevant content in local languages" (p. 988). Resta et al. (2018) noted that

most of the web is in English, but there are other projects working to diversify the web and include other cultures and languages, such as the European Schoolnet that works on transforming education to a 21st-century society. Many scholars are calling for more culturally sustaining content within technology as well as research into its implementation (Normore & Issa Lahera, 2019; Ravi, 2018; Resta et al., 2018).

The research literature on CSP and learning technologies focuses on providing guidance and frameworks to help implement them into the classroom and connecting CSP with UDL (e.g., Engerman & Otto, 2021; Hanesworth et al., 2019; Morales-Chicas et al., 2019; Rao, 2015). Morales-Chicas et al. (2019) conducted a systematic review on culturally relevant education and technology. They identify six themes that help guide educators to implement culturally relevant education and technology in their classroom: sociopolitical consciousness raising, heritage culture through artifacts, vernacular culture, lived experiences, community connections, and personalization (Morales-Chicas et al., 2019).

UDL is noted to support the diverse needs of learners (Basham et al., 2016; Scott & Temple, 2017), and there are scholars who believe UDL will help address digital equity in terms of culturally sustaining content (e.g., Ravi, 2018; Waitoller & King Thorius, 2016). Only one research study was identified from numerous searches on CSP and UDL in the classroom, which focused on using CSP and UDL during a spoken-word unit with middle school students (Coppola et al., 2019). They studied the outcome and found that the unit supported students' identities and differentiation to students' learning needs (Coppola et al., 2019).

Multicultural Education and Classroom Technology. Gronseth et al. (2020)

called for more considerations when technology is used for learning—specifically incorporating the needs of students such as hearing difficulties, language differences, and cultural differences. Their focus on cultural differences includes actions such as being aware of gender roles, power differences, and connecting the learner’s culture to the new content (Gronseth et al., 2020). This connects to multicultural education because when a teacher integrates multiple cultures with a critical multicultural education approach, the students will be challenged to understand and celebrate different backgrounds, identify skills to promote tolerance, and learn how to advocate for social justice (May & Sleeter, 2010).

Multicultural education and learning technologies have been explored through many theoretical articles, but research for this paper didn’t reveal any empirical studies with current teachers. Most of the literature questions how multicultural education and technology can be merged and some provide suggestions on how to best implement multicultural education with technology (e.g., Damarin, 1998; Sleeter & Tettegah, 2002). Chisholm (1998) reviewed the literature on impactful strategies when working with a diverse group of students and identified six elements to help integrate technology into the classroom effectively, but no empirical study was conducted on those six elements. Gorski (2009) analyzed digital equity from a critical multicultural education framework and identified eight challenges to address digital inequities from closing the access gap to adding instructional technology specialists trained in education. There was one empirical study found on technology and multicultural education by Wassell and Crouch (2008) in

which they studied the impact of a blogging project with preservice teachers that engaged on the topics of diversity and multicultural education.

Critical Theory and Learning Technologies Connections

After reviewing the literature on critical theory and learning technologies, themes and connections between them began to emerge. Noguera (2008) explored the deep histories of inequities inside and outside of schools and challenged teachers to become more aware and recognize them. This is also true for technology as Gorski (2009) identified there is an essential need to interrogate and address learning-technology inequalities as technology can further expand the current gap instead of closing them. These calls to deeply examine and alter the power structures of the digital divide directly link to the work of critical theory (e.g., Delgado Bernal, 2002; Freire, 1998; Howard et al., 2018).

Critical Theory of Technology

As noted previously critical theory is expansive with a variety of different branches, terms, and applications (e.g., Butler, 2009; Dixson & Rousseau, 2005; hooks, 1994). One of the branches of critical theory is *critical theory of technology* (e.g., Feenberg, 2002; McCarthy, 2018). Critical theory of technology challenges others to examine how technology influences society and reinforces unequal power structures (Feenberg, 2005). Power dynamics in technology include that between the creator of the technology and the user and how technology controls society and different societal processes (e.g., Feenberg, 2005; Leckie & Buschman, 2009). Societal processes could include how people apply for jobs or access healthcare. Critical theory of technology in

education can be used to examine how females are seen less often than males in classroom technology software, and when they are incorporated into the software, they are frequently shown in stereotypical and passive roles (Gorski, 2009). This lack of representation demonstrates how the creator of the technology has power over the user—by establishing bias and societal expectations. Similar to critical theory, critical theory of technology seeks to identify and tackle these power structures of the creator and user.

Technology is also essential in preparing students for workforce readiness, and the controls technology has over society and societal processes can impact students obtaining jobs or participating within society (e.g., Bevins et al., 2012; Bybee & Fuchs, 2006; Larson & Miller, 2011). Critical theory of technology, like critical theory, sets a goal of finding these power structures that technology dominates over society and calls on others to take action to fight against them (e.g., Leckie & Buschman, 2009; McCarthy, 2018).

Critical Theory Themes and Digital Equity Connections

The four main themes of critical theory can be linked to digital equity and will be discussed within this section: (1) narratives and storytelling in critical theories, (2) challenges with understanding and applying critical theory, (3) critical theories call to action, and (4) critical theories diverse applications. Evidence of narratives and storytelling is found within digital equity as students hear stories from others around the world, make community connections, and learn about different cultures (e.g., Falloon, 2020; May & Sleeter, 2010; Morales-Chicas et al., 2019). Reaching digital equity is challenging as there are still major gaps in access to technology and applications of

technology in the classroom (e.g., Choi et al., 2018; Judge et al., 2004; Resta et al., 2018). There are continuous calls to action to improve access to technology and increase the quality of the technology to include culturally relevant content, raising awareness of gender norms, and challenging power structures (e.g., Gronseth et al., 2020; Morales-Chicas et al., 2019; Normore & Issa Lahera, 2019). Though digital equity is not as expansive as critical theory, there are still diverse applications as digital equity has been used to evaluate access to technology, assess the quality of the technology, and critique the applications of the technology (e.g., Dolan, 2016; Gorski, 2009; Resta & Laferrière, 2015).

Multicultural Education and Digital Equity Connections

There are three primary connections between multicultural education and digital equity; both support the objectives of social justice, each is needed for all students, and each advocates to address inequities. The first primary connection between multicultural education and digital equity is they both support the goals of social justice. Nieto and Bode (2018) stated “multicultural education promotes democratic principles of social justice” (p. 32). This aligns with Judge et al.’s (2004) definition that digital equity “is a social justice goal” (p. 383). The second connection between multicultural education and digital equity is that they are each essential components to the classroom for all students. Both multicultural education and digital equity argue that one of their purposes is to advocate for social justice. Judge et al. (2004) included the phrasing “ensuring that all students ...” in their definition of digital equity (p. 383). This is similar to Nieto and Bode’s description that multicultural education is “important for all students” (p. 32).

Based on these descriptions, both digital equity and multicultural education are to be used to support every student and not only a specified group. The third connection between multicultural education and digital equity is they advocate to address inequities.

Multicultural education “focuses on knowledge, reflection, and action (praxis) as the basis for social change” (Nieto & Bode, 2018, p. 32). Digital equity ensures “that all students have access to information and communication technologies for learning regardless of socioeconomic status, physical disability, language, race, gender, or any other characteristics that have been linked with unequal treatment” (Judge et al., 2004, p. 383). There are numerous connections between critical theory and digital equity, which can support deepening the understandings of digital equity and gaps within digital equity (e.g., Freire, 1998; Gorski, 2009; Howard et al., 2018). The following section will identify digital equity gaps and future research opportunities.

Digital Equity Gaps

Multicultural Education and Learning Technology Competency Models and Frameworks

Although the four technology competency models for teachers described earlier in this chapter (Ferrari, 2012; Foulger et al., 2017; ISTE, n.d.; McGarr & McDonagh, 2019) all identified characteristics of digital citizenship, only two of these moved toward digital equity (Foulger et al., 2018; ISTE, n.d.). Within these two, there is a lack of depth and detail on what this means for classroom teachers. ISTE’s (n.d.) and Foulger’s (2017) models described culturally relevant teaching and multicultural education, but only ISTE’s (n.d.) model directly referenced culturally relevant teaching.

Foulger et al. (2017) identified two indirect references to culturally relevant and multicultural education. The first indirect competency stated that “teacher educators will use technology to differentiate instruction to meet diverse learning needs” (p. 142). The second indirect competency identified: “design instruction in which teacher candidates use technology to collaborate with learners from a variety of backgrounds and cultures” (p. 433). Foulger et al. (2017) did not explicitly include CSP or multicultural education in their competency model, but they did reference meeting diverse learning needs and designing instruction to engage with learners from diverse backgrounds and cultures, which supports the goals and objectives of CSP and multicultural education (e.g., May & Sleeter, 2010; Paris & Alim, 2017).

ISTE (n.d.) indirectly referenced CSP and multicultural education in their competency model and included one direct reference to CSP. Under the equity leader competency, the ISTE (n.d.) competency addressed the importance of culturally relevant learning activities, providing “a diverse range of ethical, social and cultural perspectives” and featuring “diverse role models and teams” (section 2b). ISTE (n.d.) made indirect references to multicultural education to select teaching approaches that do not use stereotypes; build a positive, diverse classroom culture; address biases; and foster multiple perspectives.

There is a disconnect between digital equity theory and learning-technology competency models and frameworks. Digital equity theory emphasizes the importance of digital citizenship, CSP, and multicultural education, but the competency models and frameworks do not make any direct references to multicultural education. This suggests

there is a gap between digital equity theory and the classroom technology standards for teachers and leaves room for additional research in this area.

Multicultural Education and Learning Technologies Research

There is a small collection of digital equity classroom practices and curriculum applications in the literature, and the majority of the digital equity articles center around digital citizenship. Digital citizen research examined students' and teachers' perceptions of digital citizenship, and researchers noted there is a need for additional education for teachers to fully understand and apply digital citizenship in the classroom (Choi et al., 2018; Gleason & von Gillern, 2018; Lauricella et al., 2020). The CSP research within digital equity is primarily focused on stressing the importance of CSP with learning technologies, as well as the UDL framework, but there was only one empirical study found on CSP and UDL in the classroom (e.g., Coppola et al., 2019; Ravi, 2018; Waitoller & King Thorius, 2016). There were not any empirical studies on classroom teachers or students when reviewing multicultural education and technology in the literature (e.g., Chisholm, 1998; Damarin, 1998; Wassell & Crouch, 2008). Multicultural education is noted by scholars as a characteristic and competency for quality technology, but the lack of empirical studies indicates there is a need for additional research on multicultural education and technology.

Multicultural Education and Learning Technologies Future Research Opportunities

The literature has identified that learning technologies and multicultural education are essential components to equitable education, but a search of the literature found no research that studied both and the exchanges between them. Beyond considerations of

student access to technology, little attention has been paid to learning technologies and multicultural education in the classroom, especially in empirical research. There are numerous connections between learning technologies and multicultural education, and those intersections are seen within teachers' classroom practices and curriculum applications. Learning technologies and multicultural education play significant roles in student development and achievement, and it is important to understand how learning technologies are being applied and viewed by teachers in the context of digital equity (e.g., Bevins et al., 2012; Gorski, 2009; Gronseth et al., 2020; Patterson, 2005). There are calls in the research to better understand technology, specifically on how it is being implemented into the classroom (e.g., Dolan, 2016; Gorski, 2009). Previously, learning technologies and multicultural education have been viewed as two separate areas of studies, but recently scholars have been calling for technology to include multicultural education concepts such as exploring other cultures, assessing power structures, and fostering multiple perspectives (e.g., Damarin, 1998; Gorski, 2009; Gronseth et al., 2020; Marshall, 2001). There is a need for additional research on multicultural education and learning technologies, specifically on exploring teachers' perspectives and applications on digital equity, learning technologies, and multicultural education.

Chapter Three

Digital equity is an equity-centered approach that seeks to improve students' access to learning technologies, and advance classroom practices, curriculum applications, and teacher beliefs with the intent to resolve the digital divide and prepare students to succeed in a technology-driven society. Learning technologies, one of the components of digital equity, has a well-developed body of literature that has shown learning technologies can increase student achievement and prepare students for the workforce (e.g., Bevins et al., 2012; Eyyam & Yaratan, 2014). Multicultural education, one of digital equity's classroom practices and curriculum applications, derives from critical theory and it focuses on learning and celebrating different backgrounds to promote tolerance and advocate for social justice. Multicultural education has been identified by researchers as an essential element in achieving teacher excellence and student achievement (e.g., Gay, 1994; Grant & Sleeter, 2011; Nieto & Bode, 2018). The third component to digital equity, teacher beliefs, is focused on teachers' acceptance of technology and technology competence (e.g., Aesaert et al., 2013; Ertmer & Ottenbreit-Leftwich, 2010; Schepers & Wetzels, 2007). Teachers that are more comfortable and accepting of technology are more likely to apply it with higher-order thinking skills (e.g., Amin & Mirza, 2020; O'Dwyer, 2004). There have been numerous studies on technology access, digital citizenships, and teacher beliefs, but there have not been any studies that researched the digital equity components of learning technologies, multicultural education, and teacher beliefs together. As technology becomes more integral into the

threads of society, there is a research need to understand learning technologies, multicultural education, and teacher beliefs. The purpose of this dissertation was to explore current educators' perspectives and applications of digital equity within their classrooms – specifically this dissertation investigated teacher beliefs, classroom practices, and curriculum applications on learning technologies and multicultural education. Chapter three will provide the details of this dissertation by explaining the methodology approach, research design, and study limitations. A copy of the IRB approval can be found in Appendix A.

Methodology Approach

A qualitative, multiple-case study approach was used to explore educators' perspectives and applications of multicultural education, learning technologies, and digital equity. The objective of a multiple-case study approach is to intensively study a group of people to test theories, create descriptions, explore problems, and develop new theory (e.g., Creamer, 2018; Creswell, 2013; Gustafsson, 2017; Stake, 2003; Yin, 2006). As identified earlier in chapter two, digital equity theory has been well established by numerous researchers, but there have been few empirical studies that have investigated digital equity with current educators' perspectives and beliefs on learning technologies and multicultural education (e.g., Judge et al., 2004; Gorski, 2009; Gronseth et al., 2020). This dissertation's design supported the objectives of a multiple-case study as it evaluated digital equity theory, described how digital equity is understood by teachers, and made recommendations that addressed identified problem areas and gaps.

The following research questions were addressed in this study:

1. How do educators perceive multicultural education, learning technologies, and digital equity in education?
2. How do educators incorporate multicultural education, learning technologies, and digital equity into the classroom?
3. How do learning technologies and multicultural education intersect to support digital equity?

Research Ontology and Epistemology

Identifying and exploring a researcher's ontology and epistemology is important for transparency and addressing any potential preconceptions or influence within the research process (e.g., Johnson & Onwuegbuzie, 2004; Maxwell & Mittapalli, 2011). My personal way of knowing is through a post-positivist approach, which drives me to seek the truth by asking questions, collecting data, making observations, and conducting research. As a former classroom teacher, I saw and respected my students' different perspectives and beliefs, so I also value each person's experiences and the importance of understanding an individual's truth. I believe it is important to gain insight into people's understandings through interviews and surveys, and interpretivism plays a significant role in educational research. I adhere to the argument that there is more significance on the quality of the plan and analysis for the study than the paradigms the researcher connects with – however, the researcher should not underestimate the effect of their philosophical perspectives (Maxwell & Mittapalli, 2011; Shannon-Baker, 2016). I agree that my ontological and epistemological beliefs have influenced my research, and to ensure these personal perspectives did not negatively impact the outcome of my dissertation I reflected

on my viewpoints continuously and critically through every phase of the research process. I did this by taking time before each interview to reflect on my beliefs and biases, reviewing my research questions and goals, and recentering my focus through an interpretivist lens. I took these steps before analyzing my data and developing my findings as well.

A qualitative, interpretivist approach was used as a philosophical guide for this dissertation (Shannon-Baker, 2016). As the researcher I used an interpretivist lens and reminded myself before each interview that there are multiple and individual truths while exploring educators' understandings and applications of digital equity (e.g., Duffy & Sène-Harper, 2021; Hart, 2015). Survey and interview data were collected to provide in-depth insight into understanding educators' individual perspectives and understandings of digital equity (e.g., Creamer, 2018; Olsen, 2004).

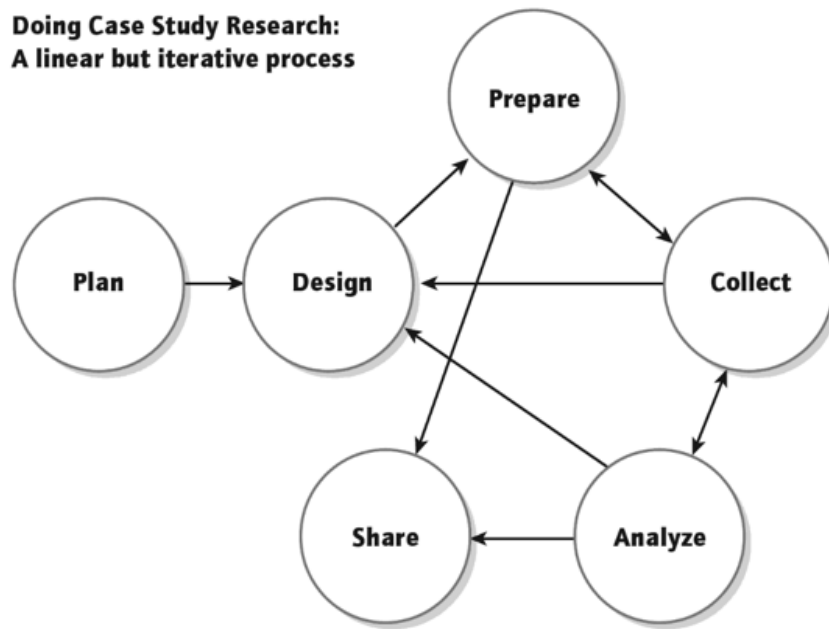
Potential limitations of using an interpretivist approach include influences of biases of the researchers and participants and challenges presented in interpreting contradictory data (e.g., Creamer, 2018; Duffy & Sène-Harper, 2021; Olsen, 2004). These limitations were addressed within the research process by using reflexivity, establishing clear criteria, remaining grounded in digital equity theory, and addressing biases during the data collection and data analysis (e.g., Duffy & Sène-Harper, 2021; White, 2008). The procedures section below will provide more details on the research process.

Research Design

A multiple-case study approach was used in this dissertation to examine how educators are understanding and applying digital equity in their classrooms (Yin, 2018). This case study explored the bounded system of single individuals (Creswell, 2005). Each case focused on an individual educator and the same data (i.e., a survey, two interviews, classroom practices and curriculum applications) was collected for every case. To increase the validity of the findings (Yin, 2018) four cases were examined in this study.

A descriptive, multiple-case study design provided insight into the complexity of digital equity and the outcomes inform theories, professional learning, and classroom practices (e.g., Smith & Strahan, 2004; Yin, 2018). Case studies are intended to be flexible depending on the research objectives and settings, so there are a wide variety of research designs for case studies (Ebneyamini & Sadeghi Moghadam, 2018). I followed Yin's (2018) recommended iterative process for a case study; see Figure 4 for Yin's case study process. There are six phases in Yin's (2018) case study process: plan, design, prepare, collect, analyze, and share. Each phase is intended to move the case study forward while ensuring the data collection and analysis follows the research design.

**Doing Case Study Research:
A linear but iterative process**



Note. The six phases of a case study research process. From Case study research: Design and methods (4th ed.), by R. K. Yin, 2009. SAGE Publications.

Figure 4.

Yin's Case Study Process.

Case studies are sometimes criticized as not a valid or rigorous research method, but other scholars disagree and have provided recommendations on how to create a strong case study (e.g., Ebneyamini & Sadeghi Moghadam, 2018; Yin, 2018). I followed the recommendations of a strong case study by preparing a well-developed research design plan that addressed construct validity, internal validity, external validity, and reliability (e.g., Ebneyamini & Sadeghi Moghadam, 2018; Yin, 2018). An embedded, multiple-case design was used for this study (Yin, 2018), and to ensure a well-developed research plan

I leveraged Yang et al.'s (2020) research process, which was founded in Yin's case study process. See Figure 5 for my research process.

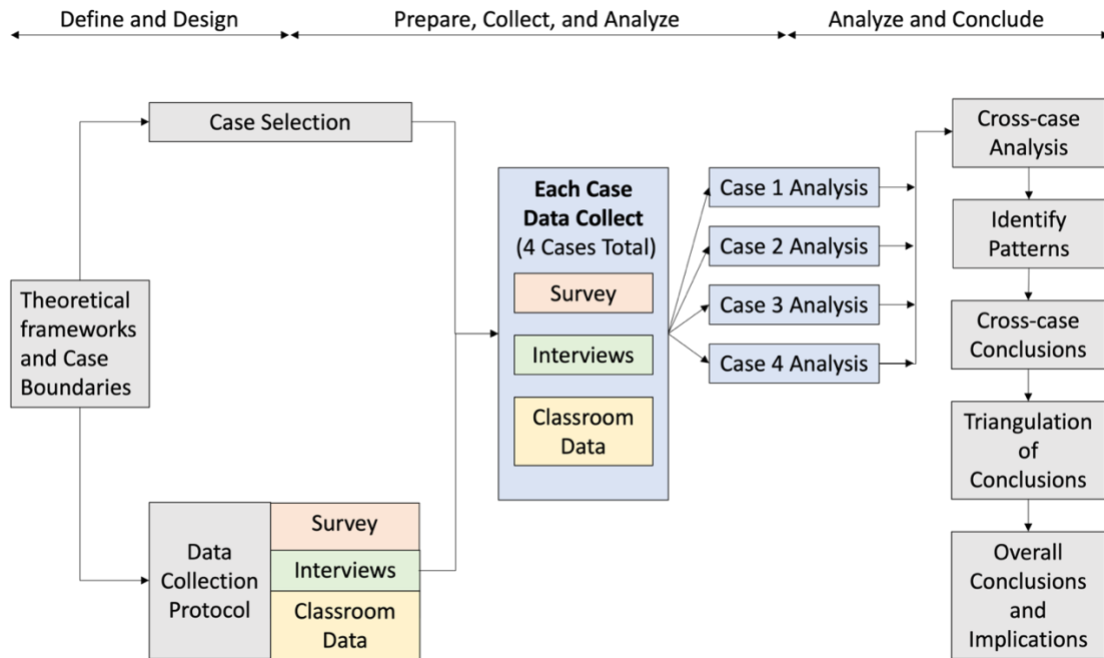


Figure 5.

Research Process.

I began the define and design phase by exploring digital theoretical frameworks and case boundaries. Case selection occurred at the same time the data collection protocol was established. There were three different major data points collected: one survey, two interviews, and classroom data. These three data points were collected for every case. Once the data collection was complete, a case analysis was conducted for each case and patterns were identified. Then a cross-case analysis occurred, and cross-case conclusions

were developed. A triangulation of all the data were conducted and overall conclusions and implications were created.

Several strategies were used throughout this dissertation to address the potential limitations of a case study approach, which includes researcher bias, generalizations, construct validity, internal validity, external validity, and reliability (Ebneyamini & Sadeghi Moghadam, 2018; Yin, 2018). I applied a well-developed research design plan, and to increase the quality of the study, manage construct validity, and decrease researcher bias, I focused on being transparent and exploring my way of knowing (e.g., Maxwell & Mittapalli, 2011; Yin, 2018). I selected a multiple-case study approach because it is stronger than a single-case design and addresses construct validity (Yin, 1994; Yin, 2018). To address the limitation of generalizations, I have included my data and how my results were analyzed. I managed this study's internal validity by identifying patterns, using triangulation in my data analysis, and exploring my research bias (Merriam, 1998; Yin, 1994). Multiple-case studies follow replication logic, which can support external validity concerns (Yin, 1994). Reliability of this study was addressed by establishing data collection protocol and creating a study database (Yin, 1994).

Setting

This research was conducted with public school teachers in the United States. Due to the current COVID-19 pandemic, all data were collected online or virtually. This included email correspondences, a website for the online survey, interviews were conducted via Zoom, an online video conference platform, and all the data from the classrooms were collected over websites or viewed over Zoom.

Participants

Purposeful sampling was used to select four public school educators who have a high technology proficiency level. Purposeful sampling may not be the recommended approach for a descriptive case study (Yin, 2018), but it was selected due to the research correlating teachers with a higher comfort in technology have a higher usage of technology in their classrooms. The purpose of this study was to explore how teachers understand and apply digital equity in the classroom, so it was important to select participants that are using technology in their classroom practices and curriculum applications. The participants were all currently teaching and using technology in their classroom at the time the interviews occurred. Two elementary educators and two high school teachers were selected. Elementary classrooms are structured differently than high school classrooms; elementary teachers typically teach all primary subjects (e.g., literacy, mathematics, social studies), but high school teachers typically teach a specialized subject. Comparing the elementary case data to the high school case data during the analysis phase gave the opportunity to examine how educators may be using learning technologies and multicultural education differently in the classroom. The recommended number of cases in a case study varies from one to 15, but most researchers believe three to six is an acceptable number of cases (Creamer, 2018). For this dissertation four participants were included to provide enough data to compare the different grade levels. The participants all have more than five years of experience with varied backgrounds and working with diverse student populations. This section will provide details of each case,

such as their experience level, education background, current classroom assignment, and school demographics.

Selection of Participants

Participants were recruited through a variety of approaches including educational courses offered at a university in northern Virginia, advertisements on social media, and through professional contacts. The advertisement included a description of the study, study participant requirements, financial benefits for those who complete the study, and a link to the survey. The educational courses were master level for practicing educators working on advancing their teaching knowledge and practices. An initial email was sent out to the three different educational courses advertising the study. The dissertation advertisements were also shared on the social media site Facebook. I have numerous professional contacts in the education field and provided them with the advertisement so they could share it with other educators.

Those who agreed to participate in the study first completed a survey that included demographic information, the Technology Proficiency Self-assessment Questionnaire for 21st Century Learning (TPSA-C21; Christensen & Knezek, 2017). The TPSA-C21 (Christensen & Knezek, 2017) measured the educators' technology proficiency. Nine individuals agreed to participate in the study, and purposeful sampling was used to select the final four participants for the study. Selected participants were currently teaching and had a high technology proficiency level (based on the TPSA C-21).

Participant 1: William. William (a pseudonym) was the first participant I communicated with and interviewed at the end of February 2022. William is a high school math teacher in the upper east of the U.S., and he identifies as a White man. William has over 25 years of experience and has previously taught in Hawaii and Virginia. He has a master's degree and a high technology proficiency as he scored 4.76 out of 5.0 on the TPSA-C21 (Christensen & Knezek, 2017). William's current school is predominately White with about half the population qualifying for free or reduced lunch. The student population was highly diverse at the school he used to teach at in Hawaii. William has previously taught middle school math, and currently teaches geometry, algebra 2, and precalculus to 9-12th grade students.

Participant 2: Faye. Faye (a pseudonym) is the second participant in this dissertation. She currently coaches and teaches Science Technology Engineering and Math (STEM) at an elementary school in Virginia. Faye participated in the study at the end of February 2022. She has two master's degrees with over 20 years of experience and identifies as a White woman. The majority of Faye's students are English Learners (ELs), and her current school's population is highly diverse. Faye has a high technology proficiency with a TPSA-C21 (Christensen & Knezek, 2017) score of 4.71 out of 5.0.

Participant 3: Helen. Helen (a pseudonym) is a high school art teacher and the third participant in this dissertation. Helen teaches at two high schools in Virginia; both schools are racially and religiously diverse. She has a master's degree and over 10 years of teaching experience. Prior to teaching high school, Helen used to be a preschool

teacher. She identifies as a White woman and has a high technology proficiency with a TPSA-C21 (Christensen & Knezek, 2017) score of 4.65 out of 5.0.

Participant 4: Claudia. Claudia (a pseudonym) was the final participant I interviewed for this dissertation. She is a third-grade teacher at a Title I school. Claudia identifies as a White woman and has previously worked for the Peace Corps and as a social worker. She teaches at a minority majority elementary school in a midwestern state. Claudia has a master's degree with nine years of experience. She has a high technology proficiency with a TPSA-C21 (Christensen & Knezek, 2017) score of 4.76 out of 5.0.

Data Sources

Three major data points were used for this study: survey, interviews, and classroom data. To support these major data points, there were a total of five data sources collected for this dissertation. The five data sources include the demographic information, the TPSA C-21, interview one, interview two, and the Checklist for Evaluating Informational Materials (Banks, 2019).

Survey

The first data source is the demographic information that was collected in the initial survey. The demographic information will provide background information on the participant and their teaching assignment. See Appendix B for the demographic questions.

The second data source is the TPSA C-21 (Christensen & Knezek, 2017), and these questions were included in the initial survey. The purpose of the TPSA C-21 was to

assess teachers' self-efficiency on their integration of technology in their classroom and curriculum (Christensen & Knezek, 2017). The TPSA C-21 was validated by Christensen and Knezek in 2017 to evaluate current educators and preservice teachers' confidence in applying technology for student learning. Christensen and Knezek reported the scale to be reliable, with a Cronbach's alpha of 0.96 for the entire survey. The TPSA C-21 provided quantitative data on the participants' perspectives of learning technologies, which addresses the first research question. See Appendix C for the TPSA C-21.

Interviews

The third data source is the first interview. The first interview was semi-structured and focused on understanding teachers' background and perspectives of multicultural education, learning technologies, and digital equity, which addresses the first research question. The surveys were collected was used to help guide the interviews, and the first interview provided participants an opportunity to expand their responses and share more details on their perspectives. See Appendix D for the first interview questions.

The fourth data source was the second interview. The second interview was semi-structured, and the purpose was to explore how educators integrate multicultural education, learning technologies, and digital equity in the classroom. The second interview was used for providing data on educators' understanding of learning technologies, multicultural education, and digital equity. It was also used to collect classroom data. This second interview addressed the second and third research question as it provided an opportunity for educators to expand on how they used learning

technologies and multicultural education materials in the classroom. See Appendix E for the second interview questions.

Classroom Data

Classroom data were collected through the second interview and the Checklist for Evaluating Informational Materials (Banks, 2019). Due to the limited access to classrooms during the COVID-19 pandemic, observations were not conducted, and the majority of the data collected was self-reported. Instead, during interview two the participants described and answered questions about a multicultural education, learning technology lesson. This information collected during interview two contributed to the classroom data.

The fifth data source is the Checklist for Evaluating Informational Materials (Banks, 2019). The purpose of the checklist was to evaluate the level of multicultural education within classroom materials. Each participant identified a learning technology they frequently use in the classroom, and I evaluated that learning technology using the Checklist for Evaluating Informational Materials before interview two (see Appendix F for the checklist). The Checklist for Evaluating Informational Materials was reviewed before interview two to help prepare me to ask relevant learning technology questions and follow-up questions. The data collected from the checklist addressed the third research question. Although reliability and validity measures were not identified for the Checklist for Evaluating Informational Materials – Dr. James Banks is a highly regarded scholar within the field of multicultural education who has written numerous books and articles on multicultural education.

Data Collection

The data were collected via three formats and in three different phases. Both the survey and the demographic information were collected in one format, an online survey program called Qualtrics. The second data collection format was the semi-structured interviews, and these were executed via an online video program, called Zoom. All interviews were conducted by the researcher. The third data collection format was the Checklist for Evaluating Informational Materials, and Microsoft Office Excel was used to record and analyze the scores.

Procedures

There were five major steps in this study, and the procedure steps can be viewed in Figure 6. The research study began with understanding digital equity theory and developing a research plan. Once the research design was finalized, IRB approval was obtained.



Figure 6.

Research Procedure Steps.

In step 1, the participants were selected for the study. To recruit participants an advertisement was created and shared through personal contacts, social media, and an

interest email that was sent to three master-level educational courses. The advertisement can be found in Appendix G, and the interest email is in Appendix H. The link to the survey was provided in the advertisement. The survey contained the IRB approval information, demographic questions, the TPSA C-21 questions, and a consent form (see Appendix I for the consent form). The surveys were analyzed, the TPSA C-21 scores were calculated via Microsoft Excel, and the participants were chosen based on the participant requirements. All the participants were currently teaching and had a high technology proficiency score (based on the TPSA C-21). The participants all signed the consent form in the online survey, and two elementary school teachers and two high school teachers were selected out of the nine that agreed to participate in the study.

Once the participants were chosen, an email was sent to each individual participant to schedule the first interview. The first interview was estimated to take 90 minutes and on average took about 75 minutes to complete. I reviewed the survey prior to the first interview. This prepared me to ask appropriate questions on the participant's background and ask relevant follow-up questions. During interview two, I asked questions about a multicultural education, learning technology lesson. Before each interview I reflected on my beliefs and biases, reviewed my research goals and questions, and recentered my focus through an interpretivist lens. I took brief notes on key discussion items during the interviews as I wanted to stay focused on the conversation, but also have a record of the comments I believed to be essential at the moment. At the end of every interview one, I asked the participants about the different learning technologies they use in their class, and which one might be the best to find a

multicultural education lesson. The second interview was scheduled at the end of the first interview with at least one weekend between to provide time to analyze the learning technology before interview two. Immediately after every interview I reviewed my research goals and questions and then wrote researcher memos for every interview question and made overall notes.

The steps of data collection overlapped between participants, depending on when each completed the survey and their availability. The procedures were sequential for each participant, but not as a collective group. All four participants were not required to complete step one before we could all move to step two. For example, William completed his survey in February of 2022, and I completed steps 1-5 in order, but Claudia did not complete her survey until May. I had already begun analyzing William's data (step 5) before Claudia had even completed her survey (step 1).

I evaluated the learning technology with Banks' (2019) Checklist for Evaluating Informational Materials three times. I first reviewed the learning technology before interview two. I evaluated the learning technology again after interview two since I had additional information from the participant. For example, William showed me some features on Desmos I was not aware of during my initial review, which resulted in a higher score. When there were discrepancies between the two scores I reviewed the learning technology a third time, to determine the final score.

Interview two occurred during step 4, and it was estimated to take 90 minutes with most interviews taking about 75 minutes. The same process was followed for interview two as interview one (e.g., preparations before the interview, key comments

recorded during the interview, researcher memo after the interview). Participants were thanked at the end of interview two and I gave them the details on how they would receive their payment for completing their engagement in the study. The individual case analysis commenced once interview two was completed.

The cross-case analysis did not begin until all the interviews were completed. Once the cross-cases analysis was done, patterns were connected between the cases and cross-case conclusions were developed. All the data points were reviewed through triangulation and overall conclusions and implications were created.

Data Analysis

This dissertation was a qualitative, case study. Numeric data were used to expand and enrich the qualitative data, but no statistical data analysis was conducted. The survey with the demographic data and TPSA C-21 scores were used during steps 1 and 5. In step 1 the means of the TPSA C-21 scores were calculated via Microsoft Office Excel, and those scores were used to select the participants and provide guidance during the semi-structured interviews in steps 2 and 4. The entire data from the surveys were used during step 5, during the triangulation portion of the analysis to help make connections and answer the research questions.

The semi-structured interviews were analyzed during steps 3 and 5 of this study. Regardless of the phase, the interview data followed the same data analysis procedures as identified by Saldaña (2021). During step 3, analyze learning technology and interview one, I recorded the interviews using Zoom software. I analyzed the data by first creating a transcript and then watched the video recording adding notes specific to the participant's

body language and tone. I read through the lines of the entire transcript, and then identified the themes. Each theme was assigned a color (e.g., pink meant it was a comment related to multicultural education), and I went through and coded the transcript by theme. After that was completed, I created a table for every code and then I identified the subcodes. Once the coding was finished, I developed two tables to help draft the metasummary and metasyntesis. The first table was organized by theme and the second table was organized by research questions. I added all the relevant data (e.g., quote, key comment, research memo notes, code, subcode) to the tables and conducted a metasummary and metasyntesis of all the information. The metasummary and metasyntesis was used to draft the major findings.

The analysis for the Checklist for Evaluating Informational Materials was conducted in Microsoft Office Excel to calculate means, and these scores were used to expand the analysis for the third research question and the overall research question. I evaluated the learning technology with Banks' (2019) Checklist for Evaluating Informational Materials before interview two. First, I explored the learning technology to become familiar with its features and lesson options. Then I chose a lesson that had the greatest potential of incorporating multicultural education characteristics. For example, on Desmos I selected a lesson on minimum wage that included discussion questions on the different average wages within the U.S. Desmos had other lesson topics, such as exploring geometry and calculating angles, which did not include any components of multicultural education. I went through all 17 checklist items in Microsoft Excel, gave each list item a score, and then hid the initial score column. After the second interview I

reviewed the lesson again and gave each list item a score. I then revealed the original scores and compared the two. If the two scores matched then I kept them the same. If the two scores did not match I went back to the lesson a third time to select a final score. I used the average calculation feature in Microsoft Excel to determine the overall integration of multicultural education in that lesson.

In order to answer the research questions a variety of analysis occurred: a cross-case analysis, identifying patterns, data point conclusions, and triangulation of all conclusions will be used (e.g., Creamer, 2018; Ebneyamini & Sadeghi Moghadam, 2018; Yazan, 2015). At the start of my analysis, I created a database for each participant, so by the end the database included the survey results, TPSA-C21 Microsoft Excel score calculation, original transcript, coded transcript, coded tables, research question tables, and learning technology multicultural education checklist Microsoft Excel calculation. The cross-case analysis was used to holistically review similarities and differences between case studies, and then patterns from this analysis were identified with the development of conclusions. I used the coded tables and research question tables to organize the data, metasummaries, and metasynthesis'. I then developed a study database to compare all the participants' data to identify themes. Once all the data sources had been analyzed they were compiled together to create a triangulation of conclusions. After the triangulation data analysis was completed, the overall conclusions and implications were developed.

Table 1 presents the alignment of the research questions, data collection, and data analysis.

Table 1

Interview Details

Research Question	Data Collection	Data Analysis
1. How do educators perceive multicultural education, learning technologies, and digital equity in education?	Demographic TPSA C-21 MTCS Interview 1	Triangulation Mean Mean Code by theme then metasummary and metasynthesis
2. How do educators incorporate multicultural education, learning technologies, and digital equity into the classroom?	Demographic Interview 2	Triangulation Code by theme then metasummary and metasynthesis
3. How do learning technologies and multicultural education intersect to support digital equity?	Checklist for Evaluating Informational Materials Interview 2	Mean Code by theme then metasummary and metasynthesis

Methodological Considerations

There are gaps within the sampling, research design, and researcher bias. It is important to address these limitations to increase the validity of the research (e.g., Ebneyamini & Sadeghi Moghadam, 2018; Maxwell, 2010).

Sampling and Design Limitations

There are limitations within the sampling and research design. Non-probabilistic sampling was used to select the participants which restricted the study to a smaller group and the participants are not representative of the entire education population. To address this, educator demographics were collected and described in the participant section. Four cases were explored in this dissertation, and due to the small sample size the findings do not include generalizations.

In the data collection phase, observations were not conducted. This decision was based on classroom restrictions due to the COVID-19 pandemic, resulting in a reduction of the data collected for each case study. Instead, questions were asked in the second interview for teachers to describe their lesson and perceived learning outcomes. Since there was only one researcher, all the data points were analyzed by one person in this dissertation. To address this limitation, I created a case study database (Yin, 1994) and followed Saldaña's (2021) recommended procedures to thoroughly review the data in multiple steps.

Researcher Bias

It is important to address researcher bias to reduce the influence a researchers' beliefs and perspectives may have on the study (e.g., Holmes, 2020; Maxwell & Mittapalli, 2011). I identify as a White woman and a native English speaker. I have never been diagnosed with a disability, but I grew up with family members with learning disabilities and as a result react strongly when negative language or beliefs around individuals with disabilities are expressed. I was a K-2 public, classroom teacher for over

five years where I taught a diverse student population and developed a passion for technology and multicultural education. I served on the district technology team, school equity team, and worked as a technology initiative lead for the district where I provided professional learning experiences (PLEs) on various learning technologies. I left the classroom due to burnout, but my love for teaching, education, and technology remains. These experiences have greatly shaped my positionality as I personally saw the positive impact of learning technologies and multicultural education with my students and other educators. Due to my time as a classroom teacher, I have a sensitivity towards deficit perspectives or blame placed on educators. As such I have attempted as much as possible during this dissertation to use neutral or positive descriptions during the data analysis and findings sections.

I navigated my researcher bias during this study through transparency and critical self-reflection. An interpretivist approach was the philosophical guide for this study, and I used that as my focus when I collected and analyzed the data. I self-reflected before and after interviews and concentrated on my research goal to explore teachers' individual understandings of digital equity (e.g., Duffy & Sène-Harper, 2021; Hart, 2015).

Ethics

Numerous actions were taken to ensure the study was ethical and the privacy of the participants was secured. IRB approval was granted before moving forward with this dissertation. The study was explained to the participants before they began the survey, the participants signed the consent forms to validate they have agreed to the terms of the study, and the participants were permitted to exit the study at any time. All data were

password protected, and the participants were assigned pseudonyms through the entire study, so their personal identities were protected.

Chapter Four

The purpose of this multiple-case study dissertation was to expand the literature on digital equity by exploring teachers' perspectives and applications on learning technologies and multicultural education. Four current classroom teachers were surveyed and interviewed. The teachers identified a learning technology, and these were analyzed to answer the following research questions:

1. How do educators perceive multicultural education, learning technologies, and digital equity in education?
2. How do educators incorporate multicultural education, learning technologies, and digital equity into the classroom?
3. How do learning technologies and multicultural education intersect to support digital equity?

An interpretivist approach was used as the philosophical guide for this dissertation. The data points were analyzed with an interpretive lens – that there are multiple and individual truths when exploring educators' understandings and applications of digital equity (e.g., Duffy & Sène-Harper, 2021; Hart, 2015).

Case Study 1: William

William cares about his students, is passionate about learning technologies, and identifies multicultural education as essential. He is a high school math teacher in the upper east of the U.S with a master's degree and over 25 years of experience. William identifies as a White man, and his current school is predominately White with about half

the student population qualifying for free or reduced lunch. This participant has taught in numerous schools throughout the U.S. including Hawaii and Virginia. William loves math, technology, and being challenged. He understands and is aware that many students view math as difficult and his goal “is always to get every kid to feel successful in the classroom.” This participant believes good teachers need to be able to relate to their students, care about them, build trust, and support their learning. William defined and integrated multicultural education, learning technologies, and digital equity individually and independently within his classroom. William described multicultural education as an essential classroom component where students learn about multiple cultures. He applied multicultural education into the classroom through an awareness of privilege and teachable moments. Learning technologies, as explained by William, are purposeful, transformational tools that should be integrated into all areas of the classroom. This participant perceived digital equity as access, and he incorporated it into the classroom through equal access to learning technologies. Intersecting multicultural education and learning technologies in support of digital equity was challenging to William. He made a few connections between the two, and none were in support of digital equity. William shared he believes multicultural education and learning technologies are critical to the classroom and there is an educational need to study them more together.

Background

William completed the online survey at the end of February 2022. He participated in two interviews in early March, one week apart. William has a high technology proficiency level on the Technology Proficiency Self-assessment Questionnaire for 21st

Century Learning (TPSA C-21; Christensen & Knezek, 2017) with a score of 4.76 out of 5.0.

Multicultural Education

William's perceptions and incorporations of multicultural education were focused on his classroom, understandings, and professional learning experiences (PLEs). William shared that he believes multicultural education is providing diverse examples and he applied multicultural education through unplanned, teachable moments. He stated he has participated in multicultural education PLEs, and the ones that have been helpful have increased his awareness of his privilege as a White man. William shared he found most of the required multicultural education PLEs were ineffective.

Multicultural Education Perceptions and Applications. William perceived and incorporated multicultural education as representing multiple cultures through undeveloped teachable moments. He stated that multicultural education is “making sure that you represent multiple cultures while teaching, whatever it is you're teaching.” William shared that he believes multicultural education should be integrated into all areas of the classroom and it is critical to incorporate it into the curriculum. He commented, “I think multiculturalism is essential... multiculturalism shouldn't be something I just use when I need it. It should always be present; it should be one of the things that are always there [in the classroom].” William noted that he believes incorporating multicultural education can be difficult in a math curriculum, but he does it by including multicultural examples of mathematicians, being aware, and capitalizing on it through teachable moments. He shared,

I use a software called Desmos, and they have a really neat thing that turns the names in the class roster into names of famous mathematicians. Desmos has done such a great job pulling in women and Africans and people I have no idea who they are, so the kids will ask about them and I will look them up.

William commented that he can apply multicultural education into his curriculum by educating himself on what is going on globally and by listening to his students' comments and questions. He stated, "[I incorporate multicultural education] by being aware. It helps a lot to be aware of what's going on currently in the world." William noted that implementing multicultural education into a math class can be difficult, but he is able to do so by addressing questions or comments when they organically occur. He shared, "I try to take these multicultural moments when they happen, though it's tough in math class to focus on culture." William offered an example of a teachable moment. His students had just learned about Helen Keller in their previous class, but they did not believe she could have truly achieved all those accomplishments. To challenge their misconceptions about people with disabilities, William paused his math lesson for about five minutes and began asking them questions about why they came to their conclusions. He then "looked Helen Keller up on Wikipedia," and at the end of class his students had altered their opinion. William knew he changed their thinking as they made comments, such as, "Oh, I never thought about it that way." If there is an opportunity to push students' thinking, William stated that he believes it is important to step away from the assigned curriculum and engage with the students, even if the subject is not aligned to the learning objectives of the day. He commented, "Brief discussions and making them

aware, especially in their tiny world, helps them to learn there is so much more out there.” William taught multiculturalism through unplanned, brief discussions with the goal of challenging his students’ beliefs.

Multicultural Education Perceptions and Applications Lens. William viewed and applied multicultural education through his awareness of privilege. He described multiculturalism as an important part of the curriculum. As a math teacher, William shared that he is cognizant that mathematics has historical and current biases that favor White men working in math-related fields. He stated, “My main focus is the really repressed culture in mathematics is women.” William did not make any comments that this was a systemic problem and shared he believes women mathematicians have continually been limited in the field, so it is critical for more young women students to engage in advanced algebra, trigonometry, and calculus. William noted, “Whenever I have female students, I try very hard to push them to be successful and make them believe they can do math.” William discussed that he actively works at a microlevel to change the demographics in the math-related workforce by encouraging his students and making sure they are successful within his class.

Multicultural Education Perceptions and Applications Potential Opportunities. There are promising methods and approaches that could expand and enhance multicultural education in William’s classroom. Many scholars have argued that White teachers have not received the appropriate PLEs to effectively teach students with different backgrounds other than their own, resulting in lower performance scores (e.g., Haberman, 1995; Hirsch, 2005; Redding, 2019). Multicultural education has been

identified as a cultural competency approach that can mitigate these concerns and improve teachers' ability to integrate students' cultures into the classroom (e.g., Banks, 1996; Nieto & Bode, 2018). William described that he views multicultural education as essential and included it in his curriculum by challenging students' perspectives through impromptu conversations and learning about mathematicians from around the globe. According to Nieto and Bode (2018), there are seven characteristics of multicultural education; multicultural education is antiracist education, basic education, important for all students, pervasive, education for social justice, a process, and critical pedagogy. There is evidence that William incorporated two of the seven characteristics, including multicultural education is basic education and multicultural education is important for all students. William did not fully embed these two characteristics as defined by Nieto and Bode (2018), but he did include pieces of them. For example, William incorporated the characteristic that multicultural education is basic education by exploring the diverse mathematicians included in the learning technology online program called "Desmos." Nieto and Bode (2018) described this characteristic as including many people and their viewpoints in the curriculum. William did not investigate the perspectives and experiences of these mathematicians deeply, but he did include a variety of mathematicians' perspectives and experiences by providing the backgrounds of the mathematicians on Desmos, and he shared he is aware of the importance of challenging monoculture classroom practices in his mathematics curriculum. William also stated it is important to represent multiple cultures in education and he does this by bringing

awareness to different cultures (e.g., gender, race), which supports Nieto and Bode's (2018) characteristic that multicultural education is important for all students.

Many scholars have argued that teachers misapply multicultural education by just teaching multiple cultures and they do not include constructive conversations about bias or social justice discussions (e.g., Gorski, 2017; May & Sleeter, 2010). William stated that he is dedicated to bringing multicultural education into his classroom, and there are a variety of opportunities he could include to deepen his students' multicultural education experiences. This participant could incorporate all seven characteristics of multicultural education in his curriculum. There is the potential to include conversations about social justice, such as doing an in-depth review of the lives and work of the mathematicians on Desmos or creating new solutions to address climate change. William could also instruct mathematics through a critical lens by having his students challenge the power structures in the mathematical field. William is including multicultural education in his curriculum, and there are additional strategies and practices that could be incorporated to advance multicultural education in his classroom.

Multicultural Education PLEs. William stated his most impactful PLEs have been focused on discussing and exploring the concept of privilege. William frequently mentioned White privilege during the interviews. He discussed that he is aware being a White man gives him advantages in society and limits his understanding of his students of color or young women experiences. William commented he believes the key to connecting with students is by listening to their perspectives, emphasizing their feelings, and learning from them. For instance, he stated, "I'm never going to be a Black

woman..., so I can't pretend that I know what that's like, but I can listen to the experience and empathize with how she felt and learn from that experience." William credited his understanding of multicultural education to his time living in Hawaii, continuously learning opportunities (e.g., reading books, listening to podcasts), and some required PLEs he received in Hawaii. He noted,

They [Hawaii] bring in a lot of new teachers, every year, and so there was always multicultural training there...we had some multicultural training in Virginia, but then after 9/11 and No Child Left Behind most of our training was on test scores... Since I've been here, I can't think of any [multicultural education training] I've had. Now, there is stuff I do myself, I used to be a much more avid reader and now I listen to podcasts.

William's formal learning experiences on multicultural education have been limited (e.g., required work opportunities, university classes), but he is still working on his own to expand his understanding of multicultural education.

Learning Technologies

William viewed and applied learning technologies as a tool to enhance student achievement with higher-order thinking skills (Sneed, 2016). He described required professional learning as unhelpful, but he has grown in his own learning technology skills through self-initiative and independent exploration.

Learning Technologies Perceptions and Applications. William shared he believes learning technologies are tools to be used to enhance students' understandings, and he incorporated all levels of Bloom's digital taxonomy in the classroom (Sneed,

2016). He described learning technologies as “any technology, it doesn’t matter if it’s computer-based or chip-based, and that it is used in a classroom or in an educational center.” This participant stated that he believes learning technologies provide an abundance of features and animations that can transform a student’s educational experience and open up new worlds. For example, if a student is struggling with a particular concept, William explained, “I can just pull up a graph on the web or use an interactive tool and show them so they what they need to do by demonstrating and explaining the concept.” For this participant, technology not only enhances student learning but improves teaching as mathematical websites and programs, like Delta Math, provide extensive data on how students are comprehending the information. William commented these math programs provide him with data so he can improve his teaching by instantly addressing any mistakes and misunderstandings. He shared,

Now I use either Desmos or Delta Math for practice, so that way grading becomes instantaneous for me, and they get immediate feedback, which is even better, because in math the biggest thing that can hurt you is constantly doing them [math problems] incorrectly.

Though learning technologies serve a critical role in the classroom, William noted they should be used to increase student learning and make education easier. He shared that they should not be used as a space filler or to simply fulfill a tech requirement. William stated, “Technology needs to make my life better, and if it doesn’t make my life better I won’t replace it with something else... the learning technology should always be something that’s actually going to help the student.” Technology is integrated throughout

William's classroom as he noted, "I have incorporated technology so much that I don't know how I would exist without technology, it's ubiquitous throughout my classroom." When talking about learning technologies, William's tone was confident, and he quickly and easily answered all the learning technology-specific questions.

This participant incorporated all levels of Bloom's Digital Taxonomy from remembering to creating (Sneed, 2016). Students in William's classroom watched tutorial videos he developed, and students practiced their skills on a variety of online math programs (e.g., Desmos). He stated, "The students watch the video, they do the assigned practice work, and then I just wander around the room waiting for someone to ask questions." William's students also used graphing calculators to create art as he shared, "Students typed in equations to create those [graphing calculator art projects]".

In both words and demeanor, William demonstrated a true enjoyment for working with learning technologies. He commented that learning technologies are "an essential tool in my life," and they must be utilized purposefully to improve teaching and increase student achievement. William had a high technology proficiency score on the TPSA C-21 (Christensen & Knezek, 2017), which was evident during the interviews as he described how he leverages learning technologies in his curriculum. William stated that he believes in the importance of learning technologies; he did not treat as a separate area of study and instead it is integrated it throughout his classroom.

Learning Technologies PLEs. William expressed that he has found required PLEs for learning technologies to be ineffective, and instead he has advanced his technology skills primarily through self-growth. This participant's beliefs about learning

technologies originated from his passion for technology as he stated, “I have always been a technology person as I used to build my own computers.” William noted that he has built some of his understandings of learning technologies through his graduate classes, but most of what he has learned has been on his own. He shared, “My degree at George Mason is instructional technology so those classes were beneficial, but most of my technology learning is self-taught.” William felt his school-required PLEs were boring and lacked rigor. He commented, “With the technology training I’ve had in school, it’s usually been boring and ineffective because they don’t differentiate.” Most of William’s definitions and applications of learning technologies were a result of his personal passion for technology and some college courses, but he reported the required PLEs did not support his knowledge or usage of learning technologies.

Digital Equity

William defined digital equity as equal access to devices and the internet, and he applied it by providing the same resources to all his students. This participant believed digital equity is about equal access to technology only, and there was not any evidence that he integrated equity-centered classroom practices or curriculum applications.

Digital Equity Perceptions and Applications. William viewed digital equity from a digital divide perspective with a focus on access. He defined digital equity as “access...is there equitable access?” William expressed concern about equitable access to technology and the internet, and he noted there is a distinct gap between students who have computers and reliable internet at home and those who do not. For example, William described that he has a student who can get through security controls and view

prohibited materials, yet he has other students who struggle to understand computer basics. William talked about the difference in access his students have,

There are two kids in my class. One kid who has computers at home and can do Window hacks on his school computer. Then there is the other kid who wants to take a computer home so he can learn to be better with it but can't.

William stated he believes "it's very obvious who does and does not have computers and the internet at home," and noted students with limited resources do not have the option of building their technology skills outside of class. William shared he feels this became highly evident during the pandemic when learning stopped for many students who lacked access to a computer, the internet, or both. William commented, "In March of 2020 the district focused on getting internet to families in our rural areas.. so, there were a lot of families when schools shut down there was no learning." This participant witnessed how digital inequities can negatively impact student achievement as he saw his students without access disengaging from learning during the COVID-19 pandemic when schools went fully virtual.

Digital Equity Access, Classroom Practices, and Curriculum Applications.

When asked about digital equity perceptions, William described digital equity as equal access to computers and the internet. William shared that he believes digital equity is addressed in his classroom by supplying one-to-one computer access, providing reliable internet, and not requiring students complete their work outside of the class. William stated he does not assign homework, so he does not have to worry about access at home because "sometimes the kids don't have internet or reliable internet in their house."

William expressed concern about equal access to technology when students are learning from home, but he believes that within his classroom, all students have the necessary tools to be successful. As noted in chapter one, digital equity is defined as an equity-centered approach that seeks to improve students' access to learning technologies, and advance classroom practices, curriculum applications, and teacher beliefs. The goal of digital equity is to resolve the digital divide and prepare students to succeed in a technology-driven society. When discussing digital equity, William focused only on access and did not mention any equity-centered classroom practice or curriculum applications.

Multicultural Education and Learning Technology Intersection

William viewed and applied multicultural education and learning technologies as classroom components that do not intersect to support digital equity. William struggled to identify the connections between multicultural education and learning technologies and viewed their relationship as important but separate from digital equity. My analysis of this participant's learning technology, Desmos, revealed there were few multicultural education components, based on Banks' (2019) checklist. William suggested that Desmos could improve their program by increasing the math content and advancing administrator features, but he did not mention any equity-centered curriculum applications or multicultural education.

Relationships Between Multicultural Education, Learning Technologies, and Digital Equity. William was hesitant with his responses when trying to explain the connection between multicultural education and learning technologies. When asked about

the similarities between multicultural education and learning technologies, he said, “(Pause). Hm, well that's a good question. (Pause). Um (pause).” William then did respond and explained that learning technologies can support the goals of multicultural education as information on multiple cultures can be easily accessed and differentiated based on your students’ needs. He stated, “I think learning technologies can make it easier to be multicultural, because you have access to so much more information and quickly at your fingertips... it’s important that students have access to it and use it at their pace.” William also described a difference between learning technologies and multicultural education. He stated that he believes learning technologies are a tool that should always be available if needed, but multicultural education is essential and should always be embedded within the classroom. This participant commented, “Instructional technologies are there to make instruction better, they are a tool...multiculturalism is essential... multiculturalism isn't a tool, it is something that should be there as a presence in the classroom, it should be more omnipresent.” William did not make any comments on digital equity or the use of multicultural education and learning technologies in support of digital equity. These responses aligned to William’s definitions and applications that multicultural education and learning technologies are individual areas and independent of each other.

Finding connections between multicultural education and learning technologies was challenging for William. When asked about the similarities between multicultural education and learning technologies, William appeared flummoxed and there were two long pauses before he answered and commented, “I’ve never thought about how they’re

similar.” William’s reaction was comparable with the question that asked about the differences between the two as there was one long pause before providing his answer.

At the beginning of interview two William shared he had reflected on the questions from interview one and believed the work in this study is crucial. He stated,

Definitely thought about it [interview one] several times. I just had a conversation this morning with a friend of mine. I was telling him about the interview, and he was like, ‘wow.’ I think what you’re doing is really cool I hope some good comes out of it.

William used a tone of excitement and appeared interested, but unsure, of the relationship between multicultural education and learning technologies. Though he did not make any direct statements on a desire to learn more about this relationship, William’s body language and comments gave me the impression this was an unfamiliar area that he would like to know more about. This participant made additional comments on how this work, looking at multicultural education and learning technologies together, is essential right now between what is currently brewing in education and how the COVID-19 pandemic has shown how important technology is to stay connected and engaged in society. At the end of interview two William shared,

I think multicultural is more important now, although the last two years has shown how badly we need technology to work well to help students and make it more equitable for students. They’re [learning technologies and multicultural education] both passions of mine, and I think they’re both incredibly important, and I love the fact that you’re doing this, with both of them together.

Though William noted he believes in the importance of incorporating multicultural education and learning technologies together, there were not any connections made to digital equity, nor were there any mentions of intersecting multicultural education and learning technologies in support of digital equity.

Learning Technology Multicultural Education Checklist Review. Desmos, as a learning technology, provided minimal examples of multicultural education integration. Desmos is one of the learning technologies frequently used in William’s classroom. To develop a better understanding on how multicultural education and learning technologies intersect to support digital equity, I evaluated a lesson on the learning technology identified by each participant using Banks’ (2019) Checklist for Evaluating Informational Materials (see Appendix F for the complete checklist). The checklist included 17 criteria questions on multicultural education and used a rating scale from one to six; one was “hardly at all” and six was “extensively” (Banks, 2019, pp. 158-159). The lesson I evaluated on Desmos focused on the minimum wage and creating dot plots. Out of the 17 criteria categories, 12 were “hardly at all” included in the lesson, so each of those categories received a score of “1.” There were five criteria categories that received a score of “2,” which means they were incorporated into the lesson, but in a limited capacity. See Table 2 for the details on the criteria and examples. Overall, the mean score was 1.3, which based on the scale, concludes that hardly any multicultural education was found.

Table 2*Banks' (2019) Checklist Breakdown for Learning Technology, Desmos*

Checklist Criteria	Desmos Example	Explanation
1. Includes a range of racial, ethnic, and cultural groups that reflects the diversity within U.S. life and society	Replaced class roster with a list of diverse names of famous mathematicians	Desmos included a wide range list of famous mathematicians, and there were not any additional names, images, or examples found outside of this one example
2. Describes the wide range of diversity that exists within racial, ethnic, and cultural groups	Included a range of average wages around the U.S.	Different wages were included in the reviewed lesson, but information on racial, ethnic, or cultural groups were not addressed
12. Helps students understand the extent to which the American dream of equality for all citizen is still incomplete and the role that students need to play to help close the gap between American democratic ideals and realities	Asked students what the impact of the average wages are.	A question in the average wage lessons may lead to students exploring the gaps between American democratic ideals and realities, but there were not any direct questions to address this
15. The mathematics and science materials help students understand the ways in which people from a variety of cultures and groups have contributed to the development of scientific and mathematical knowledge	Replaced class roster with a list of diverse names of famous mathematicians	Desmos included a wide range list of famous mathematicians, and there was not any information on their contributions to math field

16. Acquaints students with key concepts that are essential for understanding the history and cultures of racial, ethnic, and cultural groups in the United States, such as prejudice, discrimination, institutionalized racism, institutionalized sexism, and social-class stratification	Asked students what the impact of the average wages are	A question in the average wage lessons may lead to students to explore the history of social-class stratification, but there were not any direct questions to address this
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There was some evidence of multicultural education within Desmos, such as the diversity within the mathematician list or the information within the lesson on the different wage amounts in the U.S., but the Desmos lesson did not explore the why or the outcomes of having different minimum wages. Scholars advocate that multicultural education should include social justice constructive discussions and taking actions against inequities (e.g., May & Sleeter, 2010; Nieto & Bode, 2018). The most in-depth analysis question asked in the minimum wage Desmos lesson was, “What impact do you think the minimum wage has on people who live near you?” However, there were no discussions on the wage gaps, the history of inequities within wages, or what actions could be taken to address wage inequities.

Learning Technology Participant Feedback. William’s evaluation of Desmos was focused on including more practice problems and collecting additional student data. This participant shared he loves Desmos as a whole, but believes the program needs to incorporate more math problems, so students have more practice to master the required skills. He stated, “[Desmos should have] more problems that's for kids to practice with.

They're great at getting that concept big idea picture across, but you still need to build fluency and that takes practice and time.” William’s feedback on Desmos focused on collecting additional data to assess his students’ comprehension of the materials as he shared, “There is good data back there [for a teacher on Desmos], but I don’t think there’s enough to understand students’ fluency.” This participant focused his comments on increasing student learning, but he did not mention digital equity or equity-centered curriculum applications as an area Desmos could improve upon.

Multicultural Education and Learning Technologies Potential Opportunities

William shared how multicultural education and learning technologies are incorporated into his classroom, and though he included numerous examples of learning technologies with higher-order thinking applications, there was minimal evidence he incorporates them together. As addressed in the literature review, scholars that study multicultural education, learning technologies, and digital equity argue it is essential for multicultural education to have a critical focus and incorporate learning technologies with multiple levels of digital thinking skills (e.g., Falloon, 2015; Gorski, 2009; Howard et al., 2018). There are numerous opportunities that William could apply in his classroom that would incorporate both multicultural education and learning technologies critically. Some possibilities include conducting conversations on bias or researching current world problems on how mathematics is being used to improve them. William commented that there is bias in the mathematics world, and he could expand that to include discussions on the systemic problems within mathematics and what they, as students, could each do to change that. William described that multicultural education should be omnipresent in the

classroom, but he shared he teaches multicultural education as unplanned, teachable moments. Another way to expand multicultural education would be to intentionally incorporate it throughout his curriculum. As a high school math teacher, who identifies as a White man, these opportunities would require the support of impactful PLE approaches that are personalized to his individual needs, including his current understandings, instructional content area (i.e., high school mathematics), and student demographics.

Research Question #1 Findings

The purpose of the first research question was to explore teachers' perceptions on multicultural education, learning technologies, and digital equity in education. William perceived multicultural education, learning technologies, and digital equity as separate areas of study with unique definitions and understanding on how they are situated within a math curriculum. William viewed multicultural education as representing multiple cultures through an awareness of privilege and teachable moments. William defined learning technologies as a transformational tool that must be used with a purpose to improve student learning and enhance the curriculum. This participant described digital equity as having fair and equal access to computers and the internet. Though William saw multicultural education, learning technologies, and digital equity independently, he commented that all were critical in education. William shared he believes they each serve different objectives, but they are all important elements in advancing student development.

Research Question #2 Findings

The second research question explored how teachers applied multicultural education, learning technologies, and digital equity in their classroom practices and curriculum applications. William incorporated multicultural education, learning technologies, and digital equity differently; all three had their own objectives and were uniquely integrated into the classroom. Multicultural education was supplemented into the curriculum as unplanned, teachable moments. Examples of multicultural education lessons were commonly brief and with the objective to challenge students' thinking and present new ideas. William's understanding of his privilege influenced his goals to support and expand his students' ideas, so they felt successful in his classroom.

In contrast to the short and spontaneous nature of multicultural education applications in William's classroom, learning technologies were intentionally integrated and used throughout the duration of the class. All the different types of learning technologies included in the curriculum each served a purpose with the goal to increase student achievement and their educational experience. Math was the primary subject area, but William did not treat his learning technologies as a separate area of study, and they were only used intentionally to support student development. There were a variety of learning technologies components applied to the classroom, and all levels of Bloom's Digital Taxonomy were used (Sneed, 2016).

William incorporated digital equity into the classroom to ensure students had the tools necessary for student learning to occur. He did not view it in collaboration with multicultural education or learning technologies, but instead his goal for digital equity

was to guarantee his students had equal access to the devices and software necessary to complete all course requirements.

William did not intentionally incorporate multicultural education, learning technologies, and digital equity together in the classroom. They were applied individually and with different goals, but all three were integrated within his curriculum. William identified each had a purpose and value in his classroom, and though those specific objectives were different, they all make a positive impact on student development.

Research Question #3 Findings

The third research question explored how multicultural education and learning technologies connect in support of digital equity. This question focused on how teachers viewed and applied multicultural education and learning technologies to support the objectives of digital equity. For the third research question, I asked William to compare multicultural education and learning technologies and to share his favorite multicultural learning technology lesson. I also evaluated one of William's learning technologies, Desmos, before interview two, using Banks' (2019) Checklist for Evaluating Information Materials.

William did not intersect multicultural education and learning technologies to support digital equity. He viewed and applied multicultural education, learning technologies, and digital equity as separate areas of the classroom. This participant struggled with explaining the connections between multicultural education and learning technologies and he did not make any correlations to digital equity. Though finding the intersections between multicultural education and learning technologies was difficult,

William believed their relationship is important and there is an educational value and need to study them together.

Case Study 2: Faye

Faye is a dedicated teacher who loves technology and challenging her students through engaging lessons and activities. Faye has two master's degrees with 23 years of experience and is currently coaching and teaching K-5 Science Technology Engineering and Math (STEM) in a Northern Virginia school district. Faye's school is highly diverse with students from all over the world, and predominately Faye's students are English Learners (ELs). Faye is highly passionate about STEM education and supporting her EL students by creating multi-layered lessons focused on STEM, fostering community, developing language skills, building social-emotional strategies, and learning through exploration. Faye stated that she believes the role of the teacher should center around facilitation and students should be in charge and direct their own learning experiences.

Faye perceived and incorporated multicultural education, learning technologies, and digital equity with their own individualized goals and classroom applications. Faye described multicultural education as incorporating images that look like her students, and she used EL strategies to apply multicultural education her classroom. Faye thoroughly integrated a wide variety of learning technologies and applied Bloom's digital higher-order thinking skills (Sneed, 2016) into her curriculum. Faye defined and applied digital equity as providing equal access to technology and the internet.

When explaining the intersection of multicultural education and learning technologies, Faye shared she believes multicultural education and learning technologies

need to be integrated together to create a “good lesson.” Faye commented that multicultural education and learning technologies should intersect within the curriculum, and the lesson examples she provided included significant learning technology components with some multicultural education characteristics. This participant did not mention any connections between multicultural education, learning technologies, and digital equity. Faye noted that multicultural education and learning technologies play an important role in the curriculum, but not in support of digital equity.

Background

At the end of February, Faye completed the online survey and Technology Proficiency Self-assessment Questionnaire for 21st Century Learning (TPSA C-21; Christensen & Knezek, 2017). She completed the first interview at the beginning of March 2022 and the second interview two weeks later. Faye had a high technology proficiency level on the TPSA C-21 (Christensen & Knezek, 2017) with a score of 4.71 out of 5.0.

Multicultural Education

Faye primarily described multicultural education with a lens that supports EL students. She stated she did not actively plan to integrate multicultural education, and when she did it was focused on images and examples that matched her students’ backgrounds. Faye’s multicultural education professional learning experiences (PLEs) all centered around strategies or understandings that would improve the achievement of EL students.

Multicultural Education Perceptions and Applications. Faye perceived multicultural education as EL strategies and incorporated multicultural education through language development methods and student representation examples. This participant worked at a school where EL students make up most of the student population. Before Faye's current teaching placement, she would have defined multicultural education as bringing in multiple cultures into the classroom, but her definition has changed over time. 20 years ago, she would have defined multicultural education as "incorporating viewpoints from different cultures or experiences from different cultures." Now Faye would say that definition only applies to schools with a predominately White student population. She shared, "The viewpoint of what multicultural means in a setting of 30 different languages is different than a setting with all Caucasian students." Faye commented she would currently explain that multicultural education is included by providing a rigorous curriculum, including images of people who look like them, and building language skills. She stated, "We learn how to say good morning in 30 different languages and make sure that the books that we're providing for students to read have their cultures represented." Faye described multicultural education as using methods that support her EL students and ensuring students can see themselves throughout the day in all subject areas.

This participant noted that she applies multicultural education through bitmojis (i.e., personalized emojis), providing student representation images and books within the STEM field, incorporating language strategies, building classroom community, and creating an exploratory, rigorous learning environment. Faye shared in her classroom she

“uses a lot of bitmojis” and “when we're taking a look at a particular project and we're looking at what experts in the field have done, I make sure that as many cultures are represented.” This participant aimed to incorporate examples that are respectful of her students' cultures, stating "whether it's a drawing or a photograph, we try to make sure those are culturally appropriate or representative and not stereotypical.” Similar to how multicultural education was defined, Faye continued to provide classroom examples of multicultural education that centered on her EL students.

In Faye’s current school, that has a high population of EL students, she commented that multicultural education is not intentionally planned into the curriculum, and instead it is organically included by ensuring “the students’ cultures are represented.” Faye shared that multicultural education is not deliberately designed into the curriculum; multicultural education occurs naturally by simply showing and providing examples of their students’ cultures. She described multicultural education within her school as:

I don't think that what we do is that intentional... it's so blatantly in your face that kids are from different cultures. We're not so blatant, like, let's learn about all these different cultures... a lot of what we do at our school [for multicultural education] is kind of peppered in and it just becomes a part of the everyday modality.

Faye continued pushing her belief that multicultural education was not deliberately developed into her curriculum. When I asked about Faye to share a multicultural education and learning technology lesson, Faye stated,

At our school 97% are from another country and 89% of them don't speak English at home, so I feel like multicultural education is so embedded in what we already do that I don't even notice it all the time. Maybe I need to reexamine my lessons to see where multicultural is in there.

These quotes highlight that Faye viewed multicultural education as EL strategies, and by supporting a diverse population of EL students, it automatically made her lessons multicultural without any purposeful planning.

Multicultural Education Perceptions and Applications Potential Opportunities.

Faye's perceptions and applications of multicultural education were more aligned with EL strategies, specifically from the Guided Language Acquisition Design (GLAD). GLAD is a curriculum approach for EL students with the goal of learning English and the required grade-level content (Ralston et al., 2019). GLAD includes 35 instructional strategies that are grouped into four categories (Ralston et al., 2019). Faye's multicultural education definitions and applications did not fully align with the literature on multicultural education (e.g., Banks, 2019; Nieto & Bode, 2018), but they did line up with the GLAD strategies. There were three main instructional methods identified by Faye (i.e., providing authentic representations, building community, and implementing challenging activities), and each were included as a GLAD strategy (Ralston et al., 2019). For example, providing authentic representation falls under "input," building community is included in the "reading/writing" category, and implementing challenging activities is supported by the "focus/motivation" category (Ralston et al., 2019, p. 3). When reviewing Faye's comments on multicultural education she repeatedly shared responses

on building language acquisition and providing language support with minimal references to the characteristics of multicultural education (Banks, 2019).

Faye defined and incorporated multicultural education as an unintentional approach that provide students with language acquisition skills and authentic representations. Based on Nieto and Bode's (2018) seven characteristics of multicultural education, Faye partially viewed and integrated multicultural education. She incorporated parts of two characteristics, basic education and for all students, but I did not find evidence of the other five. Nieto and Bode (2018) explained that basic education as "indispensable" and "when multicultural education is peripheral to the core curriculum, it is perceived as irrelevant to basic education" (p. 35). Multicultural education was incorporated in Faye's curriculum, but she did not describe it as indispensable, and instead stated it was "peppered" into the lessons without intentionally planning it. Nieto and Bode (2018) argued that multicultural education is complex and continuously changing, so to ensure she is fully supporting her EL students, Faye could deliberately prepare multicultural education into the curriculum. Faye noted she believes that all her students have access to multicultural education, but it is limited to representing her students within the school. According to Nieto and Bode (2018), multicultural education should be "about all people, it is also for all people, regardless of their ethnicity, ability, social class, language, sexual orientation, religion, gender, race, or other difference" (p. 38). Faye's perceptions of multicultural education were concentrated on her students' languages, and the intention of multicultural education is to learn about all people, with language as one of many areas. Faye could expand her partial understanding of

multicultural education to include the other characteristics, such as learning about antiracism or social justice (Nieto & Bode, 2018).

Multicultural Education PLEs. Faye’s PLEs focused on supporting EL students. When asked about multicultural education PLEs or building additional knowledge in multicultural education, Faye only spoke about the GLAD training or getting additional information from GLAD trainers. She shared “I have had the GLAD training. I have done the full GLAD training for that, and then I worked a lot with our GLAD trainer.” This participant did not indicate any PLEs that centered around other aspects of multicultural education, nor did she share a desire to grow in her knowledge of multicultural education.

Learning Technologies

Faye stated that she believes in the importance of learning technologies and integrates them into her curriculum with higher-order thinking skills (Sneed, 2016). This participant identified her most influential PLEs were through self-initiative and personally exploring learning technologies. Faye had a high level of technology proficiency and noted she continues to grow in her classroom practices and understandings of learning technologies.

Learning Technologies Perceptions and Applications. Faye perceived and incorporated learning technologies with diverse applications and using Bloom’s digital higher-order thinking skills (Sneed, 2016). Before the interview Faye completed the TPSA C-21 (Christensen & Knezek, 2017) and received a high technology proficiency score of 4.7 out of 5.0. Throughout the two interviews there were numerous examples indicating that Faye is highly passionate about technology and bringing innovation to her

students through learning technologies. This was evident when Faye applied to numerous grants, and because of her dedication, she received funding which was spent on a wide range of physical devices and software. She stated, “We were writing a bunch of grants that I got a ton of money to order a lot of technology stuff, like the 3D printers, robots, and Z-space.” Faye accepted and believed in the importance of technology as she defined learning technology as “could be anything that's going to support student learning.” She noted that she believes learning technologies are opportunities for the students to explore and find success, and incorporated learning technologies at lower-level and higher-level order thinking skills (Sneed, 2016). When describing the outcome of using 3D printers with her students, Faye became very animated as she shared, “It’s exciting to see when kids start breaking out of their shell, to be like ‘oh, look what I figured out on my own’ and then get excited and want to learn more.” When reviewing the interview data, it is evident that Faye included a wide variety of learning technologies and used all the levels of Bloom’s Digital Taxonomy (Sneed, 2016) in her lessons.

This participant incorporated learning technologies in the same way she perceived it. Faye integrated all levels of Bloom’s Digital Taxonomy (Sneed, 2016) throughout her curriculum from watching videos to editing 3D manipulatives to creating video reports. The classroom lessons were tied to other standards, and the learning technologies were not used in isolation as an individual subject. For example, Faye taught a weather unit with her students, and they all had equal access to technology as each student had their own a tablet or Chromebook. The weather unit objectives were tied to both science and language acquisition learning goals. Various learning technologies were integrated into

these lessons and challenged students using lower- and higher-order thinking skills (Sneed, 2016). Students watched videos, designed weather map manipulatives on a 3D printer, and created a weather report using their manipulatives.

Based on all the data I found Faye had a strong understanding of learning technologies. She believed in the importance of learning technologies, demonstrated digital competence, integrated learning technologies with other subject areas, and provided each student with access to the latest equipment. She included examples of both lower-order and higher-order thinking skills (Sneed, 2016) using a variety of physical devices and software.

Learning Technologies PLEs. Faye's PLEs centered around self-initiative. Faye commented the PLEs that were impactful to her included opportunities where she had the time to engage with the learning technology and figure it out. She did not note any formal PLEs that were particularly helpful, but instead focused her responses on the excitement of learning a new technology through trial and error. She shared, "Let's figure out how it works, what it can do, and then how are we going to apply it to an elementary classroom." Faye noted when there was a learning technology she could not figure out she would take the initiative and reach out for support to either the company or to other individuals who have worked with the technology. This participant stated, "Sometimes it's a matter of a paid training that comes from the company or looking online to see what's out there. Sometimes, our tech department gives out trainings for things." Faye grew in her understandings of learning technologies, but not through formalized or

required PLEs; she developed her learning technology skills through her own curiosity and leveraging available resources.

Digital Equity

Faye viewed and applied digital equity from a digital divide perspective as she described digital equity as equal access to devices and the internet. This participant explained that digital equity is having equal access to technology, and she did not incorporate the integration of equity-centered classroom practices and curriculum application within her definition. Faye saw digital equity as ensuring everyone is equipped with the same learning technologies only, without the inclusion of the equity-centered classroom practices or curriculum applications.

Digital Equity Perceptions and Applications. Faye perceived and incorporated digital equity as equal access to devices. When asked to define digital equity, Faye described it as, “those who do not have access to internet at home, those who don't have computers... a lot of it has to do with the access that people and kids have to it.” Faye shared she saw digital inequities emerge during the COVID-19 pandemic. Her district provided computers to all the students, but they were being used by parents and siblings instead, due to the lack of technology at home. She commented, “I noticed that a lot of other family members were using the student’s computer all day and all evening because we gave them a computer.” Faye described digital equity was applied in her classroom by providing each student with their own digital devices. She stated, “Our big focus was getting access to those families for their home, but also making sure we're putting all of that access into the kids’ hands on a daily basis.” Faye’s school provided one-to-one

devices, and Faye made sure she had enough resources so all her students could engage with the different learning technologies and complete their assigned activities.

Digital Equity Access, Classroom Practices, and Curriculum Applications.

Faye defined and applied digital equity as access without equity-centered classroom practices or curriculum applications. Access to technology is just one piece to the definition of digital equity; it also includes students having access to equity-centered classroom practices and curriculum applications (e.g., Howard et al., 2018; Ravi, 2018). Faye described digital equity as equal access but did not include equity-centered classroom practices or curriculum applications within her definition or examples. There is evidence of equity-centered classroom practices and curriculum applications within her unit on weather mapping, such as the class studied weather reports from other countries, but those instances included minimal connections to the seven characteristics of multicultural education (Nieto & Bode, 2018). The digital divide is the difference in access between individuals or groups of people with any type of technology (Ravi, 2018). Since the participant focused on access, her descriptions and applications of digital equity aligned with the digital divide, which is one of the two elements of digital equity.

Multicultural Education and Learning Technology Intersection

Faye viewed and integrated multicultural education and learning technology as classroom components that are required for a good lesson, but without intersecting them in support of digital equity. This participant showed evidence that the concept of digital equity is challenging and saw multicultural education and learning technologies as different from each other. When I assessed the selected learning technology, Tinkercad,

minimal examples were found that included the integration of multicultural education. Faye stated that she believes multicultural education and learning technologies need to be integrated together to create a high-quality lesson, and the applications she shared included some multicultural education connections. I concluded, based on the interview data, that Faye believes multicultural education and learning technologies are important and need to connect to develop an effective lesson. The intersection of multicultural education and learning technologies was challenging for Faye to explain and there was minimal multicultural education integration found in the classroom practices and curriculum applications.

Relationships Between Multicultural Education, Learning Technologies, and Digital Equity. My analysis of Faye’s case indicates she viewed multicultural education and learning technologies together to advance student learning, but independent from digital equity. When asked to compare multicultural education and learning technologies, Faye stated that multicultural education and learning technologies are “different components, but they are not separate. They are two components you are going to need for a good lesson.” Faye’s perspective aligns with the digital equity definition that digital equity must integrate equity-centered curriculum applications with equal access to learning technologies, though Faye does not directly connect multicultural education and learning technologies with digital equity or classroom practices.

Faye perceived multicultural education and learning technologies separate from digital equity. There was no evidence that she viewed or applied multicultural education and learning technologies in connection with digital equity. This indicates that Faye

perceived and applied multicultural education and learning technologies separately from digital equity and not in support of digital equity.

This participant found the relationship challenging between multicultural education and learning technologies. Faye showed signs of struggle when asked to compare multicultural education and learning technologies. She took long pauses to answer both questions, and for example, stated, “How are they different... [long pause]...huh...[long pause]...I don’t know...[long pause].” Faye’s initial response to the similarities between multicultural education and learning technologies focused on how technology can help provide a wider selection of pictures and examples. She shared, “How are they similar... I think having the representational images in our story and book collections anytime we're utilizing, for example photographs.” Faye’s statement explained that technology can enhance multicultural education, but it did not include any similarities between the two. Faye’s strained appearance, long pauses, and misaligned answers provides evidence that she found it difficult connecting multicultural education, learning technologies, and digital equity.

Learning Technology Multicultural Education Checklist Review. Thinkercad, as a learning technology, provided few examples of multicultural education integration. Tinkercad was selected as the featured learning technology during this case study because it was frequently used by the participant and included prepared lessons for teachers. I asked questions about Tinkercad during the second interview and assessed it using the Checklist for Evaluating Information Materials (Banks, 2019). Tinkercad is a learning technology software, available online, for students to design products for 3D printing.

Faye used Tinkercad during her weather map unit to create weather map manipulatives. Based on the checklist and interview, there was little data found that Tinkercad, as a learning technology, incorporates multicultural education.

Banks’ (2019) Checklist for Evaluating Information Materials was leveraged to assess how Tinkercad incorporated multicultural education into the prepared lesson plans for teachers. I selected the lesson plan, Design an Inclusive Play Space, because it focused on inclusive play spaces and multicultural education is about all people for all people (Nieto & Bode, 2018). My evaluation of Tinkercad using Banks (2019) checklist revealed that out of the 17 criteria categories, 15 categories were “hardly at all” used or applied. Those 15 categories earned the lowest rating (a score of 1 out of 6). The other two categories were given a score of “2,” as they were found within the lesson, but with limited applications (see Table 3 for the details). The overall mean score for Tinkercad was 1.1, demonstrating that there was hardly any multicultural education found.

Table 3

Banks’ (2019) Checklist Breakdown for Learning Technology, Tinkercad

Checklist Criteria	Tinkercad Example	Explanation
1. Includes a range of racial, ethnic, and cultural groups that reflects the diversity within U.S. life and society	Incorporated definitions and examples of building play spaces that was both inviting and challenging for children of all abilities	Tinkercad included children of all abilities in this lesson, but it did not include a range of racial, ethnic, and cultural groups.

2. Describes the wide range of diversity that exists within racial, ethnic, and cultural groups	Addressed the need to consider a range of abilities when creating an inclusive play space	Tinkercad described children of all abilities, but it did not include a wide range of diversity within racial, ethnic, and cultural groups
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Learning Technology Participant Feedback. When Faye was asked to provide feedback on Tinkercad, her responses centered around management changes and adding additional EL features. For example, Faye wanted to get a current view of each students’ 3D design on her class list to easily review her students’ progress, but the images were not always accurate. Tinkercad provides video tutorials for students, but Faye identified they were “too wordy” and did not support her students’ language needs. During the interview, this participant did not provide any changes to Tinkercad in support of multicultural education or digital equity, but she did focus her recommended modifications around making the software more accessible to EL learners and user friendly for teachers. Faye’s evaluation of Tinkercad was isolated to managing the program and adding EL components.

Multicultural Theory and Learning Technology Potential Opportunities

There has been minimal research that studies multicultural education, learning technologies, and digital equity together and the relationships between them. Many scholars have argued that multicultural education has a positive impact on student development, but it is often limited to just culture or misapplied in the classroom (e.g., Gorski, 2016; May & Sleeter, 2010; Nieto & Bode, 2018). Faye partially incorporated

multicultural education by focusing on supporting her EL students, and there are a variety of methods that Faye could use to expand multicultural education into her classroom beyond student representation. Faye could include learning about other cultures outside of the student population or incorporating issues of inequity and social justice.

This participant demonstrated a strong understanding of learning technologies and partially incorporated multicultural education by focusing on EL strategies. For example, Faye's favorite multicultural education and learning technology lesson had numerous levels of Bloom's Digital Taxonomy (Sneed, 2016) and incorporated some characteristics of multicultural education (Banks, 2019). There are potential approaches that Faye could incorporate to execute a lesson that has both strong multicultural education and learning technology connections.

Digital equity is defined as the integration of access to technology and equity-centered classroom practices and applications. Since Faye's multicultural education and learning technology lesson had some connections to multicultural education, including all the multicultural education characteristics would increase the amount of multicultural education integration and support digital equity. Some possible examples: this lesson could have included a discussion on the inequities to reliable weather forecasting or students could have created a plan that improves access to reliable weather reporting. As an Elementary STEM teacher who identifies as a White woman, these potential opportunities would require the support of impactful PLE approaches that are individualized based on her person needs, including her current understandings,

instructional content area, and student demographics (i.e., a highly diverse school where the majority are EL students).

Research Question #1 Findings

Faye assigned unique definitions to multicultural education, learning technologies, and digital equity, and she connected each to theory in different ways. Faye had a partial understanding of multicultural education as she centered her description around EL strategies. This participant believed in the importance of learning technologies and her definitions aligned with learning technology theory. Faye saw digital equity as equal access to devices and the internet, which somewhat overlaps with digital equity theory as her definition included access but did not incorporate equity-centered classroom practices and curriculum applications. Faye's perceptions of multicultural education, learning technologies, and digital equity are all distinct with their own definitions and connections to theory.

Research Question #2 Findings

The second research question explored how educators incorporate multicultural education, learning technologies, and digital equity in the classroom. Faye integrated multicultural education, learning technologies, and digital equity into the classroom with individualized goals and applications. Faye applied multicultural education, learning technologies, and digital equity differently, as each had been independently integrated in the classroom. Multicultural education was applied as EL strategies, and though there are some curriculum examples that align with the seven characteristics of multicultural education (Nieto & Bode, 2018), the majority were activities that supported language

acquisition. Faye believed these integrations were not done with intentionality, but instead they were naturally included due to her school's diverse demographics. Faye had different learning technology goals as she planned elaborate lessons where all levels of Bloom's Digital Taxonomy (Sneed, 2016) were included with numerous classroom applications. Though Faye commented that both multicultural education and learning technologies need to be integrated to create a quality lesson, her descriptions in the interviews included lessons that incorporated numerous learning technology examples with some relations to multicultural education. There were not any examples shared that included strong connections to both multicultural education and learning technology – instead, they were integrated separately from each other.

Faye applied digital equity with unique objectives as it was included through equal access to technology hardware and the internet. The examples shared by Faye in the interviews partly supported how scholars define digital equity. Faye ensured equal access to all her students but included minimal equity-centered classroom practices and curriculum applications. In the classroom, Faye incorporated multicultural education, learning technologies, and digital equity independently from each other and with varying connections to theory.

Research Question #3 Findings

Faye integrated multicultural education and learning technologies together, and she did not insect them to support of digital equity. She struggled to explain the relationship between multicultural education and learning technologies, but believed they were both essential when creating an effective lesson. Faye did incorporate both

multicultural education and learning technologies together in her curriculum, but her classroom examples consisted of minimal connections to multicultural education theory. When reviewing the learning technology, Tinkercad, there were also few multicultural education components integrated within it. There was no mention of digital equity in Faye's responses regarding multicultural education and learning technologies. Faye viewed and applied digital equity separate from multicultural education and learning technologies. She believed multicultural education and learning technologies should intersect to support the curriculum, but not to support digital equity.

Case Study 3: Helen

Helen identifies as a White woman, and she is high school art teacher in Northern Virginia with a master's degree and over 10 years of teaching experience. She teaches at two different schools, and the student population at both schools are racially and religiously diverse. Before teaching high school Helen was a preschool teacher, so she likes to bring a lot of positive energy to her classroom and focuses on making each student feel welcomed and wanted in the classroom. Helen loves art, working with kids, and believes that every student should be seen and valued.

Helen defined and applied multicultural education, learning technologies, and digital equity uniquely and separately. She described multicultural education from an equity perspective, focusing more on the characteristics of other equity-centered approaches of culturally sustaining pedagogy (CSP) and funds of knowledge instead of multicultural education. Helen's responses demonstrated she is passionate about learning technologies. She integrated learning technologies throughout her curriculum using a

variety of programs and higher-order levels of Bloom's Digital Taxonomy (Sneed, 2016). Helen described digital equity as equal access to resources, and although she agreed that equal access is important, she does not believe it is an attainable goal. Helen viewed multicultural education, learning technologies, and digital equity separately, each with individual definitions and objectives. This participant shared she believes multicultural education and learning technologies can both strengthen student learning, but she described them all independently and not in support of each other or digital equity.

Background

Helen began participating in this study at the beginning of March 2022. She first completed the online survey and Technology Proficiency Self-assessment Questionnaire for 21st Century Learning (TPSA C-21; Christensen & Knezek, 2017) and participated in two interviews. Both interviews were conducted in March with about two weeks in between. Helen has a high technology proficiency level with a TPSA C-21 (Christensen & Knezek, 2017) score of 4.65 out of 5.0.

Multicultural Education

Helen perceived and incorporated multicultural education from an equity viewpoint as she provided definitions and classroom examples that align with equity-centered approaches. This participant integrated multicultural education within her curriculum by including artists from around the world and offering choices to her students. Helen's district required her to complete professional learning experiences (PLEs) on both multicultural education and equity. Helen described these experiences as confusing and lacked classroom applications.

Multicultural Education Perceptions and Applications. Helen viewed and integrated multicultural education with an equity lens. Helen’s definition of multicultural education more appropriately correlates with the term equity and other equity-centered approaches (e.g., funds of knowledge, CSP). This participant applied multicultural education in her classroom by showing diverse artwork and offering choices. Helen provided some examples of how she incorporates multicultural education into her classroom, and there are opportunities to develop it within her curriculum.

Multicultural Education Perceptions. Helen viewed multicultural education as equity. She explained multicultural education from a broader equity perspective and expanded her description beyond multicultural education to include components of both CSP and funds of knowledge. Helen defined multicultural education as “making sure you have representation in the classroom, where all your students see something that relates to their story.” Helen described multicultural education as incorporating perspectives from different cultures, specifically those that represent the students in her class. According to Nieto and Bode (2018), multicultural education is about all people, for all people and it is not limited to the student demographics within the class. Helen focused her definition of multicultural education on her students’ background, which connects to other equity-centered approaches of CSP and funds of knowledge. The purpose of CSP is to integrate students’ cultures into the classroom and challenge students to identify and address inequities in society (Paris & Alim, 2017). Helen partially included CSP in her definition as she noted it is important to incorporate her students’ cultures into her classroom. Funds of knowledge is a term that describes when teachers capitalize on all their students’

backgrounds (e.g., their culture, language, and religion) to help them learn by connecting to things they already understand and can relate to (González et al., 2005). Helen's definition focused on providing examples her students and their personal stories could identify with, which aligns with funds of knowledge.

Multicultural Education Applications. Helen applied multicultural education by showing examples that her students would relate to and offering different assignment options. She shared that multicultural education is integrated into her curriculum but providing samples of artists with the same backgrounds as her students as she commented, "I'm always pulling artists from different backgrounds... You can see where your students are from, and you can always pick a new artist to add to the conversation." Helen also stated she brings multicultural education into her curriculum by offering choices so students can select assignments they can better connect with. She noted, "Even having open-ended assignments, I think, is multicultural education. You're asking your students about their story and you're not limiting assignments. I want assignments that allow my students to reach into their own background experience." For example, during the collage unit students were able to choose the design, colors, and materials, and the only condition was to "create something that represents who they are." Helen commented that she believes her students open up and show themselves when removing assignment requirements, which Helen noted is an easy way to include multicultural education into her curriculum.

Multicultural Education Perceptions and Applications Potential Opportunities. Helen described and incorporated multicultural education with opportunities for potential

growth. There is evidence of equity in Helen's curriculum as she included diverse representation in the art samples and offered assignment choices so her students could share their own stories. These descriptions and examples support some of the goals of multicultural education, but they align more appropriately with the concept of equity. According to numerous scholars, multicultural education is critical for teachers to understand and implement as it promotes tolerance and advocates for social justice (e.g., Banks, 2019; Gay & Howard, 2000; May & Sleeter, 2010). There are seven characteristics of multicultural education (Nieto & Bode, 2018), and there is evidence that Helen partially incorporated one characteristic, multicultural education is important for all students (Nieto & Bode, 2018). This participant noted that she wants her students to see themselves in her class examples, so she includes a diverse range of artwork. Nieto and Bode (2018) explained that multicultural education is about all students and for all students. Helen does not provide examples that include all students, as defined within the characteristic, but she does incorporate other cultures into her curriculum. As such, to increase the usage of multicultural education in Helen's classroom, she could potentially include all seven characteristics of multicultural education (Nieto & Bode, 2018). For example, social justice is part of multicultural education and one of the characteristics identified by Nieto and Bode (2018). Historically, art has been used as a form of protest or resistance against oppression. Helen could provide artwork examples used during protests, discuss their impacts, and then have students create their own social justice artwork. Another option is for Helen to incorporate the six principles of social justice art education (Keifer-Boyd et al., 2022). Multicultural education has been found to positively

impact student development (e.g., Banks, 2019; May & Sleeter, 2010; Nieto & Bode, 2018), and there are a variety of opportunities Helen could use to increase multicultural education within her curriculum.

Multicultural Education PLEs. Helen shared that multicultural education PLEs have caused her to feel confused about the differences between equity and multicultural education and did not include guidance on how to apply it in a classroom. In our interviews, Helen frequently used characteristics of equity to describe multicultural education due to her district's required PLEs. At the time of the interview Helen was engaging in professional learning on equity. She shared that these equity PLEs were unclear and lacked classroom applications. Helen commented,

There was a big multicultural professional development push and now it's being merged with equity, and I wonder are they the same or different? They kind of overlap, I guess, like a Venn diagram where they're separate but also connected.

When providing this explanation, I observed Helen's body language and tone. She appeared unsure about the similarities and differences between multicultural education and equity, and she used a questioning tone when providing her responses. Helen shared her required PLEs did not explain the purpose of equity in education, and she wanted her district to explain, "What are we trying to achieve with equity and how is it benefiting our students?" These confusions between multicultural education and equity are present throughout her interview responses as she used broader definitions and examples that align more to equity than multicultural education.

Helen noted she wants to advance her knowledge of multicultural education, but she does not like the self-paced videos on equity provided by her district. Helen stated, “My districts have these mini videos. I’m not a super fan of those. They feel like busy work for teachers.” Helen shared she does not find the videos useful because they do not include classroom applications, so she uses outside resources for help. She stated, “I go online to research lesson ideas.” Helen discussed that she would also like practical advice from experienced teachers as she commented, “I want to know that one takeaway, or something that worked for them [the experienced teacher] and here’s how I can implement it now.” I concluded that Helen has a desire to grow in her understanding of equity when she shared, “I’m always looking for ways to incorporate equity and multiculturalism into my lessons.” This comment led me to believe that Helen would like to expand multicultural education in her classroom, but she feels her district has not provided her with the necessary information or tools to do so.

Helen identified an impactful PLE occurred in grad school when she was required to self-reflect and read a variety of student stories that were different from her own experiences. Helen commented these stories helped her to understand “how there might be barriers in the classroom for students coming in, and then, how we notice our own defaults.” Through these readings Helen learned “to self-reflect on what you as the teacher are bringing in, and [to] communicate with your students, so that you have a shared experience.” She noted that it was important to not put “barriers up where the students aren’t understanding where you’re coming from.” Helen shared these PLEs gave her the opportunity to self-reflect and expand her understanding of other individual’s

experiences, which has positively impacted how she engages with her students and helped her create a more inclusive classroom environment.

Learning Technology

Helen demonstrated a passion for technology in her interviews as she described the importance of learning technologies in the classroom and its positive impact on student learning. Helen perceived and incorporated learning technologies throughout the classroom to advance student learning. Helen has engaged in positive PLEs that built her knowledge and understanding of learning technologies. These impactful PLEs included providing teachers with additional resources and working with experts who can answer her questions.

Learning Technologies Perceptions and Applications. Helen perceived learning technologies as a tool to enhance learning and she incorporated learning technologies using all levels of Bloom's digital order thinking skills (Sneed, 2016). Helen discussed how she leverages learning technologies as a second teacher so "I don't have to be in front of the classroom to teach. Instead, I can walk around and help the students." Helen informed me that she creates her class schedule and lessons on a guided, self-paced online software called Schoology. Each class has a specific plan, and within the Schoology folder, students can access "written instructions, visual instructions, step by step guidance, and then also a video" for their work for the day. She commented, "I try to get everything into Schoology, so my students are able to have something with them all the time. It has all their assignments, and everything in there, so Schoology is kind of my go to." Helen noted her primary purpose with using learning technologies in the

classroom is to support student learning. She stated when she creates lesson plans on Schoology, “I’m just constantly thinking about what else I can do to represent the information that I want my students [to] take away. I’m always thinking in multiple layers and identifying here’s another resource and another resource.” Helen commented that she focuses significant time on creating lessons that are differentiated and support the needs of her English Learner (EL) students and students with Individualized Education Plans (IEPs). She shared,

My big thing is you always have students with IEPs, but special education is good education. That is my background; students being able to reference as many ideas or information as possible, so that if someone is not strong in one area, if they need those step-by-step written directions, they can access them.

This participant stated learning technologies enhance student learning, and she uses them within her classroom to guide her instruction and support EL students and students with IEPs.

Helen discussed how she believes in the importance of technology and integrates learning technologies throughout her curriculum. She defined learning technologies as “any technology that is used for the teacher in the classroom and for the students, so any means of conveying information that makes my job easier either or learning easier for students.” Helen shared she believes learning technologies can positively impact learning and make her curriculum more accessible to her students. Helen does not apply technology as a separate area of study, and instead incorporates numerous learning technologies throughout her curriculum. She commented,

At the start of each class I get Schoology up on the projector, and it has the daily agenda on there...I put all our assignments on Schoology, so the kids have links to the sample canvas and there's always a small video of a skill builder because digital art can be really complicated with adobe illustrator or photoshop...all the instructions and videos are step-by-step on Schoology and it's work at your own pace, so I don't have to be in front of the classroom to teach it and I can walk around and help the students.

This participant incorporated learning technologies throughout her curriculum and at all levels of Bloom's Digital Taxonomy (Sneed, 2016). Technology is interwoven throughout the classroom from "step-by-step videos" for guidance to using "Google slides" so Helen's students can apply and "practice putting together different kind of landscape compositions." Helen required her students to create digital art using different software including, "Adobe Illustrator, Adobe Photoshop, Vector, Raster." Throughout the interviews, this participant provided numerous examples on the various ways and order thinking skill levels (Sneed, 2016) she integrated learning technologies into her classroom.

Learning Technologies PLEs. Helen noted the most impactful learning technology PLEs was getting advice from experts within her school district and receiving a list of resources. Helen commented she would go to some experts within her district if she had questions or needed help with learning technologies. She shared, "I would ask my department chair and then maybe my administrator." Helen emphasized the importance of working with an expert, as not all Technology Specialists are helpful,

“Depending on the school, [the Technology Specialist] can be really good or really terrible, so if we have a good one I’ll chat with her or find out who’s the expert on this.” Helen mentioned there was only one district-required PLE she found to be helpful, because it provided additional resources she could reference later. She commented about her Schoology PLE, “The tech person showed ‘here’s where to search if you have a question.’ I think that was a big help as no one’s going to remember everything, so this is where you go to find the answers quickly.” Helen shared this PLE supported her understanding of the learning management system because she learned where to find answers later when she had questions. Helen did not share any additional PLEs she found to be helpful; the only professional learning she noted that was impactful to her included collaborating with others in her community and obtaining additional resources.

Digital Equity

Helen defined and incorporated digital equity as equal access to resources. She viewed digital equity as related to access only and did not make any connections to equity-centered classroom practices or curriculum applications. Helen was frustrated when describing digital equity as she believes it is an important but impossible goal, because some families will always have the means to pay for additional access and others will not.

Digital Equity Perceptions and Applications. Helen perceived and incorporated digital equity as an unachievable goal to obtain equal access to resources. When asked to define digital equity, Helen did not provide an explanation and instead shared her concerns that equal access to technology is an impossible goal. She commented that

digital equity is “such a loaded word. I think it's an aspirational goal that is impossible to achieve, but aspirational, nonetheless.” Helen shared her discouragement stems from seeing digital equity programs fail because there will always be families who can access greater resources than the district can, so there will always be inequitable access to resources. She noted,

I think that the concept of equity in education is an amazing goal that we're all working on, but it's just not possible. As much as the school is providing as much equity as possible it's just never going to be that way because people will always have resources to provide for their children that the county can't.

Helen shared she applies digital equity within her classroom by providing all the materials and technology, adapting her class time if the technology is not working, and incorporating free software into her lessons, so all students can access different tools once the class is over. Helen stated that in her classroom “everyone has access to the same things,” and if there is a technology problem, such as the Wi-Fi going down she “makes adjustments since it's not working today and goes back to the old school style of teaching.” Helen highlighted an example of how she tries to improve equal access in her class as she stated, “I have some students whose parents buy them iPads and then I have some students who are working off the school laptop. By having some free programs these students will still have digital options available to them.” Though Helen incorporated digital equity in a variety of ways, she discussed how she still feels frustrated that it is not fully possible, because there will always be students with families who have more resources at home. For example, Helen shared she allows her students to

print items for their collage at school, but others will choose to print images at home, and there is an obvious difference of quality between the two. Helen stated,

The students who have black and white pictures printed means they printed them at school, and the kids that come in with color pictures means they have printers at home so no matter what there's always going to be something that is not equal, despite trying to the best of our ability.

Even though Helen attempted to make her classroom resources as equal as possible, such as printing additional materials for her students, she felt there will always be inequities she cannot compensate for.

Digital Equity Access, Classroom Practices, and Curriculum Applications.

Helen defined and applied digital equity without connections to equity-centered classroom practices or curriculum applications. This participant viewed and integrated digital equity as equal access to resources. As I defined in chapter one, digital equity includes both equal access to technology and equity-centered classroom practices and curriculum applications. Helen described digital equity to include equal access, but she did not incorporate equity-centered classroom practices and curriculum applications into her interview comments or examples. Helen executed digital equity in her classroom by providing equal access to learning technologies, but to fully embrace the goals and objectives of digital equity she would need to integrate equity-centered approaches into her teaching.

Multicultural Education and Learning Technology Intersection

Helen noted there are similarities and differences between multicultural education and learning technologies, and she described them as individual learning approaches without any relationship to digital equity. She explained that multicultural education and learning technologies are classroom learning strategies and separate from digital equity as she did not indicate there are any connections between multicultural education, learning technologies, and digital equity. This participant noted she primarily uses Schoology, a learning technology, and I found some examples of multicultural education integration within the program. Multicultural education and learning technologies provide students with critical experiences to build their development, and there are numerous potential opportunities for Helen to integrate both into her classroom.

Relationships Between Multicultural Education, Learning Technologies, and Digital Equity. Helen commented that multicultural education and learning technologies are curriculum learning methods, but she made no mentions of digital equity or using multicultural education and learning technologies to support digital equity. During the interview I observed that Helen quickly noted the similarities and differences between multicultural education and learning technologies. She shared she believes that multicultural education and learning technologies are both learning strategies to support student achievement. Without hesitation Helen stated, “They are the same and both their purposes are to try and implement the best possible learning strategy for student success.” Helen noted they are different because multicultural education is more complex and learning technologies are easier to understand. She commented, “Multicultural education,

I think, can be very organic and emotional. Technology can be very kind of cut and dry. Multiculturalism can be up for interpretation. Technology is a little more straightforward.” Helen described both multicultural education and learning technologies as classroom learning strategies that support student growth, but she viewed them separately as she defined them differently and did not make any connections between them. During both interviews Helen did not mention or imply that multicultural education and learning technologies have any relationship or connection with digital equity. She saw multicultural education and learning technologies as independent from digital equity and not in support of digital equity.

Learning Technology Multicultural Education Checklist Review. Schoology is a learning technology, and I did find some examples of multicultural education integration. Helen noted she frequently uses Schoology in the classroom, so I selected it as the featured learning technology. Schoology is a learning management system for educators. Teachers can develop and organize their lessons, incorporate videos, and add some selected textbooks. I asked questions about Schoology in the second interview and used the Checklist for Evaluating Information Materials (Banks, 2019) to assess the level of multicultural integration. Based on the checklist, the lesson in Schoology included two criteria components of multicultural education. Hardly any multicultural education was found in Schoology as the mean score was 1.1 out of 6.0.

Banks’ (2019) Checklist for Evaluating Information Materials was leveraged to assess how Schoology has incorporated multicultural education into a lesson plan. I reviewed the making a collage lesson and Helen shared her screen, so I could evaluate it.

Out of the 17 criteria categories, 15 were rated “hardly at all” used or applied, so those categories received the lowest score of “1” (out of 6). The other two categories were given a score of “2,” as they were found within the lesson, but with limited applications (see Table 4 for the details). There was hardly any multicultural education found in Schoology as the overall mean score was 1.1.

Table 4

Banks’ (2019) Checklist Breakdown for Learning Technology, Schoology

Checklist Criteria	Schoology Example	Explanation
1. Includes a range of racial, ethnic, and cultural groups that reflects the diversity within U.S. life and society	Incorporated art examples from different racial, ethnic, and cultural groups	Schoology lesson included art examples from different racial, ethnic, and cultural groups, but the examples were limited to the work completed by previous students and did not include a range of racial, ethnic, or cultural groups
2. Describes the wide range of diversity that exists within racial, ethnic, and cultural groups	Included a small range of diversity by showing examples of professional artists from around the world	Schoology lesson included a small range of diversity by showing examples of professional artists from around the world, but it did not include a wide range of diversity that exists within racial, ethnic, and cultural groups

Learning Technology Participant Feedback. As part of the second interview, Helen evaluated Schoology and focused her feedback on making improvements to the layout and adding extra features that would improve student learning. This participant commented that Schoology could include more options that would increase student engagement. For example, Helen shared, “It would be nice if there was audio, because I have some students who are not the best readers.” In terms of format, Helen stated she would like a simpler design, because when the program gets too complicated “students aren't going to find what they need.” Helen did not make any comments on multicultural education and focused all her feedback on suggested changes to Schoology that would improve student learning and make it easier to use.

Multicultural Education and Learning Technology Potential Opportunities

During the interviews I observed that Helen had a strong understanding of learning technologies and extensively integrated them into her curriculum. I found less evidence of multicultural education characteristics and integrations when reviewing Helen’s definitions and applications of it in her curriculum. For example, Helen shared her favorite multicultural education, learning technology lesson was making a collage. This lesson included some racial, ethnic, and cultural group examples (Banks, 2019), but there were numerous opportunities to include additional multicultural education components. Helen explained collages are meant to show meaning and share information about the individual, and one potential opportunity to increase multicultural education into this lesson is by incorporating a social justice objective. Social justice is one of the seven characteristics of multicultural education, which challenges students to learn how

to identify inequities within society, reflect on them, and then take action to change them (Nieto & Bode, 2018). Helen could have her students create an image on Photoshop to add to their collage that represents a social injustice they feel passionate about and how they are addressing it. These possible opportunities would require the support of impactful PLE approaches that are personalized to her individual needs including her perspectives as a White woman, her instructional content (i.e., art), and her student demographics.

Research Question #1 Findings

Helen perceived multicultural education, learning technologies, and digital equity differently. She described multicultural education, learning technologies, and digital equity with their own definitions without any connections between them. Helen viewed multicultural education from an equity perspective, and this conflation of multicultural education and equity was rooted in her PLEs. Helen did participate in required PLEs on both multicultural education and equity, but she struggled to understand the difference between the two and had questions on how to apply it into her classroom. Helen defined multicultural education as incorporating perspectives from different cultures, specifically those that represent the students in her class. When I compared Helen's descriptions of multicultural education to theory (e.g., Banks, 2019, Nieto & Bode, 2018), her perspectives aligned more appropriately to equity and not multicultural education. Helen stated she believes learning technologies are an important component to the classroom and enhances student learning. She demonstrated a high level of proficiency with technology based on her comments and she had a high TPSA C-21 (Christensen &

Knezek, 2017) score. Helen described digital equity as only having equal access to resources, and she did not include any equity-centered classroom practices or curriculum applications in her explanations. Though Helen noted she believes equal access to technology is an admirable goal, she does not think it is attainable as there will always be families with more resources than others. Helen's perceptions of multicultural education, learning technologies, and digital equity are unique with their own definitions and independent from each other.

Research Question #2 Findings

Helen incorporated multicultural education, learning technologies, and digital equity into the classroom with individualized goals and applications. This participant applied multicultural education, learning technologies, and digital equity into the classroom with specific, yet different objectives. Helen integrated multicultural education by including student representation in her examples and offering different assignment options to her students. These methods closely aligned to CSP and funds of knowledge, which are equity-centered approaches. Multicultural education is also an equity-centered approach, and I found one multicultural education characteristic in the comments and examples provided by Helen (Banks, 2019). There are many opportunities within Helen's classroom to incorporate additional multicultural education characteristics, such as integrating social justice into her lesson assignments. I saw evidence of learning technologies in all areas of the classroom and curriculum. Helen shared numerous types of learning technologies applied in her curriculum and provided assignment examples that applied all higher-order levels of Bloom's Digital Taxonomy (Sneed, 2016). Helen

incorporated digital equity in the classroom by providing all the required technology, but she limited digital equity to access only. I defined digital equity, in chapter one, as having equal access to resources including equity-centered classroom practices and curriculum applications. Helen provided her students access to the same resources, but she did not mention incorporating any equity-centered classroom practices and curriculum applications. Helen integrated multicultural education, learning technologies, and digital equity separately with different application goals and connections to theory.

Research Question #3 Findings

Helen stated she believes both multicultural education and learning technologies enhance student learning, but she did not explain how they intersected to support digital equity. Helen described multicultural education and learning technologies as strategies for the classroom to support student learning, but she did not see them connecting or intersecting in support of digital equity. This participant commented on the similarities and differences between multicultural education and learning technologies, but never mentioned digital equity or any correlation between them. Helen viewed multicultural education and learning technologies as separate, but each supports student learning without any relationship to digital equity.

Case Study 4: Claudia

As a former social worker, Claudia centers her classroom around students feeling safe and welcomed. Claudia is a third-grade classroom teacher at a Title I school. She teaches at a minority majority elementary school in a midwestern state, and she has a master's degree with nine years of experience. Claudia has a history of community-

service positions as she has worked for the Peace Corps and Teach for America before becoming a teacher. Claudia identifies as a Caucasian woman and believes in the importance of classroom community and kindness. She viewed multicultural education, learning technologies, and digital equity as unique and separate components to the classroom. As I will discuss below, this participant integrated multicultural education and learning technologies together unintentionally and not in support of digital equity. This participant perceived multicultural education as a method to celebrate and learn about other cultures with the goal to explore actions that leads to change. Claudia shared that she views and incorporates multicultural education at a basic level and wants to learn more on how she can advance it in her classroom. She stated that she believes in the importance of learning technologies, and she integrates them throughout her classroom at lower-order thinking skills (Sneed, 2016). Claudia defined and applied digital equity as equal access to resources for every student. She shared lessons that integrated multicultural education and learning technologies, and the lessons were not deliberately designed to incorporate both. There was no evidence found that multicultural education and learning technologies intersect to support digital equity, and there are a variety of opportunities to integrate multicultural education, learning technologies, and digital equity together in Claudia's classroom.

Background

Claudia submitted her responses to the online survey and Technology Proficiency Self-assessment Questionnaire for 21st Century Learning (TPSA C-21; Christensen & Knezek, 2017) in late April 2022. The first interview was held at the end of April and the

second interview was completed about a week later in early May. This participant has a high technology proficiency level with a TPSA C-21 (Christensen & Knezek, 2017) score of 4.76 out of 5.0.

Multicultural Education

As described below, Claudia viewed multicultural education as exploring and celebrating other cultures from a non-critical lens as she focused on food and holidays instead of investigating inequities or interrogating power structures. This participant has engaged in professional learning experiences (PLEs) on multicultural education that have been impactful. Claudia commented she understands multicultural education at a basic level and wants to learn more on how to advance multicultural education in her curriculum.

Multicultural Education Perceptions and Applications. Claudia viewed and applied multicultural education from a celebratory objective to learn about and connect to other cultures. She described multicultural education as a topic within the social studies subject area and not as something that was integrated throughout her curriculum. Claudia shared she wanted to deepen and expand multicultural education in her classroom, and there are numerous opportunities for her to do so. Claudia perceived and incorporated multicultural education as exploring other cultures without a critical lens.

Claudia celebrated multicultural education as a social studies topic. She stated, “I’m realizing multicultural education isn’t an area I’ve focused on enough with my students. I make excuses because social studies minutes are one of the first things that get cut from an elementary school day.” She also shared, “As a teacher I don’t plan heavily

for multicultural education. My excuse is it's just 30 minutes of social studies.” Claudia did not view multicultural education as an approach that could be integrated throughout the curriculum. Instead, she saw it as a component of the social studies curriculum. This participant also showed an awareness that multicultural education was lacking in her classroom, and she shared that she should plan and incorporate more multicultural education in her curriculum.

Claudia defined multicultural education as exploring other cultures through a celebratory approach as she stated multicultural education is “trying to expose kids to a lot of different people, see how families can look different, how people have different customs and traditions, and that we need to respect all of those different customs and traditions.” Claudia viewed culture from many different perspectives including race, families, and religions. She shared that multicultural education incorporates “many cultures into the classroom, such as racial, like if kids are Black or White, but multicultural education also includes LGBTQ and students with disabilities.” Claudia provided examples on how she includes multicultural education in her curriculum.

Claudia engaged her students in dialogue and commented she likes to focus her daily read aloud books on the designated heritage of the month (e.g., Black History Month, LGBTQ+ Pride Month, Disability Pride Month), so her students can experience other cultures. She shared, “During the heritage month, like Black History Month, Women's History Month, Latinx History Month, I'll try to find books that focus on that culture to read.” Claudia described the read aloud lessons are followed up with questions that challenge students to think about the social justice actions taken and how these changes

relate to her students' lives. For example, Claudia read a book for Women's History Month, and she stated,

I have the students talk about what they know and the connections they've made. We read a story about women that biked across the United States and how that lead from women wearing dresses to making bloomers more common. So, I'll try to help them make connections by asking do you guys wear dresses all the time and why do you think that happened.

Claudia believed and integrated multicultural education from an approach that celebrated other cultures, and she did not include topics that may be uncomfortable or addressed inequities. When describing one of her multicultural education lessons she shared,

A lot of the multicultural lesson was on more concrete things that the kids could relate to, like how they slept, how they lived, what they ate, and that kind of stuff, because in third grade I really don't want to teach them about things like war.

There's enough war at recess right now we don't need it in the classroom.

Claudia stated she did not include discussions on bias or discrimination in her multicultural lessons as she felt it was not appropriate for her third-grade students.

Multicultural Education Perceptions and Applications Potential Opportunities.

There are potential opportunities to advance and enrich multicultural education in Claudia's classroom. Claudia viewed and incorporated multicultural education as a way for students to learn about other cultures and make connections. She stated she wanted her students to understand that everyone is different but have a lot in common as well. Claudia shared that her multicultural education lesson objective is that "people can be

different from us, but really we're probably more the same than we are different.” This participant applied multicultural education in the same way as she defined it – as an opportunity to learn about other cultures with the purpose to identify similarities and celebrate our differences.

Claudia incorporated two out of the seven multicultural education characteristics by Nieto and Bode (2018). Claudia noted she wanted to teach all her students about all people, which aligns with the first multicultural education characteristic, “multicultural education is important for all students” (Nieto & Bode, 2018, p. 32). This participant provided her students with examples of how people’s action led to change and then conducted discussions so the students could reflect and answer questions. This partly supports the second multicultural education characteristic, “multicultural education is education for social justice” (Nieto & Bode, 2018, p. 32). Claudia shared classroom examples on the different ways she includes multicultural education, which was focused primarily on celebrating differences, identifying similarities, and understanding the actions of social justice role models.

In my data analysis I noted possible opportunities that would increase the usage of multicultural education within Claudia’s classroom. One example included incorporating the other five multicultural education characteristics into the curriculum. Claudia could expand some of her current lessons, such as her read aloud discussions, to incorporate identifying inequities and discussing ways to fight against them. Another opportunity for Claudia to increase multicultural education in her curriculum is by updating all her lessons and classroom practices through a critical lens in all subject areas. According to

the research explored in the literature review earlier in this paper, teachers with a critical lens will promote student achievement. Claudia stated that she is aware there is more she can do with multicultural education, and there are a variety of options within Claudia's curriculum that could advance multicultural education.

Multicultural Education PLEs. Claudia shared she has a personal desire to grow in her understandings of multicultural education and her PLEs included a guided book club that gave her opportunities to self-reflect. The professional learning provided by Claudia's school district included differentiated options, so teachers could select the one that best suited their needs. Claudia selected a book club where she read, reflected, and discussed diverse first-person memoirs. She shared that the book club was the most impactful PLE on multicultural education as it helped her to expand her world views.

Claudia described the PLE:

Our school district did a diversity series, all first-person memoirs, then we would have discussions. This was the best diversity or multicultural training I've had. A lot of them in the past I've just felt were not this strong, and I think it's really helpful to get to read that first-person perspective.

Claudia shared she personally grew through the book club, but she did not include any information on how it may have influenced her classroom or interactions with her students.

While describing multicultural education in her classroom, Claudia acknowledged that she is not doing enough and believes she could do more as she shared, "I feel like I practice multicultural education at a surface level... I need to do more than just putting in

diverse names into the word problems I'm writing for my students." This participant commented she wants to do more with multicultural education in her classroom but is not sure how to do it. When discussing what questions, she has about multicultural education, Claudia wanted to know how to incorporate it more meaningfully. She shared one of her questions about multicultural is, "What is that next deeper level?" Claudia discussed she has a desire to grow in her understanding and applications of multicultural education, but she does not know how and none of her PLEs have provided her with that information.

Learning Technology

Claudia perceived learning technologies as an important component of the classroom. She incorporated learning technologies throughout her day and in all subject areas, but the levels of order thinking skills are low, based on Bloom's Digital Taxonomy (Sneed, 2016). Claudia shared she has a desire to grow in her understanding of learning technologies, but she cannot advance her skills due to the basic PLEs provided by her district.

Learning Technologies Perceptions and Applications. This participant stated that she uses learning technologies throughout the day in her classroom. Claudia viewed learning technologies as technology hardware and software. She defined learning technologies as physical devices and software, stating "both the physical technology from books, SMART Boards, and tablets, but also the programs on them." Claudia shared she believes and accepts the importance of technology, and thinks she is proficient with it. She stated, "For a teacher, I feel I'm pretty tech savvy. I have a fair amount of confidence that I can get kids onto different websites or different activities and explain to them what

to do.” This comfort with technology aligns with Claudia’s TPSA C-21 (Christensen & Knezek, 2017) level as she has a high technology proficiency score.

Claudia incorporated technology in her daily schedule as she explained she includes learning technologies in every subject area. For example, in writing she commented she uses the SMART Board and Google slides for grammar practice. Claudia shared, “At the beginning of writing I always put three sentences up using Google slides on the board.” She noted in her science lessons students participate in Mystery Science on the SMART Board and then answer questions on a Google form. Claudia stated, “Students choose a Mystery Science video and then answer questions on a Google form.”

Claudia’s integration of learning technologies was applied at lower-order thinking levels of Bloom’s Digital Taxonomy, as she shared examples of remembering, understanding, and applying skills, but not the higher-order thinking skills, such as creating (Sneed, 2016). For example, Claudia noted her students work on a program called IXL. This program offers a personalized learning plan including lessons, questions, and quizzes based on the student’s instructional level. Claudia shared, “We have 35 minutes of IXL every day... IXL is a program that gives a recommend set of skills, based on what kids have shown they can or cannot do. It’s really great.” Claudia commented her students are learning, comprehending, and calculating answers with learning technologies in her classroom, but they are not building anything new or validating information, which are higher-order thinking skills (Sneed, 2016). When I asked Claudia directly if her students were engaging with learning technologies through creation or monitoring Claudia did not share any examples, but instead recapped what was already

shared by stating, “Yeah, thinking about this year, there’s reading, writing, and then the IXL program where they can practice math or reading. That is probably the big things that they are allowed to do.” This participant incorporated learning technologies throughout the day using lower levels of Bloom’s Digital Taxonomy (Sneed, 2016).

Learning Technologies PLEs. Claudia shared she felt frustrated by her PLEs on learning technologies as they only provided rudimentary information. She noted there were not any required PLEs she found to be helpful as she stated,

A lot of tech training is at a base level, and you just get the same base level every year, and no one helps you figure out the next steps. You have to figure out the next steps by yourself, because it doesn't really move past that basic information.

Claudia stated she wants to grow in her knowledge on learning technologies, but she feels she cannot do that with the PLEs delivered by her district. For example, Claudia’s district introduced new programs for reading, social studies, and science, but they only offered the teachers with some beginner information. Claudia shared, “I felt very frustrated that our district didn’t prepare us well for these programs...we had to figure it out ourselves.” Claudia discussed that she has a desire to learn more about technology, but she is not being provided any impactful PLEs through her school district.

Digital Equity

Claudia perceived and incorporated digital equity as equal access to resources. As I described in chapter one, digital equity includes both equal access to resources and equity-centered classroom practices and curriculum applications. Claudia viewed and applied digital equity partially into her classroom as she provided her students with equal

access to digital resources and did not include equity-centered classroom practices and curriculum applications.

Digital Equity Perceptions and Applications. Claudia described digital equity from the perspective that everyone has the same resources available to them. She commented that digital equity is “making sure or trying to get equal access to technology.” When sharing examples of digital equity, Claudia noted she made sure her students all had the same tools available to them. She gave an example of digital equity that every student at her school “got a Chromebook at the beginning of the year with a charger and a case and all the things they would need to make sure they had access to the materials they would need.” Claudia shared that she believed she achieved digital equity because all her students got the same devices and were able to engage in the same software.

Digital Equity Access, Classroom Practices, and Curriculum Applications. Claudia’s description of digital equity did not include any equity-centered classroom practices or curriculum applications in her comments, which more appropriately aligns with the definition of the digital divide. The digital divide is defined as providing equal access to technology (e.g., Dolan, 2016; Howard et al., 2018; Ravi, 2018), and Claudia stated the digital equity is providing equal resources. As I described in chapter one there is a difference between the digital divide and digital equity as digital equity also focuses on equity-centered classroom practices and curriculum applications. Claudia never mentioned or indicated equity-centered classroom practices or curriculum applications

when discussing digital equity, and instead her responses were concentrated on equal access to resources.

Multicultural Education and Learning Technology Intersection Themes

Claudia viewed multicultural education and learning technologies separately as she did not note any similarities or differences between them. This participant did create lessons that integrated both, but she did not make any connections between them or digital equity. Claudia struggled to explain the relationships between multicultural education and learning technologies as she was unable to answer some of the questions comparing the two, and when I asked her to critique a learning technology she did not make any comments related to multicultural education or digital equity.

Relationships Between Multicultural Education, Learning Technologies, and Digital Equity. Claudia described digital citizenship when explaining her views on the connections between multicultural education and learning technologies. When I asked Claudia about the similarities between multicultural education and learning technologies she did not answer the question, and instead spoke about how learning technologies can enhance multicultural education in the classroom, stating, “technology is the key to opening the door to learning new cultures.” Claudia did not provide any comments on the similarities between multicultural education and learning technologies, but she did discuss how technology can support digital citizenship. As I described in chapter two, digital citizenship is one of digital equity’s classroom practices and curriculum approaches. Claudia stated, “Technology can open up kids’ experience, if used the right way. If taught how to use technology correctly and safely they could do research on their

own about different people, and they can see different experiences.” Claudia viewed multicultural education and learning technologies individually as she did not provide any explanations or examples of them together. She admitted, “As concepts how are they're different? No. I'm blanking on that one.” Claudia viewed multicultural education and learning technologies separately and without any connections between them as she did not answer questions about the relationships between them.

This participant did share a lesson that incorporated both multicultural education and learning technologies, but she did not intentionally utilize them together in support of digital equity. Claudia conducted a lesson with her students where they explored cities around the world (e.g., Rome, Cairo) and learning technologies were used to present the information she wanted to share (e.g., YouTube, online magazines, Google Earth). She noted, “We talked about ancient cultures around the world, and then how those cultures have continued today...I put things up on the SMART Board, like what we were reading, and we did some virtual museum tours.” When Claudia described her lessons or her perceptions on multicultural education and learning technologies, she never made any comments on digital equity. She described the purpose of the learning technologies in her lesson was for information only and she did not make any comments that she purposefully included them together in support of digital equity.

Learning Technology Multicultural Education Checklist Review. Mystery Science, as a learning technology, did not include any examples of multicultural education integration. Mystery Science is a staple in Claudia’s classroom as she described she frequently uses it during her science class. She shared, “In science time we

often use a site called Mystery Science which has a lot of really great science videos, resources, and activities.” Mystery Science is an online resource that includes complete lessons for teachers on various science concepts. These lessons include videos, handouts, and discussion questions. During the second interview I asked Claudia questions about Mystery Science, and I used the Checklist for Evaluating Information Materials (Banks, 2019) to assess the integration of multicultural education within the learning technology.

Mystery Science provides lessons, and the one I evaluated was on Habitats, Fossils, and Environments Over Time. Out of the 17 criteria categories, all the multicultural education criteria were “hardly at all” used or applied in the learning technology, so those categories received a score of “1” (Banks, 2019). The Mystery Science lesson received an overall score of “1” because it did not provide diverse images or include any social justice discussions. The lesson centered around the state of Illinois and how over time habitats and environments can change. Students are directed to complete a worksheet where they sort the correct fossil to the correct soil layer. There are questions about the soil layers, but there is not any information or discussion topics that explore any inequities or unfair environmental factors leading to changes in habitats or environments. After I reviewed all the content, I did not observe any integration of multicultural education in this Mystery Science lesson.

Learning Technology Participant Feedback. Claudia shared the improvements she would make to Mystery Science would focus on decreasing preparation time and including more content. This participant commented she values Mystery Science because the website provides well-developed, completed lessons that reduces her planning time.

Claudia noted she appreciates Mystery Science so much she wishes there were more lessons to choose from, specifically ones that require minimal preparation time. She stated, “I think it would be great if there was a bigger variety of units, and I think it would be great having more activities where we can just print and go.” Claudia’s Mystery Science critiques were centered around having more lesson options that included minimal preparation time. When discussing the learning technology Mystery Science, Claudia did not make any comments on digital equity or multicultural education.

Multicultural Education and Learning Technologies Potential Opportunities

As I defined earlier in this paper, digital equity, through high-quality technology and instruction, improves student achievement, digital citizenship, workforce readiness, and personalized learning opportunities (e.g., Bevins et al., 2012; Gronseth et al., 2020; Howard et al., 2018). There was evidence within all the data collected that Claudia does incorporate some aspects of multicultural educational and learning technology integration in support of digital equity, but it was not done intentionally and there are opportunities to advance multicultural education and learning technologies in Claudia’s classroom. For example, Claudia described a multicultural education, learning technology lesson where her students explored other cultures around the world. In this lesson students engaged with learning technologies using lower-order thinking skills (Sneed, 2016) and two out of the seven characteristics of multicultural education were included (Nieto & Bode, 2018). This lesson has the potential to include higher-order digital thinking skills and additional multicultural education characteristics. One way to integrate higher-order thinking skills is by having students create a virtual book on what they learned from each city.

Multicultural education could be incorporated by having discussions on how each city develops laws, compare that to the U.S. and identify any inequities, and then create ways the U.S. could improve their process. Claudia identifies as a White woman, and as an elementary classroom teacher, these potential opportunities would require the support of impactful PLE approaches that are individualized to her needs, including her current perspectives, instructional content area, and student demographics.

Research Question #1 Findings

Claudia perceived multicultural education, learning technologies, and digital equity uniquely and differently with their own individual definitions. Claudia described multicultural education as a separate area of study under social studies, and its purpose is to make connections, celebrate, and learn about other cultures. She saw multicultural education in isolation as she described it as a separate topic area under social studies, and she wanted to explore social justice and celebrate other cultures within her comfort levels. There are opportunities for Claudia to expand multicultural education in her curriculum by integrating it in other subjects and engaging in PLEs that help her grow in her racial identity development and provide guided classroom examples. Claudia accepted and believed in the importance of incorporating learning technologies into the classroom as she felt comfortable including learning technologies throughout her curriculum. This participant felt proficient with her technology skills and shared she was frustrated by the lack of rigor in her PLEs. Claudia reported the required PLEs provided foundational information and did not advance her skills or understandings of learning technologies. Claudia defined digital equity as equal access to digital devices. This aligns

well with the definition of the digital divide as Claudia did not include equity-centered classroom practices and curriculum applications in any of her comments. Claudia described multicultural education, learning technologies, and digital equity with their own definitions; they are viewed differently and separately without any comments correlating them together.

Research Question #2 Findings

Claudia incorporated multicultural education, learning technologies, and digital equity into the classroom with unique applications and there are possibilities to enrich each within her classroom. Claudia shared she brings multicultural education into her curriculum by learning about and discussing many cultures (e.g., race, religion, gender). Two out of seven characteristics of multicultural education (Nieto & Bode, 2018) are integrated in Claudia's classroom. She included topics about all students, for all students and provided social justice examples. Claudia intentionally included multicultural education in her lesson plans with an inclusive focus instead of a critical one. She wanted her students to celebrate their differences and deliberately filtered out any topics she was uncomfortable with, such as antiracism. Claudia shared she is aware that her integration of multicultural education is shallow, but she does not know how to incorporate it more deeply into her curriculum and her multicultural education PLEs never provided any classroom applications. There are opportunities that could enrich and expand multicultural education in Claudia's classroom by including more conversations about inequities and using a critical lens when building her curriculum. Claudia integrated learning technologies throughout the day and in all subject areas from a consumer

perspective as students engaged with them using lower-order thinking skills (Sneed, 2016). This participant could advance the application of learning technologies by including higher-order thinking skills, such as creating products or testing materials through learning technologies. Claudia implemented digital equity by providing her students with the same access to learning technologies. This perspective partially aligns with the definition of digital equity as she provided the same technologies for her students, but she did not include any equity-centered classroom practices and curriculum applications. Claudia incorporated multicultural education, learning technologies, and digital equity in her classroom with individualized applications. They were implemented in different ways and there are potential opportunities for Claudia to advance each of them in her curriculum.

Research Question #3 Findings

Claudia intersected multicultural education and learning technologies, but not intentionally or in support of digital equity. Claudia struggled to explain the relationships between multicultural education and learning technologies and she did not note any correlations between them. Claudia did not perceive multicultural education and learning technologies as connected as she had unique definitions and understandings of them. The two concepts did intersect during her lesson example on exploring other cultures around the world, but it was not deliberate, and it was not in support of digital equity. Claudia shared she believes multicultural education and learning technologies each have separate classroom purposes, there are not any relationships between them, and they do not intersect in support of digital equity.

Cross Case Synthesis

After analyzing all the cases, there were seven overall themes that emerged from the data: (1) the participants had divergent beliefs about multicultural education, (2) the participants believed learning technologies enhances student learning when integrated throughout the curriculum, (3) the participants defined digital equity is equal access to resources and did not include equity-centered classroom practices or curriculum applications, (4) the participants struggled to describe the relationships between multicultural education and learning technologies, (5) the participants viewed multicultural education and learning technologies separately from digital equity, (6) the learning technology software included hardly at all any multicultural education, and (7) there are numerous opportunities for each participant to enhance multicultural education, learning technologies, and digital equity in their classroom.

William, Faye, Helen, and Claudia each shared they believe multicultural education includes providing diverse representation in their classroom images and examples, but their individual perspectives on it were unique. In this dissertation the participants had divergent views of multicultural education as they defined and applied it differently. The participants believed and accepted the importance of technology and its positive impact on student learning. They all integrated learning technologies throughout their curriculum. All four of the learning technologies I reviewed using Banks' (2019) checklist for evaluating multicultural education had "hardly at all" (pp. 158-159) any multicultural education and received an overall mean score of 1.1 (out of 6.0). William, Faye, Helen, and Claudia each described digital equity as equal access to technology, and

they did not view digital equity to include equity-centered classroom practices or curriculum applications. The participants struggled to explain the relationships between multicultural education and learning technologies and saw them separately from digital equity. After analyzing the data, William, Faye, Helen, and Claudia had opportunities to advance and enhance multicultural education, learning technologies, and digital equity in their classrooms. The following sections will explain the data and these themes in detail.

Background

William, Faye, Helen, and Claudia experiences and perspectives were each unique, but they all demonstrated a passion for education and cared about their students. All four participants were teaching in public schools, had a high technology proficiency score, identified as White, and had experiences teaching students with backgrounds different from their own. They each taught different grade levels and subject areas. William and Claudia were classroom teachers as William taught high school math and Claudia taught second grade. The other teachers were content-specific; Helen taught high school art and Faye taught elementary STEM. The participants all instructed at different schools and the student populations the teachers worked with were not the same. See Table 5 for the background of each participant.

Table 5

Participants' Background

Demographic Information	William	Faye	Helen	Claudia
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Role	High school math teacher	K-5 STEM Teacher and Coach	High school art teacher	3 rd grade classroom teacher
Experience	More than 25 years; master's degree	More than 20 years; two master's degrees	More than 10 years; master's degree	Nine years; master's degree
School demographics	Predominately White; 50% qualify for free or reduced lunch	Diverse school; majority of the students are English Learners	Taught at two schools; two schools were racially and religiously diverse	Minority majority school
Background	White man; wants every kid to feel successful	White woman; creates engaging and challenging lessons	White woman; sees and values every student	White woman; welcomes all
TPSA-C21 Score (Christensen & Knezek, 2017)	4.76	4.71	4.65	4.76

Multicultural Education

I asked William, Faye, Helen, and Claudia about their perspectives, applications, and professional learning experiences (PLEs) on multicultural education. Their encounters and beliefs on multicultural education diverged as they were all different and distinct, and I identified numerous opportunities on how each participant could enhance multicultural education in their classrooms.

Multicultural Education Perceptions and Applications. Each participant viewed and integrated multicultural education uniquely (see Table 6 for each definition).

Table 6*Multicultural Education Participant Definitions*

William	Faye	Helen	Claudia
Making sure that you represent multiple cultures while teaching, whatever it is you're teaching... I think multiculturalism is essential... multiculturalism shouldn't be something I just pull out where I need it. It should always be present; it should be one of the things that are always there [in the classroom].	The students' cultures are represented... We're not so blatant, like, let's learn about all these different cultures... a lot of what we do at our school [for multicultural education] is kind of peppered in and it just becomes a part of the everyday modality.	Being able to pull perspectives from different cultures is really important. Representation in the classroom where all your students see something that might possibly relate to their story.	Trying to expose kids to a lot of different people, see how families can look different, how people have different customs and traditions, and that we need to respect all of those different customs and traditions.

All four participants shared they believe multicultural education includes providing images and examples from many cultures, but how they defined and applied multicultural education was different. William described multicultural education as an essential component to the classroom and he incorporated it through undeveloped teachable moments when the class explored multiple cultures. Faye viewed multicultural education as EL strategies and naturally integrated it by providing images and examples that matched her students' backgrounds. Helen's definition of multicultural education was focused on equity, and she applied it by showing diverse artwork and offering choices to her students. Claudia believed multicultural education is a method of celebrating and learning about other cultures, languages, religions, families, and genders. She integrated

it by reading historical stories and conducting discussions on how people’s actions led to social changes.

Nieto and Bode (2018) identified seven characteristics of multicultural education (p. 32). Table 7 explains the participants’ data for every multicultural education characteristic.

Table 7

Multicultural Education Characteristics and Participant Data

Characteristic	William	Faye	Helen	Claudia
1. Multicultural education is antiracist education	No evidence found	No evidence found	No evidence found	Disagree. Claudia stated she wanted multicultural education to be celebratory and not include discussions on inequities or discrimination
2. Multicultural education is basic education	William’s class explored the diverse mathematician list in an online math program, Desmos	Faye stated multicultural education is peppered into all classrooms	No evidence found	Disagree. Claudia commented that multicultural education is a social studies topic
3. Multicultural education is important for all students	William stated it is important to represent multiple cultures in	Faye believed that all her students have access to multicultural	Helen wanted her students to see themselves in her class examples, so	Claudia had a goal to teach all her students about all people

	education and he does this by bringing awareness to different cultures	education, through student representation	she includes a diverse range of artists	
4. Multicultural education is pervasive	No evidence found	No evidence found	No evidence found	No evidence found
5. Multicultural education is education for social justice	No evidence found	No evidence found	No evidence found	Claudia gives role model examples of how people's action have led to change and had the students reflect and answer questions
6. Multicultural education is a process	No evidence found	No evidence found	No evidence found	No evidence found
7. Multicultural education is critical pedagogy	No evidence found	No evidence found	No evidence found	No evidence found

All four participants shared comments or examples that supported at least one of the characteristics, but no evidence was found where they incorporated all seven. William, Faye, Helen, and Claudia shared they believe multicultural education is important for all students (the third characteristic), and there were four characteristics where no evidence

was found in any of the participants' data (i.e., antiracist education, pervasive, process, and critical pedagogy).

Multicultural Education Perceptions and Applications Potential Opportunities.

I provided potential examples on how William, Faye, Helen, and Claudia could advance multicultural education in their classrooms. The specific multicultural education possibilities for each participant were unique as they have different curriculum needs and learning objectives (e.g., high school math versus a third-grade class). No evidence was found on conducting constructive conversations about biases or inequities for any of the participants, so all four could incorporate antiracist education or critical pedagogy to increase the application of multicultural education in their classrooms.

Multicultural Education PLEs. William, Faye, Helen, and Claudia had a variety of multicultural education PLEs that included both positive and negative learning opportunities. The positive experiences included educational events that explored their privileges, provided relevant student strategies, included self-reflection, and offered differentiated events. The participants noted critiques of their PLEs. One participant, William, had minimal multicultural education PLEs in his current placement, and another, Helen, noted her PLEs were confusing as they went from focusing on multicultural education to equity with minimal clarifications between the two. William, Helen, and Claudia shared they had experienced some impactful PLEs on multicultural education with William and Helen providing some specific critiques that their PLEs were minimal or unclear.

Learning Technology

William, Faye, Helen, and Claudia shared how they defined and integrated learning technologies during their interviews. All four participants stated they believe learning technologies enhance student learning when integrated throughout the curriculum. They all participated in PLEs and commented they all grow in their skills and understanding of learning technologies through personal exploration.

Learning Technologies Perceptions and Applications. There were multiple commonalities between William, Faye, Helen, and Claudia's definitions and integration of learning technologies in their classrooms. They all had high technology proficiency scores, accepted and believed in the importance of learning technologies to support student development, and showed a passion for learning technologies.

William, Faye, Helen, and Claudia integrated learning technologies throughout their classroom practices and curriculum. They did not include learning technologies as a separate area of study but instead used it diversely to support student engagement and with a purpose to enhance student learning. For example, Helen leveraged learning technologies for multiple objectives to include sharing resources, guiding the daily schedule for the class, providing links, developing video examples, and evaluating assignments. William, Faye, and Helen incorporated all levels of Bloom's Digital Taxonomy (Sneed, 2016) within their curriculum. Claudia integrated lower-order thinking levels of Bloom's Digital Taxonomy but did not integrate higher-order thinking opportunities with her students, such as creating or evaluating with learning technologies in her classroom.

Learning Technologies PLEs. William, Faye, Helen, and Claudia all had experienced PLEs with learning technologies, and each commented they took self-initiation to learn more and develop their understandings of various learning technologies. William and Claudia stated they found the required professional development provided by their schools was unhelpful, specifically describing them as “boring” or “basic,” and William suggested that required professional development on learning technologies should be differentiated. Helen shared that she did experience some helpful required professional development, and that was due to the trainer providing a list of resources teachers could reference as needed for support.

Digital Equity

William, Faye, Helen, and Claudia all shared their beliefs and integrations of digital equity within the classroom. All four participants defined digital equity as equal access to technology. William, Faye, Helen, and Claudia described digital equity examples in their classroom to include providing one-on-one devices, and William commented he does not require work to be completed outside of class due to the lack of equitable resources. When discussing digital equity within their classrooms, there were not any comments about or connections to equity-centered classroom practices or curriculum applications.

Multicultural Education and Learning Technology Intersection

William, Faye, Helen, and Claudia shared their beliefs on the intersection of multicultural education and learning technologies and described their favorite multicultural education and learning technologies lesson. The participants struggled to

describe the relationships between multicultural education and learning technologies, and they viewed multicultural education and learning technologies separately from digital equity. William, Faye, Helen, and Claudia provided a list of learning technologies used in the classroom, and I reviewed four of them using Banks’ (2019) multicultural education checklist. The learning technology software I evaluated included hardly at all any multicultural education and the average score for all the learning technologies was 1.1 (out of 6.0).

Relationships between Multicultural Education, Learning Technologies, and Digital Equity. Helen and Claudia viewed multicultural education and learning technology as individual areas to a classroom, but William and Faye did intersect them and described them as important pieces to a curriculum. Table 8 includes key parts to the participants’ explanations of the relationship between multicultural education and learning technologies.

Table 8

Multicultural Education, Learning Technologies, and Digital Equity Participant Descriptions

William	Faye	Helen	Claudia
“I’ve never thought about how they’re similar.”	“How are they different... [long pause]...huh...[long pause]...I don’t know...[long pause].”	“They are the same and both their purposes are to try and implement the best possible learning strategy for student success.”	“Technology is the key to opening the door to learning new cultures.”
“They’re [learning technologies and multicultural education] both passions of mine, and I think they’re	“They are different components, but they are not separate.		“As concepts how they're different? No. I'm blanking on that one.”

both incredibly important, and I love the fact that you're doing this, with both of them together."	They are two components you are going to need for a good lesson."
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Helen and Claudia both saw multicultural education and learning technologies as separate critical components to the classroom, and William and Faye commented that they are connected. Faye specifically stated they are both needed for a good lesson, but none of the participants viewed multicultural education and learning technology in support of digital equity. Digital equity was not mentioned by any of the participants and no connections between multicultural education, learning technology, and digital equity were found in any of the data collected. William, Faye, and Claudia did struggle with finding connections between multicultural education and learning technology as they were hesitant with their answers, and Claudia was unable to explain the differences between them.

All the participants described a lesson that integrated both multicultural education and learning technology. When reviewing the lessons, none of the participants incorporated all seven characteristics of multicultural education with multiple levels of Bloom's Digital Taxonomy (Sneed, 2016). There was an imbalance between multicultural education and learning technologies for most of the lessons (e.g., all levels of Bloom's Digital Taxonomy were incorporated, but there were few multicultural education characteristics) or they were low in both areas. For example, Faye's lesson on creating weather manipulatives with a 3D printer integrated all levels of Bloom's Digital

Taxonomy, but one multicultural education characteristic (i.e., important for all students) was moderately included when different weather forecasts from around the world were shown. Overall, half the participants connected multicultural education and learning technology together, but none of the participants intersected multicultural education and learning technologies in support of digital equity.

Learning Technology Multicultural Education Checklist Review. Four different learning technologies (i.e., Desmos, Tinkercad, Schoology, Mystery Science) were reviewed using Banks’ (2019) Checklist for Evaluating Informational Materials. Table 9 includes the scores for each learning technology, and the mean rating for all four learning technologies was 1.1, “hardly at all” (pp. 158-159). That average score means there was hardly at all any multicultural education within these learning technologies.

Table 9

Selected Learning Technology Multicultural Education Score

William (Desmos)	Faye (Tinkercad)	Helen (Schoology)	Claudia (Mystery Science)
1.3 (hardly at all)	1.1 (hardly at all).	1.1 (hardly at all)	1.0 (none found)

Desmos, Tinkercad, and Schoology included some multicultural education features and Mystery Science did not include any. For example, in Desmos, I reviewed a lesson on the minimum wage. There was one question that asked about the impact the minimum wage has on people, but there was nothing in the lesson that addressed or explored inequities, power structures, or social justice. The learning technologies in this dissertation included

minimal multicultural education components. When William, Faye, Helen, and Claudia were asked what changes they would make to these programs, they all provided answers that focused on making improvements to increase student achievement or additional features to make managing the program easier. None of the participants made any comments on equity-centered curriculum applications or digital equity.

Multicultural Education and Learning Technologies Potential Opportunities

Multicultural education and learning technologies have been found to advance student development, and scholars have argued that digital equity is essential in the classroom (e.g., Bevins et al., 2012; Gronseth et al., 2020; Normore & Issa Lahera, 2019). William, Faye, Helen, and Claudia incorporated multicultural education and learning technologies in different ways, and there are numerous opportunities for all four participants to expand and deepen their integration of multicultural education and learning technologies in their classrooms. These potential applications are unique to each participant as they teach different ages and content areas, but they include all the characteristics of multicultural education (Nieto & Bode, 2018) and every level of Bloom's Digital Taxonomy (Sneed, 2016).

Research Question #1 Findings

William, Faye, Helen, and Claudia have unique perspectives on multicultural education, and similar perspectives on learning technologies and digital equity. Though all four participants shared they believe multicultural education includes showing images and examples of multiple cultures, they each defined multicultural education differently. Learning technologies and digital equity were explained in similar ways between the

participants. William, Faye, Helen, and Claudia stated they believe learning technologies are digital tools that are important for student development and should be integrated throughout the curriculum. All four participants defined digital equity as equal access to resources and made comments that they are concerned about resource equality as it is critical for student achievement. William, Faye, Helen, and Claudia did not make any connections to equity-centered classroom practices or curriculum applications when defining digital equity.

Research Question #2 Findings

All four participants incorporated multicultural education through individualized methods, and they applied learning technologies and digital equity using comparable approaches. William, Faye, Helen, and Claudia all provided images and examples of multiple cultures in their curricula, but there were distinct differences on how multicultural education was embedded. For example, William used teachable moments to include multicultural education, but Faye let it naturally occur. To implement multicultural education, Helen gave her student choices and Claudia focused on reading diverse stories and conducting group discussions. William, Faye, Helen, and Claudia included at least one of Nieto and Bode's (2018) seven characteristics of multicultural education in their classroom, but none of the participants integrated all of them.

William, Faye, Helen, and Claudia interweaved learning technologies throughout their curriculums. Their classrooms frequently used learning technologies with varied purposes and methods. William, Faye, and Helen incorporated all levels of Bloom's

Digital Taxonomy (Sneed, 2016), and Claudia included numerous lower-order thinking skills.

William, Faye, Helen, and Claudia all incorporated digital equity within their classrooms by ensuring their students had equal access to digital resources. All four teachers provided one-to-one devices to their students and were cognizant of their students' access to digital resources outside of school. None of the participants included equity-centered classroom practices or curriculum applications when sharing examples of digital equity.

Research Question #3 Findings

William, Faye, Helen, and Claudia all intersected multicultural education and learning technologies in their classrooms, but it was not done intentionally or in support of digital equity. The majority (three out of four) of the participants were challenged by the idea of connecting multicultural education and learning technologies. Helen and Claudia saw them as separate components to the classroom, and William and Faye were able to identify there are relationships between them, but they did not make any connections to digital equity. All four participants shared a multicultural education and learning technology lesson but incorporating the two into the lesson was not done intentionally. None of the multicultural education, learning technologies lessons included all seven characteristics of multicultural education (Nieto & Bode, 2018) and all levels of Bloom's Digital Taxonomy (Sneed, 2016). The learning technologies used by the participants had hardly any multicultural education components and received low scores with Banks' (2019) multicultural education checklist. When critiquing the learning

technologies, none of the participants included any improvements tied to multicultural education or digital equity. William, Faye, Helen, and Claudia did not make any comments or showed evidence of multicultural education and learning technologies intersecting in support of digital equity.

Chapter Five

Technology is critical to the classroom as it increases student achievement, provides opportunities for digital citizenship, prepares students for workforce readiness, and provides personalized learning experiences (e.g., Eyyam & Yaratan, 2014; Gronseth et al., 2020; Howard et al., 2018). Inequities exist in other areas of education including access to funding, more experienced teachers, and technology (Irwin et al., 2021; Knight, 2019). Problems with access to technology are not limited to students' connections to computers or the internet, but also include inequitable incorporation of technology as students are not always engaging with technology in creative and meaningful ways (e.g., Judge et al., 2004; Resta et al., 2018). Digital equity is an equity-centered approach that seeks to improve students' access to learning technologies, and advance classroom practices, curriculum applications, and teacher beliefs with the intent to resolve the digital divide and prepare students to succeed in a technology-driven society. Researchers have identified that digital equity should be integrated into classroom practices and curriculum applications through the cultural competency approaches of digital citizenship, CSP, and multicultural education (e.g., Gronseth et al., 2020; Howard et al., 2018; Normore & Issa Lahera, 2019). Digital equity researchers have defended and explained the importance of students obtaining access to high-quality technology and instruction as it can improve student achievement, digital citizenship, workforce readiness, and personalized learning opportunities (e.g., Bevins et al., 2012; Gronseth et al., 2020; Howard et al., 2018).

Despite this established need for digital equity in the classroom, there is limited empirical research on this topic.

This dissertation explored educators' perspectives and applications of digital equity through learning technology and multicultural education theory. These areas of study are interconnected yet have not previously been researched together. Four K-12 public school educators participated and completed a survey and two interviews where I asked questions about multicultural education, learning technologies, digital equity, and the connections between them. I evaluated four different learning technologies using Banks' (2019) Checklist for Evaluating Informational Materials. This dissertation provides insight into how educators are engaging with multicultural education and learning technologies within their classroom. The findings and conclusions of this study have numerous implications on digital equity, multicultural education, learning technologies, and the relationships between them. This chapter identifies and explains the findings from this dissertation, implications, future research opportunities, and final conclusions.

Connections to Theory

Digital equity is emerging within the teachers' classroom, but it was not planned, done intentionally, or with the purpose to support the goals and objectives of digital equity. There is a theme of partial understandings of terms and applications as William, Faye, Helen, and Claudia described multicultural education and digital equity with portions of the definitions, and they struggled to explain the relationship between multicultural education and learning technologies. The key to supporting educators'

understanding and applications of critical theory, such as multicultural education, is through impactful professional learning approaches, such as differentiated training to address bias and racecraft (e.g., Colombo, 2004; Field & Fields, 2014; Ladson-Billings, 2014). This was also true with the participants of this dissertation as the professional learning experiences (PLEs) were insufficient and contributing to their partial understandings of multicultural education. William, Faye, Helen, and Claudia also partially understood digital equity as they saw it as equal access to resources only and did not intersect multicultural education and learning technologies to support digital equity. My review of each of the educators' four learning technology lessons using Banks' (2019) Checklist for Evaluating Informational Materials found minimal integration of multicultural education. The learning technology software was not designed in support of multicultural education or digital equity. The four participants in this study all had high technology proficiency levels, believed in the importance of learning technologies, took self-initiative to grow in their learning technology skills while receiving minimal to no help from required PLEs. Learning technology theory has been focused on teacher beliefs and acceptance, but current studies have shown preservice teachers are entering programs with positive beliefs already established (Ertmer et al., 2012; Lee et al., 2020; Scherer et al., 2019). Learning technology theories and PLEs require modernization as educators are already believing in the importance of learning technologies, and instead need additional, more challenging PLEs to build their skill sets.

Multicultural Education Data and Literature

Based on the participants' comments, their PLEs were not addressing their questions or partial understandings of multicultural education. The following sections will compare the data outcomes of this dissertation with theory and explain the confusion and challenges around multicultural education. The participants shared views and applications that partially aligned with multicultural education theory, and most participants engaged in some impactful multicultural education PLEs.

Multicultural Education Perceptions, Incorporations, and Theory. Each participant perceived multicultural education differently, which supports other established findings within multicultural education literature. Though William, Faye, Helen, and Claudia viewed multicultural education differently, they all believed it included exploring diversity through images and examples. Multicultural education, as identified within critical theory literature, is challenging to understand (e.g., Matias & Mackey, 2016; Philip, 2014; Tatum, 1992). Even established scholars have different definitions for multicultural education, but those descriptions all have common characteristics, such as incorporating social justice actions and exploring biases and inequities (e.g., Banks, 2019; May & Sleeter, 2010; Nieto & Bode, 2018). Gorski (2016) believed the reason behind the misunderstandings with multicultural education was due to using the term culture, and instead recommended using the term "equity" to remove any confusion people may have. Helen's comments on multicultural education conflicts with Gorski's argument as Helen shared she had PLEs focused on both multicultural education and equity, but she still experienced confusion between the two. All the

participants had a partial understanding of multicultural education as they each defined it as showing diverse representation, but other multicultural education connections were not included, such as promoting tolerance or advocating for social justice (e.g., Banks, 2019; May & Sleeter, 2010; Nieto & Bode, 2018).

William, Faye, Helen, and Claudia included multicultural education in their classrooms by showing diversity, but they each incorporated it uniquely and with varying purposes. As addressed previously in the literature review, multicultural education has been simplified to learning about foods and festivities (May & Sleeter, 2010), and Nieto and Bode (2018) explained multicultural education in detail with their seven characteristics of multicultural education. All four participants primarily applied multicultural education in a partial format by integrating one or two characteristics. William, Faye, Helen, and Claudia all incorporated diverse images and examples in their classroom, but there were other multicultural education components that were not included by all the participants, such as advocating for social justice. For example, William shared there is a lack of women mathematicians, so he encourages and challenges his students to help change that inequity. William is putting the action on women instead of interrogating the mathematical field and encouraging his students to change the system.

One participant, Claudia, did engage her students by sharing and discussing examples of social change, but when her class studied other cultures she wanted to keep the content positive and narrowed the information to food, home life, architecture, and celebrations. William, Faye, Helen, and Claudia integrated one component of

multicultural education, *it is important for all students*, but none of the participants incorporated all aspects of multicultural education. Additionally, some elements of multicultural education were not addressed by any participants, including antiracist education or acting for social change.

Multicultural Education Perceptions and Incorporations Conclusions. As I defined in chapter one, multicultural education is a type of student-centered, cultural competency approach with the goal to maximize student achievement by focusing on learning and celebrating different backgrounds to promote tolerance and advocate for social justice. Though the exact definition varies by scholars and the participants in this study, the objective of multicultural education remains the same between experts – to examine and actively resist inequities (e.g., Banks, 2019; May & Sleeter, 2010; Nieto & Bode, 2018). William, Faye, Helen, and Claudia did not view or apply multicultural education as antiracist or to take action against injustices, but instead simplified it as exposing their students to other cultures. Providing a narrow version of multicultural education in the classroom is a perpetual problem as previous research has already found teachers struggle to understand all the characteristics of multicultural education. Based on the data in this dissertation, this problem persists.

Multicultural Education PLEs and Theory. The findings related to the PLEs described by William, Faye, Helen and Claudia are aligned with the literature on critical theory professional learning outcomes. As identified in chapter two, there are five characteristics or strategies used in successful critical theory PLEs: (1) differentiated training to address bias and racecraft, (2) dedicated time for critical self-reflection, (3)

high quality, continuous professional learning, (4) professional learning with a support system, and (5) guided classroom applications (e.g., Fields & Fields, 2014; Haynes, 2020; Wylie et al., 2009; Yoo, 2016). The impactful PLEs approaches noted by the participants within this dissertation had elements that were identified in previously research studies. For example, William shared about his experiences expanding his awareness of privilege, which lines up with the need to address bias and racecraft. Helen discussed the PLEs she found helpful included self-reflection, and Claudia described how the differentiated PLE she participated in had numerous positive impacts on her development. The participants noted there were other PLE methods that would have been helpful, such as Helen and Claudia wanting more classroom examples and Helen requesting a support system. These two participant suggestions, guided classroom examples and professional learning with a support system, have already been identified within the literature as impactful professional learning approaches. All five PLE approaches identified in chapter two are essential in developing individuals' understandings and applications of critical theory (e.g., Drago-Severson & Blum-DeStefano, 2017; Fields & Fields, 2014; Ladson-Billings, 2014). Of the successful characteristics of PLEs recommended within the literature, the participants were exposed to some of the methods, but none of the participants experienced all of them.

Multicultural Education PLEs. The properties of the meaningful PLEs shared by the participants of this study support previous research on impactful PLEs for multicultural education (e.g., differentiated training to address bias and racecraft). However, the schools and districts do not use these successful approaches. The

participants stated their school/district may focus on one impactful PLE method, but they were not getting the support they need to build their multicultural education proficiency. For example, Helen and Claudia both shared they wanted to learn more about multicultural education, but they did not know how to apply it in their curricula and none of their PLEs addressed it.

When reviewing the multicultural education practices described by the participants and comparing them to the seven characteristics of multicultural education (Nieto & Bode, 2018), there were numerous opportunities for each teacher to increase multicultural education into their classrooms. Even though the literature has already noted successful PLEs approaches (e.g., Fields & Fields, 2014; Howard & Navarro, 2016; Rice Doran, 2010) and multicultural education resources (e.g., Banks, 2019; May & Sleeter, 2010; Nieto & Bode, 2018) they are not being utilized, and the findings in this dissertation provides evidence that the participants require more. Using all five impactful PLEs strategies would expand and enrich educators' perspectives and applications of multicultural education. There is a demand for higher quality multicultural education PLEs and educators are not receiving the support they need.

Multicultural Education Conclusions. Based on the data and analysis in this dissertation, multicultural education is challenging, perceived differently, and partially applied. The multicultural education PLEs were limited and did not incorporate all five successful PLE approaches. Previous research has concluded that teachers limit multicultural education in the classroom, and these partial understandings are continuing with the participants in this study, making it an ongoing problem. Even though impactful

multicultural education PLEs strategies have been established in previous research studies, schools/districts are not implementing them. The findings in this dissertation indicate there are perpetual narrow understandings of multicultural education, and those challenges are not being addressed by using impactful PLE approaches.

Learning Technologies Data and Literature

Learning technology theories are out of date and do not support the advancement of educators' understandings and applications of technology in the classroom. Learning technology PLEs are not meeting the demands of current educators and need to be differentiated to appropriately support and enhance their learning technology skills and curriculum strategies.

Learning Technologies Perceptions, Incorporations, and Theory. William, Faye, Helen, and Claudia all accepted and believed in the importance of learning technologies and its impact on student achievement. The four participants utilized learning technologies throughout their curriculum and classroom practices with various software and physical devices. As addressed earlier in chapter two, educators who accept and believe learning technologies are essential are more likely to apply it (e.g., Bame et al., 1993; O'Dwyer, 2004). This literature aligns with the data in this dissertation as each participant stated they believe that technology serves a critical role in the curriculum, and they applied learning technologies throughout their classroom lessons and practices.

William, Faye, and Helen integrated learning technologies at all levels of Bloom's Digital Taxonomy (Sneed, 2016), while Claudia incorporated learning technologies at the lower-order thinking levels. The literature on learning technologies concluded that

teachers with positive learning technologies perspectives are more likely to incorporate learning technologies with the purpose of engagement and creation, and not just consumption (O'Dwyer, 2004; Ravitz et al., 2000). That was not what Claudia's students experienced as they interacted with learning technologies from a consumer role and not a creator role. Claudia, like all the participants, had a high level of technology proficiency (Christensen & Knezek, 2017), but she did not include learning technologies using higher-order thinking skills. There is a research need to explore the Technology Proficiency Self-Assessment Questionnaire for 21st Century Learning (TPSA C-21) by Christensen and Knezek (2017), because Claudia believed and accepted the importance of technology and had a high proficiency technology score, but she did not integrate learning technologies using higher-order thinking skills (Sneed, 2016). The participants' data supports the need for differentiated PLEs. For example, Claudia would benefit from learning curriculum strategies on creating lessons using higher-order thinking skills, whereas William would find advance software guidance more appropriate for his progress. Providing leveled PLEs based on the educators' current needs would expand and improve the impact learning technologies have on student development.

Learning Technologies Perceptions and Incorporations. According to learning technology research, teachers accepting and believing in the importance of learning technologies is a key component to integrating digital higher-order thinking skills in the classroom (e.g., O'Dwyer, 2004; Ravitz et al., 2000). Learning technologies are quickly evolving, and the data collected from this dissertation suggests there is a mismatch between Claudia's data and previous research on teachers' perceptions and incorporations

of learning technologies. Some more recent studies on learning technologies (e.g., Lee et al., 2020; Scherer et al., 2019) found preservice teachers already had positive beliefs and acceptance of learning technologies. The data in this dissertation, when compared with the literature, indicates though the scholars' conclusions were true at the time of their study, there is a need to reexamine teacher beliefs and update learning technology theory.

Learning Technologies PLEs and Theory. William, Faye, Helen, and Claudia stated they took self-initiation to develop their understandings of various learning technologies. William and Claudia shared their required learning technologies PLEs were not helpful as they provided beginner-level information, and William recommended that required PLEs should be differentiated. Within the learning technologies literature, scholars identified that teachers may experience challenges with accepting technology, teachers may struggle with digital competence, and teachers sometimes teach technology as an individual subject (e.g., Foulger et al., 2017; McGarr & McDonagh, 2019; O'Dwyer, 2004). The participants' data did not align with the literature as they accepted technology, were not challenged by digital competence, and integrated technology throughout their classroom. There has been numerous theories and models (e.g., TPACK, PICRAT, PEAT) created to increase the usage of learning technologies in the classroom (e.g., Koehler & Mishra, 2009; Ottenbreit-Leftwich & Kimmons, 2018; Scherer et al., 2019), but the participants in this dissertation did not struggle with their beliefs or competence with technology and did not need PLEs that addressed those areas. Although I found a need for differentiation in PLEs, previous literature has not explored this strategy as there was not any research found within the literature on learning technologies

PLEs that included differentiation or the role of self-initiation to develop learning technologies skills and strategies.

Learning Technologies Conclusions. Learning technology theories and PLEs require modernization. Current theories and frameworks around learning technologies need to be updated as technology and teachers' understandings of learning technologies evolve. As discussed in the literature review, teacher beliefs and acceptance that learning technologies can enhance student development were key to educators incorporating technology in the classroom, but all four participants believed in the importance of learning technologies and integrated throughout their curriculum. More recent studies have shown that preservice teachers are entering their education programs already believing learning technologies are essential. Since the concern is no longer about teacher beliefs, there is a need to focus on what is next for learning technology theory.

Learning technology PLEs must be leveled to meet the teachers' current needs so they can advance and grow in their learning technology skills and strategies. Educators should be provided differentiated PLEs on learning technologies, and there is a need to upgrade the literature on learning technology PLEs. Learning technology competency models and frameworks provide a starting point, specifically the International Society for Technology in Education (ISTE) as they continuously update their standards and include competency descriptions that support the goals of digital equity. As learning technologies alter and advance, the research and frameworks need to be reviewed and updated as well. Educators should be provided with various PLEs that help them progress with their

current perspectives and applications of learning technologies and grow as the educators' understandings develop.

Digital Equity Data and Literature

William, Faye, Helen, and Claudia perceived and applied digital equity as equal access to technology without equity-centered classroom practices and curriculum applications. According to digital equity scholars (e.g., Gronseth et al., 2020; Howard et al., 2018; Resta et al., 2018), digital equity must include both equal access to resources and equity-centered classroom components. The participants in this study defined digital equity as equal access to resources, so they partially viewed and incorporated it by including equal access to resources but not equity-centered classroom practices and curriculum applications.

Digital Equity Perceptions, Incorporations, and Theory. William, Faye, Helen, and Claudia all viewed digital equity as access. Their perception on digital equity aligns with the definition of the digital divide, not digital equity (e.g., Judge et al., 2004; Ravi, 2018). The digital divide is defined by Ravi (2018) as “a difference in access or participation via digital technologies experienced by two or more individuals or groups of people” (p. 201). As defined in chapter one, digital equity is an equity-centered approach that seeks to improve students' access to learning technologies, and advance classroom practices, curriculum applications, and teacher beliefs. The participants' definitions and applications of digital equity matched that of the digital divide as they focused on access to learning technologies, but none of the participants made any connections to equity-centered classroom practices or curriculum applications. This means there is a gap

between digital equity theory and digital equity practice, because within this dissertation, digital equity is not being perceived or applied as described by scholars.

Digital Equity Conclusions. William, Faye, Claudia, and Helen perceived and applied digital equity differently than how it is defined in the literature. All four participants did not incorporate equity-centered classroom practices or curriculum applications into their beliefs on digital equity. The literature on digital equity has argued it can advance student achievement, digital citizenship, workforce readiness, and personalized learning opportunities (e.g., Bevins et al., 2012; Gronseth et al., 2020; Howard et al., 2018). Despite the established need for digital equity in the classroom, there is limited empirical research on this topic so there are not any other educational studies to compare these findings to. The participants did view and apply equal access to resources, which is part of digital equity, but they do not include all the components of digital equity. I conclude these gaps could be addressed by PLEs or through the development of a new term that more clearly describes the equity-centered classroom practices and curriculum application of digital equity, such as digital equity pedagogy.

Multicultural Education and Learning Technology Intersection

The relationship between multicultural education and learning technologies were evaluated during this dissertation. The dynamic between multicultural education and learning technologies was difficult for the participants to understand and there was little multicultural education found incorporated into the learning technology software. There was no direct evidence discovered that learning technologies and multicultural education intersected to support digital equity. However, there was evidence that digital equity was

emerging as William and Faye made some connections between the two, and all four participants had at least one lesson where multicultural education and learning technologies were integrated together.

Relationships Between Multicultural Education, Learning Technologies, and Digital Equity and Theory. In this dissertation the participants perceived the relationship between multicultural education and learning technologies differently. Helen and Claudia saw them as separate classroom components, but William and Faye believed they are connected. All the participants did incorporate both multicultural education and learning technologies together, but it was not intentional or well balanced between the two (e.g., higher-order digital thinking skills with few multicultural education characteristics). No prior research has studied how educators view and apply the connections between multicultural education, learning technologies, and digital equity. This dissertation contributes to the literature by exploring how educators understand and engage with multicultural education and learning technologies in their classrooms. I have concluded, based on the findings, that the participants in this study are challenged by the relationships between multicultural education and learning technologies. They do incorporate them together, but not intentionally, and not with the purpose of supporting digital equity.

William, Faye, and Claudia found the connections between multicultural education and learning technologies to be difficult. Research studies on critical theories also concluded teachers struggle to understand and apply cultural competency approaches into the classroom (e.g., Matias & Mackey, 2016; Philip, 2014; Tatum, 1992), and there

are numerous PLEs methods that have been found to help teachers build a critical mindset and classroom (e.g., Bustos Flores et al., 2018; Jacob et al., 1996; Lin et al., 2008). William, Faye, Helen, and Claudia have completed some of these effective PLEs, but not all of them. It is important to note that engaging in impactful PLEs includes individualized opportunities as each educator has a different background, with different student demographics, and teaching different content areas. Experiencing all five impactful PLEs strategies that are personalized based on each educator's needs would help build the connections between multicultural education and learning technologies, and there is a demand for PLEs, so educators are provided the support they need.

Learning Technology Multicultural Education Checklist. The Checklist for Evaluating Informational Materials (Banks, 2019) is a list of questions with the purpose to evaluate the level of multicultural education within the materials. Each participant identified at least one learning technology that would integrate multicultural education. I evaluated the four learning technologies using the checklist and found they each had hardly at all any multicultural education (Banks, 2019). The checklist is a method to evaluate multicultural education in a curriculum, but it was designed to review classroom materials and not specifically for learning technologies. Though the checklist was not created to review learning technologies, all the learning technologies I reviewed had the potential to incorporate all the multicultural education criteria from the checklist. Though there was evidence that the learning technologies had some integration of multicultural education – overall, there was not any learning technology software designed to support multicultural education or digital equity. I believe this finding to be significant as it

means multicultural education is being omitted by the software that is being leveraged in the classroom. The participants in this dissertation shared they utilized learning technologies throughout their lessons, and if the software they are using is not incorporating multicultural education, then it will be missing from the curriculum as well. This dissertation only reviewed a few lessons but based on the minimal integration of multicultural education found, could indicate a larger problem that many learning technologies are not incorporating multicultural education in their prepared lessons or programs.

Multicultural Education and Learning Technology Intersection Conclusions.

The relationship between multicultural education and learning technologies is challenging and unclear. William, Faye, Helen, and Claudia had inconsistent viewpoints on the intersection of multicultural education and learning technologies. When identifying how multicultural education and learning technologies intersect in support of digital equity, all the participants' responses were similar. William, Faye, Helen, and Claudia did not view or apply multicultural education and learning technologies in support of digital equity. When reviewing the integration of multicultural education in the learning technology software there was hardly at all any found, and the learning technology software did not include components of digital equity. The four educators in this dissertation, and the software they selected for review, did not intersect multicultural education and learning technologies to support digital equity. Although the participants in this study are not representative of all teachers, it is possible that a lack of overlap of multicultural education and learning technologies are typical of U.S. classrooms today.

Research Questions

This dissertation investigated teachers' perceptions and applications of digital equity with three research questions. The first research question asked, "How do educators perceive multicultural education, learning technologies, and digital equity in education?" I identified that educators perceive multicultural education individually and learning technologies and digital equity similarly. The participants all believed multicultural education is learning about different cultures through diverse images or examples within their curriculum, but their exact definitions were different. William, Faye, Helen, and Claudia viewed learning technologies as essential curriculum tools that enhance student development and defined digital equity as equal access to resources.

"How do educators incorporate multicultural education, learning technologies, and digital equity into the classroom?" was the second research question. William, Faye, Helen, and Claudia integrated multicultural education uniquely and incorporated learning technologies and digital equity using similar strategies. The participants all incorporated multicultural education through presenting diverse images or examples within their curriculum, but their methods and strategies on multicultural education were individually applied. William, Faye, Helen, and Claudia integrated learning technologies throughout the curriculum, and digital equity was incorporated by providing equal access to resources.

The third research question asked, "How do learning technologies and multicultural education intersect to support digital equity?". William, Faye, Helen, and Claudia did not intersect multicultural education and learning technologies to support

digital equity. There was no evidence found in any of the data that the participants viewed or applied multicultural education and learning technologies together to execute digital equity.

Implications for Teacher Education

There were not any empirical studies found that investigated multicultural education, learning technologies, and digital equity in the classroom, and the purpose of this dissertation was to explore teachers' perceptions and applications on learning technologies and multicultural education. The data and findings of this dissertation has numerous implications for education and the literature on multicultural education, learning technologies, and digital equity.

There are advances that can be made within multicultural education, learning technologies, and digital equity, including professional learning experiences (PLEs) and preservice education programs. The primary point of confusion demonstrated by the participants was understanding and applying multicultural education and digital equity. Both fall under the umbrella of critical theory, and there are professional learning methods and strategies found to be impactful that are not being utilized by school districts or educators. As addressed previously in the literature review, there are five themes on successful critical theory PLEs: (1) differentiated training to address bias and racecraft, (2) dedicated time for critical self-reflection, (3) high quality, continuous professional learning, (4) professional learning with a support system, and (5) guided classroom applications. These should all be leveraged together by districts, schools, and teachers, so

educators can grow in their understandings of multicultural education and digital equity and integrate them effectively into their classrooms.

Another area PLEs and preservice education programs could improve their impact is through tiered, modernized PLEs on learning technologies. William suggested differentiated professional learning so teachers can grow and develop based on their skill sets, and as I shared in chapter two, previous research has found that many preservice teachers are already entering their teacher education programs with positive attitudes on learning technologies. PLEs and preservice education programs should evaluate each person's current level of comfort and understanding of learning technologies, and then provide them with appropriate educational opportunities that both challenge and excel their understandings and applications of learning technologies.

Digital equity was challenging for the participants to describe and there was an imbalance between multicultural education and learning technologies within the participants' lessons. There were potential opportunities for all four participants to increase their integration of multicultural education and learning technologies and individualized PLEs could support those developments. Educators need to have personalized PLEs as they each have different backgrounds, content areas, and student demographics.

Future Research

This dissertation only began to explore digital equity by studying educators' perceptions and applications of learning technologies, multicultural education, and digital equity, and there are many different opportunities for future research on these topics. This

dissertation selected participants with a high technology proficiency, and future research could include looking at how educators with high technology proficiency and high multicultural education competence implement digital equity in their classroom. Another study could replicate the methods in this dissertation but increase the sample size as I included only four participants. All four teachers identified as White and partially implemented multicultural education, so future research could study, using Critical Whiteness theories, why these teachers had a narrow view of multicultural education. William, Faye, Helen, and Claudia all had multicultural education PLEs, but none of them participated in all five of the impactful approaches. An additional research study could analyze the outcomes of multicultural education perceptions and applications after completing all five successful critical theory PLEs. Claudia believed in the importance of technology and has a high technology proficiency score but did not incorporate learning technologies using higher-order thinking skills. Future research could investigate the Technology Proficiency Self-Assessment Questionnaire for 21st Century Learning (TPSA C-21; Christensen & Knezek, 2017) and see if any improvements could be made to the questionnaire so it may evaluate teachers' technology proficiency more accurately.

There is potential for growth within the current literature on multicultural education and digital equity. Banks' (2019) Checklist for Evaluating Informational Materials provides educators with an excellent resource to evaluate their classroom materials, but there could be a specific checklist developed to evaluate multicultural education and learning technologies. A future study could conduct an affordance analysis to measure the level of multicultural education in different learning technologies. The

participants in this study partially understood digital equity as equal access to resources, which indicates there is a need to take a closer look at digital equity theory and the misconceptions of it. There may be a need for PLEs or a need to redefine digital equity and develop a new term to describe equity-centered classroom practices and curriculum applications.

There are several frameworks that help teachers accept and incorporate learning technologies within teachers' curriculums, but the evidence within this dissertation shows there is a need for a more modernized framework to help teachers advance in their technology skills and understand how to integrate learning technologies with equity-centered curriculum applications. Digital equity is more than equal access to digital resources, and there is a need to evaluate what current learning technology theory should look like and what can be done to take technology to the next step in education. A future research study could update these frameworks to support educators' learning technology understandings and integrations more appropriately.

The four learning technologies analyzed had very little multicultural education integration. This limited multicultural education integration could indicate a larger problem with the learning technology software. Future research could investigate the gaps within the learning technology software, including the biases of the learning technologies themselves, the level of integration of equity-centered curriculum applications, and what actions may be required by teachers to supplement those deficiencies found in the learning technologies.

Limitations

There were numerous limitations within this dissertation. The sample size was small with only four participants and the findings cannot be generalized. The analysis was based on the data collected, which was not completely comprehensive. Only one multicultural education, learning technology lesson was analyzed within this dissertation, but not the entire curriculum, so there could have been additional multicultural education components that were not captured during the data collection. Due to the COVID-19 pandemic, classroom observations were not conducted and instead were replaced with interview questions and reviewing learning technologies, thus reducing the amount of data collected to capture a holistic understanding of each participant's classroom.

William, Faye, Helen, and Claudia identify as White, but the methodology of the study did not leverage a type of critical theory called Critical Whiteness. A Critical Whiteness lens was not used to analyze the data, thus potentially restricting the depth of the findings.

Another limitation was using Banks' (2019) Checklist for Evaluating Informational Materials. Banks' (2019) checklist was not designed specifically to be used for learning technologies. Since this checklist was not created for assessing learning technologies, there may be gaps within the data collected or the analysis. Banks' (2019) checklist descriptions was also less inclusive than Nieto and Bode's (2018) characteristics descriptions. Nieto and Bode (2018) focused on all people, specifically including "ethnic, racial, linguistic, religious, economic, gender, and sexual orientation, among others" (p.32), whereas Banks focused on "racial, ethnic, and cultural

groups...social class, regional, ideology, and language diversity within ethnic groups” (p. 158). Since Banks’ (2019) checklist was more exclusive than others, this could potentially change the overall scores.

Conclusions

The presence of technology in the classroom will continue to grow and evolve, and it is essential for educators to understand the depth learning technologies influence students’ experiences in the classroom. Digital equity will ensure students have access to both resources and high-quality instruction, so they can advance and develop 21st century skills. I identified seven major findings during my analysis of the interview and learning technologies data. These major findings indicate digital equity is emerging and there is a need for modernizing and improving PLEs as the participants were not getting the information and support that would help them transform their knowledge and skills in multicultural education, learning technologies, and digital equity. William, Faye, Helen, and Claudia were passionate about education and dedicated to their students. They each were actively addressing the digital divide in their classrooms, but they had an incomplete understanding of digital equity and did not intentionally incorporate it when building and executing their curriculums. The participants in this study partially understood and applied multicultural education and were provided minimal successful PLEs to build their knowledge of multicultural education. The goal of this dissertation was to begin to explore how teachers are perceiving and applying multicultural education, learning technologies, and digital equity in education, and I found that educators were viewing them individually with minimal relationships between each

other. Understanding digital equity is challenging, and PLEs are the key to advancing educators' knowledge of multicultural education, learning technologies, and digital equity. There are many future research opportunities that could explore digital equity more deeply and contribute to the fields of critical theory, multicultural education, learning technologies, and digital equity.

Appendix A

IRB Approval



Office of Research Integrity and Assurance

Research Hall, 4400 University Drive, MS 6D5, Fairfax, Virginia 22030
Phone: 703-993-5445; Fax: 703-993-9590

DATE: February 21, 2022

TO: Nancy Holincheck
FROM: George Mason University IRB

Project Title: [1866087-1] Educators' Perspectives and Applications in Digital Equity

SUBMISSION TYPE: New Project

ACTION: APPROVED
APPROVAL DATE: February 21, 2022
REVIEW TYPE: Expedited Review

REVIEW TYPE: Expedited review category #7

Thank you for your submission of New Project materials for this project. The George Mason University IRB has APPROVED your submission. This submission has received Expedited Review based on applicable federal regulations.

You are required to follow the George Mason University Covid-19 research continuity of operations guidance. You may not begin or resume any face-to-face interactions with human subjects until (i) Mason has generally authorized the types of activities you will conduct, or (ii) you have received advance written authorization to do so from Mason's Research Review Committee. In all cases, all safeguards for face-to-face contact that are required by Mason's COVID policies and procedures must be followed.

Please remember that all research must be conducted as described in the submitted materials.

Please remember that informed consent is a process beginning with a description of the project and insurance of participant understanding followed by a signed consent form unless the IRB has waived the requirement for a signature on the consent form or has waived the requirement for a consent process. Informed consent must continue throughout the project via a dialogue between the researcher and research participant. Federal regulations require that each participant receives a copy of the consent document.

Please note that any revision to previously approved materials must be approved by the IRB prior to initiation. Please use the appropriate revision forms for this procedure.

All UNANTICIPATED PROBLEMS involving risks to subjects or others and SERIOUS and UNEXPECTED adverse events must be reported promptly to the IRB office. Please use the appropriate reporting forms for this procedure. All FDA and sponsor reporting requirements should also be followed (if applicable).

All NON-COMPLIANCE issues or COMPLAINTS regarding this project must be reported promptly to the IRB.

This study does not have an expiration date but you will receive an annual reminder regarding future requirements.

Please note that all research records must be retained for a minimum of five years, or as described in your submission, after the completion of the project.

Please note that department or other approvals may be required to conduct your research in addition to IRB approval.

If you have any questions, please contact Kim Paul at (703) 993-4208 or kpaul4@gmu.edu. Please include your project title and reference number in all correspondence with this committee.

GMU IRB Standard Operating Procedures can be found here: <https://oria.gmu.edu/topics-of-interest/human-subjects/>

This letter has been electronically signed in accordance with all applicable regulations, and a copy is retained within George Mason University IRB's records.

Appendix B

Demographic Questions

These questions were designed as a text entry, so they could provide any response they felt best answered the questions.

1. In what state and school district do you teach?
2. What grade level(s) do you teach?
3. What subject areas do you teach?
4. What is your highest level of education?
5. How many years have you been teaching?
6. Race and/or Ethnicity
7. Gender

Appendix C

Technology Proficiency Self-assessment Questions (TPSA C-21; Christensen & Knezek, 2017)

I feel confident I could... (participants were given five options to select: strongly agree, somewhat agree, neither agree nor disagree, somewhat disagree, strongly disagree).

1. . . . send e-mail to a friend.
2. . . . subscribe to a discussion list.
3. . . . create a distribution list" to send e-mail to several people at once.
4. send a document as an attachment to an e-mail message.
5. keep copies of outgoing messages that I send to others.
6. use an Internet search engine (e.g., Google) to find Web pages related to my subject matter interests.
7. . . . search for and find the Smithsonian Institution Web site.
8. . . . create my own web page.
9. . . . keep track of Web sites I have visited so that I can return to them later. (An example is using bookmarks.)
10. . . .find primary sources of information on the Internet that I can use in my teaching.
11. . . . use a spreadsheet to create a bar graph of the proportions of the different colors of M&Ms in a bag.
12. . . . create a newsletter with graphics.

13. . . . save documents in formats so that others can read them if they have different word processing programs (e.g., saving Word, pdf, RTF, or text).
14. . . . use the computer to create a slideshow presentation.
15. . . . create a database of information about important authors in a subject-matter field.
16. . . . write an essay describing how I would use technology in my classroom.
17. . . . create a lesson or unit that incorporates subject matter software as an integral part.
18. . . . use technology to collaborate with teachers or students, who are distant from my classroom.
19. . . . describe 5 software programs or apps that I would use in my teaching.
20. . . . write a plan with a budget to buy technology for my classroom.
21. . . . integrate mobile technologies into my curriculum.
22. . . . use social media tools for instruction in the classroom. (e.g., Facebook, Twitter, etc.)
23. . . . create a wiki or blog to have my students collaborate.
24. . . . use online tools to teach my students from a distance.
25. . . . teach in a one-to-one environment in which the students have their own device.
26. . . . find a way to use a smartphone in my classroom for student responses.
27. . . . use mobile devices to connect to others for my professional development.
28. . . . use mobile devices to have my students access learning activities.
29. . . . download and listen to podcasts/audio books.
30. . . . download and read e-books.
31. . . . download and view streaming movies/video clips.

32. . . . send and receive text messages.
33. . . . transfer photos or other data via a smartphone.
34. . . . save and retrieve files in a cloud-based environment.

Appendix D

Interview 1 Questions

1. Please share a bit of why you decided to go into education.
 2. What do you understand are the key characteristics that all classrooms must incorporate in order for students to succeed?
 3. How would you define multicultural education?
 4. How do you incorporate multicultural education into your classroom/interactions with students?
 5. Please describe a typical day on how you use multicultural education in your classroom.
 6. Please describe what professional learning experiences you've had on multicultural education either at your school or on your own. How have you felt during your multicultural education training?
 7. What questions have arisen for you over time about multicultural education specifically in education?
 8. Where would you go if you wanted to learn more about multicultural education?
 9. How would you define learning technologies?
 10. How do you incorporate learning technologies into your classroom/interactions with students?
- *Ask for specific examples on the name of the technology and how it is used.

11. Please describe a typical day on how you use learning technologies in your classroom.
12. Please describe what professional learning experiences you've had on learning technologies either at your school or on your own. How have you felt during your learning technologies training?
13. What questions have arisen for you over time about learning technology specifically in education?
14. Where would you go if you wanted to learn more about learning technologies?
15. How are multicultural education and learning technologies similar to you?
16. How are multicultural education and learning technologies different to you?
17. What do you think of when you hear the term digital equity?
18. How do you see digital equity in your classroom?
19. What are some learning technologies you use in your classroom?
20. When are you available for interview two?

*At the next interview, could you please be prepared to talk about your most favorite multicultural educational, learning technology lesson? I will ask questions about the lesson and the outcomes.

Appendix E

Interview 2 Questions

1. Is there anything you have thought about or wondered about since our last conversation?
2. Please describe your favorite multicultural educational, learning technology lesson?
3. What were the learning outcomes for this lesson?
4. What were the student outcomes for this lesson?
5. What did you like about this lesson?
6. What did you dislike about this lesson?
7. What would you change if you were to do this lesson again?
8. Why did you identify this lesson as your favorite multicultural educational, learning technology lesson?
9. What features would you like to see added to the [selected learning technology]?
10. What features would you like to see removed or modified from the [selected learning technology]?
11. What changes [to the selected learning technology] do you think would enhance student learning? How would those changes enhance student learning?
12. How does [this learning technology] impact your planning or classroom time?
13. How is [this learning technology] accessible to all students?

14. Is there anything else you would like to share about multicultural education, learning technologies, or digital equity?

Appendix F

Checklist for Evaluating Informational Materials (Banks, 2019, pp. 158-159)

Rating starts with hardly at all (a score of 1) to extensively (a score of 6)

Criteria Questions

1. Includes a range of racial, ethnic, and cultural groups that reflects the diversity within U.S. life and society.
2. Describes the wide range of diversity that exists within racial, ethnic, and cultural groups (for example, social class, regional, ideology, and language diversity within ethnic groups).
3. Describes the roles, experiences, challenges, and contributions of women within various racial and ethnic groups.
4. Helps students to view American history and society from the perspectives of women within various racial and ethnic groups, such as African American women who played major roles in the civil rights movement but who are often not given much visibility compared to men in the movement (e.g., Ella Baker, Jo Ann Gibson Robinson, and Fannie Lou Hammer).
5. Describes the range of dialects and languages within U.S. society, the problems of language and minority groups, and the contributions that diverse languages make to U.S. society.


6. Integrates the histories and experiences of racial and ethnic groups into the mainstream story of the development of America rather than isolating them in special sections, boxes, and features.
7. Challenges the concepts of American exceptionalism and Manifest Destiny and helps students to develop new views of the development of the United States.
8. Helps students to view the historical development of the United States from the perspectives of groups that have been victimized in American history, such as Native Americans, Mexican Americans, African Americans, and lower socioeconomic groups, and from the perspectives of groups that have been advantaged in America, such as Anglo-Saxon Protestants and higher-income groups.
9. Uses primary resources to document and describe the experiences of racial, ethnic, and cultural groups in the United States.
10. Helps students to understand the powerful role of social class in U.S. society and the extent at which class is still a significant factor in determining the life chances of U.S. citizens.
11. Helps students to understand the extent to which acculturation within U.S. society is a two-way process and the ways in which majority groups have incorporated (and sometimes appropriated) aspects of the cultures of ethnic groups of color and the extent to which ethnic groups of color have adapted and incorporated mainstream culture into their ways of life.

12. Helps students understand the extent to which the American dream of equality for all citizens is still incomplete and the role that students need to play to help close the gap between American democratic ideals and realities.
13. The mathematics and science materials help students to understand the ways in which the assumptions, perspectives, and problems within these fields are often influenced by culture.
14. The mathematics and science materials describe the ways in which these disciplines influence the knowledge that is constructed about racial, ethnic, cultural, and gender groups.
15. The mathematics and science materials help students understand the ways in which people from a variety of cultures and groups have contributed to the development of scientific and mathematical knowledge.
16. Acquaints students with key concepts that are essential for understanding the history and cultures of racial, ethnic, and cultural groups in the United States, such as prejudice, discrimination, institutionalized racism, institutionalized sexism, and social-class stratification.
17. Acquaints students with key historical and cultural events that are essential for understanding the experiences of racial and ethnic groups in the United States, such as the Harlem Renaissance, the Middle Passage, the internment of Japanese Americans, the Treaty of Guadalupe Hidalgo, and the Trail of Tears.

Appendix G

Recruitment Advertisement


Digital Equity Research Study



Seeking Educators Who Love Technology

Researchers at George Mason University are recruiting current K-12 educators who use technology in their classroom. The purpose is to better understand educators' perspectives and applications of learning technologies and multicultural education. Participants will be compensated with a \$100 Amazon gift card for completing a survey and two interviews (3.25 total hours).

Select this [link](#) or use the QR code to access the survey



Questions?
Email Laura Godlewski at [REDACTED]

George Mason University's Office of Institutional Review Board can be reached at irb@gmu.edu if you have questions or comments regarding your rights as a participant in the research.
IRB Number 1866087-1

Appendix H

Recruitment Interest Email

Greetings,

Hello! My name is Laura Godlewski and I am currently a doctoral candidate in education at GMU. I am conducting my dissertation to better understand educators' perspectives and applications on learning technologies and multicultural education, and I will be giving out an Amazon \$100 gift card to those who participate in both a survey and two interviews (for a total of about 3.25 hours), which will be audio and video-recorded via Zoom.

If you are interested please go to the link below, read the consent form and determine if you are willing to participate in the study that accompanies this project. Please complete this information within the next 7 days.

This research (IRBnet Project# 1866087-1) is being conducted by Laura Godlewski-Faltynski ([REDACTED]) and Dr. Nancy Holincheck ([REDACTED]) in the College of Education and Human Development at George Mason University. They may be reached at the above email addresses or phone number for questions about the research.

<INSERT LINK TO ONLINE CONSENT FORM>

Thank you,
Laura Godlewski-Faltynski & Dr. Nancy Holincheck

IRBnet Project# 1866087-1

Appendix I

Consent Form

Educators' Perspectives and Applications in Digital Equity
IRB Number 1866087-1
Informed Consent Form

RESEARCH PROCEDURES

This research is being conducted to explore educators' understanding and applications of learning technologies and multicultural education. If you agree to participate, you will be asked to complete a survey and two interviews, which will be audio and video-recorded via Zoom. The survey should take about 15 minutes, Interview 1 should take about 90 minutes, and Interview 2 should take about 90 minutes, for a total of 3.25 hours.

RISKS

There are no foreseeable risks for participating in this research.

BENEFITS

There are no direct benefits to you as participants, but you will contribute to our understanding of technology and multicultural education.

CONFIDENTIALITY

The data in this study will be confidential. All data will be collected through an online survey tool (Qualtrics) and audio recorded interviews. All names will be removed from interviews; a pseudonym will be placed on the transcripts from your interviews. Only the researchers on this project will have access to the research files and identification key that will link the audio tapes and the transcripts. All data will be retained in password protected, secure files on the researchers' computers. Any hard copies of these files will be held in the PI's locked files and office on the Mason campus. In addition, the audio recordings will be deleted after transcription and the transcripts will be retained for a minimum of 5 years after study closure. De-identified data will be stored indefinitely. While it is understood that no computer transmission can be perfectly secure, reasonable efforts will be made to protect the confidentiality of your transmission.

You may review Qualtrics' website for information about their privacy statement. <https://www.qualtrics.com/privacy-statement/>

You may review Zoom's website for information about their privacy statement. <https://zoom.us/privacy>.

The Institutional Review Board (IRB) committee that monitors research on human subjects may inspect study records during internal auditing procedures and are required to keep all information confidential. Identifiers may be removed from the data and the de-identified data could be used for future research without additional consent from participants.

PARTICIPATION

Participants must be current educators. Your participation is voluntary, and you may withdraw from the study at any time and for any reason. If you decide not to participate or if you withdraw from the study, there is no penalty. There are no costs to you or any other party. Educators who complete the survey and interviews will be provided with a \$100 Amazon gift card. Under the U.S. federal tax law you may have individual responsibilities for disclosing the dollar value of the incentive received on this study.

CONTACT

This research is being conducted by Laura Godlewski-Faltynski () and Dr. Nancy Holincheck () in the College of Education and Human Development at George Mason University. They may be reached at the above emails/numbers for questions or to report a research-related problem. You may contact the George Mason University Office of Institutional Review Board office at 703-993-4121 or irb@gmu.edu if you have questions or comments regarding your rights as a participant in the research.

This research has been reviewed according to George Mason University procedures governing your participation in this research.

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This research has been reviewed according to George Mason University procedures governing your participation in this research.

CONSENT

I have read this form, all of my questions have been answered by the research staff, and I agree to participate in this study

The George Mason University Institutional Review Board has waived the requirement for a written signature on this consent form. Your name and email serves as your signature.

I agree to participate and consent for my interview to be audio- and video-recorded.

I do not consent for my interview to be audio- and video-recorded.

Please type your name and email in the boxes below and click "Submit".

Name

Email

(Date of Signature will be collected electronically)

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Biography

Laura L. Godlewski-Faltynski graduated from Memorial High School, Eau Claire, Wisconsin, in 2002. She received her Bachelor of Arts in History from the University of Wisconsin-Madison in 2006, and her Master of Science in Curriculum and Instruction from the University of Wisconsin-Milwaukee in 2011. Prior to her doctoral studies, Laura worked as a classroom teacher and adult learning, technology initiative lead at Chapel Hill-Carrboro City Schools. Laura was recognized as the 2012-2013 Teacher of the Year for her school, and currently she works as an instructional designer.