Diversity in the Digital Age: Integrating Pedagogy and Technology for Equity And Inclusion

Kathryn de Groof Kaiser, Teachers College, Columbia University, US

ABSTRACT

This study explores the perceptions of how and why teachers might integrate technology to support their goals of equity and inclusion with a group of teachers who identify as culturally responsive in their pedagogy and describe themselves as fluent in the use of technology in school. Teachers working with students of diverse backgrounds were chosen purposively using an "extreme case sampling" method in order to interview experienced and pedagogically aligned participants. Drawing on in-depth interviews, a review of class artifacts and documents, and a focus group, this study provides critical insights into how self-identified culturally relevant teachers use technology. Discussion of the findings focused on how the unique affordances of technology lend themselves as a critical resource for teachers engaged in culturally responsive pedagogy. Participants provided evidence that technology can be an active dimension of their work toward equity and inclusion. Thus, this research expands upon existing literature on pedagogical practice in both technology in education and diverse classrooms.

INTRODUCTION

Contemporary demographics of teachers and students in the United States are rapidly changing as the United States becomes increasingly diverse. Our census shows a growing non-White population, with White students enrolled in public schools decreasing in number (from 25.0 million to a projected 23.5 million between Fall 2014 and Fall 2025) and expected to account for 46% of total enrollment in 2025 (National Center for Educational Statistics [NCES], 2016). While U.S. classrooms are becoming increasingly diverse, this diversity is not reflected in the teachers (Albert Shanker Institute, 2015; Boser, 2011; Carter & Welner, 2013; Villegas & Irvine, 2010). The rapidly changing demographics in American classrooms necessitate critical attention and awareness of the diverse needs of students from wide-ranging cultural backgrounds. In an effort to understand and change how culture and race interact in the educational system, scholars have written about the relationship or connection between and among race, racism, and power in critical race theory (Chapman, 2008; Dixson & Rousseau, 2006; Howard, 2008; Ladson-Billings & Tate, 1995; Lynn, 2004; Lynn & Parker, 2006; Milner, 2008; Paris, 2017). In order to develop critical thinking and problem-solving skills in heterogeneous learning communities, teachers need to be aware of diverse student needs and strategies for authentic technology integration. Not enough is known about the deliberate choices teachers might make to pursue equity and inclusion within their classrooms regarding the use of technology. Integrating

learners from varying socio-economic and ethnic backgrounds is essential for preparing students for a more global society where skills in critical thinking and problem solving are necessary (Wells et al., 2016). Technology has the potential to play an important role when used as thinking tools in collaborative groups in the pursuit of these 21st century skills. Technology is a powerful tool for learning in classrooms, but not enough is known about how well-intentioned teachers leverage these tools to support their efforts to achieve equity and inclusion in diverse classrooms. Teachers need tools and practices that help them create inclusive and equitable learning communities where children of diverse backgrounds can collaborate and communicate effectively.

This study explored the perceptions of how and why teachers might integrate technology to support their goals of equity and inclusion with a group of teachers who identify as culturally responsive in their pedagogy and describe themselves as fluent in the use of technology in school. Teachers were selected to participate because they self-identified as valuing equity and inclusion in their classes and also considered themselves to be technologically proficient.

Educators purpose tools to reflect beliefs (Fullan, 2013). Fullan tells us, "Teachers in small groups become leaders, designers, and active guides to learning" (p. 47). It was anticipated that participant teachers would evaluate, modify, and adapt what is given or available to them in ways that support their existing pedagogy. Tools are used to consciously or unconsciously reflect beliefs about teaching. Fullan argues that the future compels us to integrate technology, pedagogy and change knowledge. This research further suggests that equity is also an essential component of this integration. To integrate a pedagogy that ignores the needs of many students would further widen the achievement gap and contribute to students' feelings of exclusion.

This study sought to identify specific uses for technology integration to potentially support equity and inclusion in diverse classrooms from the perspective of teachers who feel they practice culturally responsive pedagogy. By beginning with pedagogy, the researcher sought to learn more about the deliberate choices pedagogically aligned teachers make when integrating technology while pursuing equity and inclusion within their classrooms. This research adds to the body of knowledge on teacher perspectives on using technology to develop inclusive and equitable learning communities for students of diverse backgrounds. Improved

awareness of the effective approaches to integrating ICT in the classroom can be achieved by this examination of the perspective of Culturally Relevant Pedagogy (CRP) teachers skilled at using technology. The researcher encourages a pro-active, culturally responsive approach to educational technology and advances the ideal that digital-age educators should be proficient in making decisions about technology integration guided by an understanding of CRP.

Improvement in educational outcomes for low-income Black and Latino students in the U.S. is imperative. This study has the potential to offer an important contribution toward this national goal. Teachers with experience, knowledge, and a commitment to achieving equity and inclusion in their classrooms are an important voice in this effort.

BACKGROUND

Educational technology

An important development in education is the potential for Information Communication Technology (ICT) to provide powerful learning experiences for students (Rienties et al., 2009). Originally the term "digital divide" was coined to describe the inequitable access to hardware and software (Hargittai & Walejko, 2008; Warschauer & Matuchniak, 2010). Though increased access to hardware and software has improved in most communities, the proliferation of technology both in and out of schools may have, in fact, widened the "digital divide" (Dimaggio et al., 2001; Van Dijk, 2005; Warschauer, 2003). Warschauer explains that the way in which our students use technology is often divided by socio-economic differences. The current use of educational technology in communities is substantively different and, therefore, inequitable (Reich & Ito, 2017). Inequitable schools also practice inequitable technology integration. Institutionalized and unconscious bias are broader social forces preventing meaningful integration of technology in diverse schools (Reich & Ito, 2017). Integrating educational technology approaches in classrooms has been demonstrated to support problem-solving, analyzing and other higher order thinking skills and have more positive effects than digital learning that supports basic developmental skills such as memorizing facts and applying rules (Buckner & Kim, 2013; Ruggiero, 2015).

Boss (2011) states, "Today's learning landscape includes an almost dizzying array of tools, from inexpensive personal computers and handheld devices to interactive whiteboards, digital video cameras, and a constantly expanding suite of Web 2.0 tools" (para 5). In November

of 2009, President Obama "launched the Educate to Innovate campaign to improve the participation and performance of all U.S. students, including underrepresented groups such as girls and women, in science, technology, engineering, and mathematics (STEM)" (Gray, Thomas, & Lewis, 2010, p. 13), in part to address persistent disparities between technology-rich schools and those that have limited access to outdated equipment. Integrating educational technology approaches in classrooms has been demonstrated to support problem solving, analysis, and other higher-order thinking skills and to have greater positive effects than digital learning that supports basic developmental skills, such as memorizing facts and applying rules (Buckner & Kim, 2013; Ruggiero, 2015). As Web 2.0 tools evolve, teachers and students are transitioning from consumers to creators of online content and knowledge more generally (Scardamalia & Bereiter, 2014). Although schools have been slow to bring social media into the classroom, many students are using digital tools on their own to create and publish content, connect with acquaintances, and pursue their own interests (Boss, 2011).

These digital tools and evolving social media platforms have exponentially expanded opportunities for integrating technology into teaching. Digital tools have been shown to increase individual learning outcomes and foster communication and collaboration among students (Buckner & Kim, 2013; Ruggiero, 2015). Cennamo et al. (2014) provide a summary of digital tools utilized in classrooms, including the current, widely used platform Google Classroom, which permits collaboration between and among students and teachers and others. "Learning happens when people are active and technology simply allows us to provide more of those opportunities … as soon as you give students control over their own education, it's terribly empowering" (p. 84). Previously, the term Web 2.0 tools stood for social networking, allowing people to quickly "post text, images, videos, and other media, which their users can then comment on or add content to" (p. 9). Now cell phone and tablet apps are common and frequent Web 2.0 tools and vary from providing learning through technology-based tutorials to games, including Khan Academy, Edx, Quizlet, TED, and iTunes U. Databases, mind and concept maps, Wordles, simulations and animations, website design, digital storytelling, and Web conferencing are additional digital tools frequently used in classrooms. Social-media platforms currently used in classrooms include Facebook, Instagram, Pinterest, Twitter, Youtube, and Weblogs. Social-media learning has led to mobile learning (mLearning), which is the "latest frontier in terms of leveraging information to support teaching and learning. Students can access

and create information, whether in or out of class with small portable devices that may utilize web browsers or education-specific apps on the go" (p. 9).

President Obama addressed Congress on February 24, 2009, asserting, "Technology itself is an important driver of change. Technology can enable transforming education but only if we commit to the change that it will bring to our education system" (as cited in U.S. Department of Education [USDOE], 2010, p. 4). One year later, the U.S. Department of Education's Office of Educational Technology's NETP was released with a vision for leveraging the learning sciences and modern technology to create engaging, relevant, and personalized learning experiences for all learners that mirror students' daily lives and the reality of their futures. In contrast to traditional classroom instruction, this requires that students are put at the center of the learning process and empower them to take control of their own learning by providing flexibility on several dimensions (USDOE, 2010, p. x).

When integrating technology in classrooms, there can be an imbalance between the technological, pedagogical, and content knowledge of a teacher, sometimes determined by training available at individual institutions (Lawless & Pellegrino, 2007; Rienties & Townsend, 2012). Learning to effectively integrate technology tools is a challenge for teachers. In order to effectively implement ICT in classrooms, researchers argue that it is important to adjust the content to synchronize with the technology selected and the pedagogical approach used (Alvarez et al., 2009; Lawless & Pellegrino, 2007; Rienties & Townsend, 2012). Several researchers (McCarney, 2004; Mishra & Koehler, 2006; Rienties & Townsend, 2012; Ziegenfuss & Lawler, 2008) have shown that technological knowledge is often independent of content and pedagogical knowledge. Mishra and Koehler (2006) hypothesized that learning is most effective when an awareness of the complex interplay between pedagogy, technology, and discipline-specific content knowledge.

Diversity in Education

The discussion and empirical research on cultural difference and discontinuity in education emerged with Woodson and Bethune in the 1930s continuing through the Civil Rights and Ethnic Studies movements (Aldridge, 2009; Banks & McGee Banks, 2004; Carter & Goodwin, 1994; Watkins, 2001). Activists marched and litigated to bring attention to the denial of access

to quality schools for all students as well as the alienation experienced by a curriculum that omitted the history and contributions of all (Aldridge, 2009; Watkins, 2001).

In 1954, the Supreme Court handed down the landmark decision that segregated schools were unconstitutional in *Brown v. Board of Education*. Until this time, "separate but equal" had been the prevailing doctrine. Successful integration of schools has been 65 years in the making and has still not fulfilled its promise. Derrick Bell (2004), in his book *Silent Covenants*, called *Brown* a decision that "promised so much and accomplished so little" (p. 2).

Within the past 20 years, much attention has been drawn to the "achievement gap" present between students of color, specifically African American and Latino students, and White and some Asian students. The achievement gap describes the discrepancy in educational outcomes for students based upon their racial/ethnic background and/or socio-economic status. The difference in educational outcomes between students of different ethnic and SES backgrounds has been framed historically in various ways—often as an achievement gap, but also as an opportunity gap or an education debt faced by students of color and students from under-resourced communities (Cuban, 1989; Darling-Hammond, 2004; Ladson-Billings, 2007; Milner, 2012). Cuban (1989) argued that the ways in which reforms are constructed and students are labeled speak more to the values of the decision makers than to the apolitical qualities inherent in the groups of students these reforms are intended to help. African American, Latino, and lower-SES students face additional obstacles that hinder their access to opportunities to learn (Noguera, 2003).

Darling-Hammond (2004) focused the problem on resources rather than student and family deficiencies. Many schools in urban communities that educate students of color are staffed by underqualified or inexperienced teachers, receive inequitable funding and lack a challenging curriculum that enables students to develop and demonstrate their true academic abilities (Darling-Hammond, 2004, 2017). Ladson-Billings (2007) described this disparity in resources as a cumulative educational debt that continues to accumulate. Milner's (2012) opportunity gap framework helps researchers identify the ways in which colorblindness, cultural conflicts, the myth of meritocracy, low expectations resulting from a deficit mindset, and context-neutral mindsets and practices contribute to opportunity gaps for students of color.

One example of the way in which the "achievement gap" has been addressed

unsuccessfully is the *No Child Left Behind Act*. While the act addressed teacher quality and accountability, it measured success through high-stakes assessments of students' content knowledge instead of measuring the pedagogical knowledge of the teachers (Darling-Hammond & Youngs, 2002).

The disparities in education faced by students of color continue to reflect ongoing social inequity (McKown &Weinstein, 2008). These disparities include teacher biases, perceptions, and attitudes as they relate to different ethnic and cultural groups. Numerous research studies have found that most White teacher candidates bring deficit-oriented stereotypes about children of color and little cross-cultural background, knowledge, and experience (Delpit, 1995; Ladson-Billings, 1995; Sleeter, 2008; Valdes, 1996; Valenzuela & Dornbusch, 1994). Biases towards particular students affect teacher expectations, regardless of actual student achievement history (McKown & Weinstein, 2008). McKown and Weinstein found that in homogeneous classrooms, where the teacher and the student backgrounds align, the same biases are not present. Only when classrooms are made up of learners who differ from their teacher were these deficit-oriented stereotypes and damaging biases noted.

The cultural divide of students of color and their teachers influences student achievement. Ideally, all teachers would seek to improve the educational outcomes of students of color by acknowledging the role that their racial identities, prior knowledge, and learning styles play in educational experiences. Culturally appropriate, culturally congruent, culturally compatible, culturally synchronized, and culturally responsive approaches all examine the ways in which teachers may support students in their acquisition of school knowledge and dominant cultural capital by connecting to the students' own cultures, namely, their linguistic patterns, cultural practices, and cultural ways of knowing (Carter, 2005; Ladson-Billings, 1994, 2001).

In Culturally Relevant Pedagogy, knowledge and practices valued in schools are based on notions of cultural hegemony that must be challenged and, in the case of cultural relevance, transformed to be inclusive of the various perspectives, histories, and knowledge outside of a Eurocentric perspective (Ladson-Billings, 1995a).

Culturally relevant pedagogy rests on three criteria or propositions: (a) students must experience academic success; (b) students must develop and/or maintain cultural competence; (c) students must develop a critical consciousness through which they challenge the status quo

of the current social order. (Delpit, 1995, p. 160)

Gay (2000) tells us that effective cross-cultural communication is another aspect of preparing for culturally responsive teaching. She quotes Porter and Samovar (1991), who explain that culture influences "what we talk about; how we talk about it; what we see, attend to, or ignore; how we think; and what we think about" (p. 21). Gay also quotes Montagu and Watson (1979), who describe communication as the "ground of meeting and the foundation of community" (p. vii) among human beings. Carefully assessing what students know, how they learn best, and what motivates them most is one way for students to see effective communication when these aspects of their learning identity are part of determining what is experienced in the classroom. Ladson-Billings (1994) defined this work as a commitment to building relationships and community with and between students.

Ladson-Billings (1994) studied the teaching practices of teachers identified by their community as successful teachers of African American students. She showed that the instructional approaches varied greatly (structured to informal) in the teachers, but shared beliefs served as the foundation for their instructional practices. These include (a) a conception of self and others that is marked by the belief that teaching is a noble profession, that one's students are capable of success, and that they are members of the community; (b) a conception of knowledge that is characterized by the belief that knowledge is not neutral nor static, mastery can and should be demonstrated in a variety of ways, and cultural knowledge should be used to scaffold learning; and (c) social relations, which reflects the belief in building a community of learners (teacher included) who interact collaboratively and are responsible for one another.

The tenets of culturally relevant pedagogy, according to Ladson-Billings(1994), include:

1. commitment to academic achievement—intellectual growth as the result of learning experiences;
2. cultural competence—promoting a positive racial identity within students; and
3. sociopolitical consciousness—utilizing school knowledge to identify and challenge social inequities (p. x).

Scholarly interest in students' engagement with diverse viewpoints is increasing. Studies have described the role of interactional diversity in creating the kind of disequilibrium, discontinuity, or discrepant experience that has been found to lead to increased openness and

cognitive complexity, and ultimately to greater ability to take the perspectives of others (Gurin, 1999; Gurin, Dey, Hurtado, & Gurin, 2002; Hurtado, 2005). In a report developed for the legal defense of the University of Michigan's affirmative action policy, Gurin (1999) stated that "teaching students to think about complex issues from different perspectives is a primary goal of higher education" (p. 39).

Globalization and advancing technology are creating a workforce that is increasingly diverse. McGrath, Berdahl, and Arrow (1995) describe diversity as the differences among the members of some particular groups. Williams and O'Reilly (1998) define diversity as any attribute people use to tell themselves that another person is different. Diversity has been called a "double-edged sword" because it presents risks as well as benefits to teamwork (Milliken & Martins, 1996; Phillips, Northcraft, & Neale, 2006).

One functional benefit of diversity is increased creativity and innovation for an organization (Cox & Blake, 1991; McLeod, Lobel, & Cox, 1996). Many studies have looked at how increased levels of diversity in groups helps members reach better decisions. When solving a problem, people tend to rely on their prior experience to approach the problem, making implicit assumptions that are guided by mental frameworks they have acquired previously (Bettenhausen & Murnighan 1991). People tend to rely on a limited perspective and are unaware of alternative approaches to a problem. One way to help them see beyond their limited frames of reference is to expose them to alternative perspectives. Increasing awareness of the different views or experiences of others can influence one to explore alternative approaches to a new problem, and subsequently, result in better and more novel solutions (e.g., Beersma & De Dreu, 2005; Nemeth, Personnaz, Personnaz, & Goncalo, 2004).

RESEARCH DESIGN

This study explored the perceptions of how and why teachers might integrate technology to support their goals of equity and inclusion with a group of teachers who identify as culturally responsive in their pedagogy and describe themselves as fluent in the use of technology in school. Purposeful sampling was used to identify teachers who self-identified as valuing equity and inclusion in their classes and also considered themselves to be technologically proficient.

To achieve this purpose, the following research questions were explored:

1. How do teachers who identify as culturally responsive characterize the role of technology in classrooms, and what uses of technology do they put into practice?
2. When incorporating technology, how do teachers describe the extent to which they feel they are achieving equity and inclusion with their students of diverse backgrounds?

In order to understand how teachers perceive the use of technology to help create opportunities for inclusion and equity in classrooms comprised of students of diverse backgrounds, the researcher used a qualitative approach: case study methodology. To collect data, three methods were used: one-on-one interviews, artifact and document reviews, and focus groups.

Qualitative case study design was especially suited to this study as it allows for open exploration of the research questions that address the meaning participants make and their perceptions as they are developing approaches with new tools. The researcher constructed a set of criteria that participants had to meet in order to become formal participants. These criteria were:

1. Teachers self-identify as culturally competent.
2. Teachers describe their classes as comprised of a diverse student body.
3. Teachers describe themselves as proficient in the use of technology.

These criteria were selected because teachers with skills in both cultural competency and technology usage were needed to answer the research questions. The researcher's interest was in learning how inclusivity and equity can be supported through technology integration in classrooms comprised of students of diverse backgrounds; therefore, an effort was made to include criteria that demonstrate a commitment to both inclusivity and the use of technology resources. The researcher examined information contained in each potential participant's demographic survey against the researcher criteria to ensure that teachers who had a particular pedagogy and practice were included in the study. The researcher utilized the snowball technique—the act of initial participants referring other potential candidates they consider suitable for the research (Creswell, 2013). This generated an "extreme case" sample of teachers who were not reflective of the general population. The study sample consisted of 30 teachers representing 17 different schools. The researcher focused on the teachers' perception of how technology is integrated into their classrooms, where equity and inclusion are valued. Information was collected from the following sources: classroom artifacts, school documents,

interviews, and focus groups.

Demographic information was collected for each participant, and the sample showed wide-ranging backgrounds and experience. Even with the divergent demographics, participant teachers showed alignment in their perspectives. Semi-structured in-depth interviews were conducted. These were transcribed verbatim and then coded. Inter-rater reliability was conducted wherein two peers checked codes against actual interviews to determine whether they independently arrived at the same results. Any discrepancies were discussed and reconciled with the coder. School documents and class artifacts were analyzed as part of triangulation. A focus group was conducted with teachers who met the same criteria as the initial purposeful sample group of teachers but who did not participate in the interview. Interview and focus group data were coded, and themes were highlighted. Class artifacts and document review additionally provided data on each participant's use of technology, specifically examples of technology projects and applications.

Participant teachers shared family communications, including examples of family engagement sessions, class blogs, emails, and student conference materials. Actual student projects, artifacts, and unit plans were reviewed from participant teachers in a range of grades from kindergarten through Grade 7. Collaborative student assessment tools, including shared Evernote files, Padlet, and other multi-media portfolio-based programs, were reviewed. Additionally, conference and professional learning resources discussed were examined, as were websites and admissions literature for each of the schools represented. Looking in-depth at resources and class artifacts referenced in interviews helped provide a richer and more detailed context for the content discussed in the interviews and the focus groups .A thorough analysis was conducted on the results of the interview, document review, and focus group.

Analysis of the data began after each phase of data collection was completed, thus enabling the researcher to draw upon the data and strengthen each subsequent phase (Marshall & Rossman, 2006). Marshall and Rossman describe seven possible analytical steps for data analysis: (a) organizing the data; (b) finding relevant details in the data; (c) generating categories and themes; (d) coding the data; (e) offering interpretations through analytic memos; (f) searching for alternative understandings; and (g) writing the report or other format to present the study.

After an initial reading of the 30 interview transcripts, the researcher re-read the manuscripts of 5 interviews to create a preliminary coding scheme. Data were categorized under words, sentences, phrases, and paragraphs that appear in the transcriptions of interviews and documents. Each piece was coded, isolated, and placed in a category, providing cross-referencing and convenience in looking for commonalities and discrepancies. This was also an accessible way to identify emerging themes or concepts.

Initial interview coding used an alphanumeric identification code assigned to each participant prior to the interviews and posted on the transcript. Narrative descriptions were then coded according to various categories. The researcher assigned descriptive codes to the raw data that had been transcribed from the recorded, semi-structured interviews. Coding letters for themes and categories to the transcription from the recorded, semi-structured interviews were written along the margins. Through this process, the researcher developed the findings of the study and organized the data in preparation for writing.

After the coding and the assignment of the data to various categories, the researcher used a manual recording and representation system. The data were analyzed through multiple lenses, and the most frequent codes were investigated. The researcher used identified themes to single out concepts that were reflective of the participants' experiences. As themes emerged, visualizations were created. The data collected from the documents and interviews and the emergent themes were reviewed against themes in the literature. A process of analysis and synthesis enabled the key themes from the findings to be identified, and through a comparison with the literature, interpretations were drawn up. Dependability and credibility were tested primarily through triangulation of interview, focus group, and document review.

At the conclusion of this research effort, the literature was re-evaluated for a better understanding of the implications for this study and to generate recommendations for future research studies.

The researcher attempted to give meaning to every finding that emerged as part of the process of analysis and synthesis. Some findings and meanings were expanded upon, while others became integrated.

The major outcome of an analysis of the data was a thematic description of teachers' characterizations of meaningful uses of technology in their classrooms that value equity and

inclusion. Based on this analysis, a series of recommendations was developed for ways that may enhance the use of technology by teachers seeking to achieve equity and inclusion, and suggestions for further research.

Limitations of the interview data exist with both the participants and the researcher. Since the interview was semi-structured, significant issues that might emerge from a less structured interview were not explored. In addition, the researcher's follow-up to responses varied among participants. A third limitation is the fact that the participants volunteered for the interview. Because they were self-selected, the participants may not accurately represent the general population of teachers with students of diverse backgrounds in technology-resourced classrooms.

FINDINGS

Technology as a learning tool

The first major theme that emerged from the interview analyses was the illuminating perspective participants brought to technology as a learning tool. Culturally responsive teachers explained that the tools allowed them to develop and provide content in a way that is more relevant to the diverse perspectives of their students and more aligned with their teaching goals. They developed individualized uses of technology to support student knowledge building and differentiated instruction.

Teachers were asked to describe their perceptions of the role of technology in their classrooms. In order to characterize the role of technology in classrooms where the teacher espouses a culturally responsive approach and the children come from diverse backgrounds, participants were first asked to describe the diversity in the classroom and to define what culturally responsive pedagogy meant to them. After providing this context, all participants went on to characterize technology as a tool for learning and to describe uses that supported their efforts to develop student understanding and to increase collaboration in the student community. Teachers provided hundreds of descriptions and examples of various resources, lessons, projects, and strategies where they used technology.

Participants described knowledge-building efforts and a range of uses for technology in providing differentiated instruction to learners of diverse backgrounds. Some gave specific examples of ways the technology supported diverse learners, and others spoke more generally

about technology as a tool for learning. Participant teachers described technology as one more tool in a large and varied toolbox to help students learn in their culturally responsive classroom. Scardamalia and Bereiter (2014) define knowledge building as an educational approach where students make a collective effort to learn and develop ideas together rather than learn only from the teacher (p.36).

Classroom knowledge building can, on the one hand, give students experience in a wide variety of ways of contributing; on the other hand, it can help students develop their individual styles and skills of contributing so that each one has something distinctive to offer in any collaborative knowledge-building effort. That is perhaps the surest way of enabling everyone to find fulfilling roles themselves in a knowledge society and to feel part of the knowledge progress that is reshaping the world. (p. 48)

Participant teachers described technology approaches that facilitated student learning from and with each other. For example, Jason, a middle grades teacher, shared:

> Here's work that draws you in and not only demonstrates my knowledge but causes you to learn something as well … [enticing] other people to approach the student's work. I'd rather see the students using the technology as a means to get their work to the next level and to make it not only a demonstration of their knowledge, but also a point of conversation with their peers and with their teachers.

They were eager to engage students through more dynamic mediums than traditional text and lectures by finding videos, interactive tools, audio recordings, pictures, and other resources that could convey a greater range of experiences and voices than the school provided. Children in the classrooms of the participant teachers were able to use technology resources to work with relevant and accessible materials, develop understandings, generate their own content, and share their knowledge with each other and a larger audience. Each of these categories is described below.

Participant teachers found multi-media content to be varied and engaging with qualities not present in traditional classroom resources. They described gathering and presenting multi-media content that was accessible to a range of students.

Byron, a third-grade teacher, was well aware of the opportunity afforded by technology to enrich traditional classroom resources during project work:

> I'm thinking in particular about one of the big research projects that we do at the end of third-grade around the Harlem Renaissance and so, we do a lot of teaching in the classroom and then we do a lot of centers with different materials in the classroom around that time period. And then, for the research they're given books and given articles, but they also have a component where they can watch videos, they can listen to audio from the time-period, especially if they are researching a performer or a singer. We could have the photographs and the art and the music and the literature that would make those units rich.

When describing the connection between teaching and learning, Leah, a kindergarten teacher, characterized technology in her classroom as a multi-media tool. "Technology is a way for students to get access to information that I guess isn't as easy to receive from oral, but they can use it as a visual, they can use it to communicate, they can use it to record, they can use it to write…. I think technology helps many different students and gives students access to many things ... different cultures."

Priya, another kindergarten teacher, described multi-media as an inclusive feature of technology. "Technology ranges from just projecting something on the screen to turning their work into an eBook, play music in the classroom … making sure that each one of my students feels seen and heard and represented in the classroom. Just making sure again the students feel seen, heard, welcomed in the space—comfortable."

Teachers were looking for any resource that could improve a child's opportunity to learn and master new skills. Many teachers saw technology resources as augmenting or improving upon their own limitations. The affordances of multi-media were seen as a valuable aspect of technology in culturally responsive classrooms.

In addition to valuable multi-media qualities to enhance learning, teachers also named access to resources that represented a wider range of perspectives as a beneficial use of technology in the culturally responsive classroom. Participant teachers often described their traditional classroom resources as providing narrow contexts and leaving out wide-ranging perspectives. They found technology resources to be a gateway to more meaningful resources than were readily available in their everyday classroom materials. They were intentional about trying to present wide-ranging content and contexts as part of their classroom approach. They found resources online that allowed them to supplement classroom resources and provide a greater range of examples when presenting content to students. Charles, a second-grade teacher, described a project and the advantages of the incorporation of technology resources.

> "It also affords us the ability to just find the information that reflects their experience and where they come from, and when we're doing the neighborhood project, that we have the ability to get the resources to put in front of them, and that we're not limited by the books we already have if they're not represented in those resources."

Other teachers used databases and websites to gather content that could provide more nuanced perspectives. Some teachers found their own knowledge and access limited, and the resources in their classroom narrow for historical perspectives that could resonate with their students. Terra, an early grade teacher, named a limitation many teachers experience: "There aren't a lot of books that are diverse enough for students for a multitude of reasons." Teachers turned to technology to provide access to greater mentors and resources for students.

Byron used online resources to provide needed background information for an immigration study. "My class looked at Puerto Rican migration to the Lower East Side in the mid-twentieth century, which is fairly specific. And we were able to find some books, some oral histories, at the Tenement Museum they had some great resources but a lot of the things that I found for kids and that kids ended up looking at and interacting with came from digital resources."

Jason, an older grade teacher, saw similar benefits to expand, not just reflect, personal experiences: "I can amplify their point of view and their worldview through the use of technology."

Dierdre, another older grade teacher, used technology resources to compare media with students:

> In advisory we talk a lot about who you see on the screen and representation of different races as well as representation of different identities, whether that is religious identity or sexual orientation. More so even than in the past years because we watch CNN Student News frequently as part of our advisory curriculum, just to be informed and to compare messages between channels. But we talk about what media literacy means. If you look at one news station—that's what the student news offers—but how do we become a little more dissecting if we're watching Fox versus NBC versus etc.

Many teachers characterized technology as a tool for bringing multicultural and wide-ranging perspective content to students engaged in collaborative inquiry.

In addition to the many ways teachers described technology uses for developing student understanding, they also described the importance of using technology for students of diverse backgrounds to create and share their learning with others. Many participant teachers

characterized the role of technology in the culturally competent classroom as a medium for students to convey their understanding and share ideas with each other. Collaborative and collectivist practices were highly valued in these classrooms, and technology was a tool teachers leveraged to develop this community. Teachers were thoughtful about providing students with the opportunity to apply understanding in new ways. "I think we try mostly to use it to have the children create things rather than just look at things," shared Charles.

Jason found that technology resources could help students communicate their ideas and teach others about their perspective:

> My students use technology to share with us the knowledge that she or he creates around a particular subject … it's them producing videos or their writing … if the technology is used in such a way to entice other people to approach the student's work, to learn something from the student's work, I think that's a great use of technology…. I think the technology needs to be—it needs to be behind and almost obscured by the quality of knowledge the student's able to demonstrate.

Byron described technology as a tool for content creation, not just access to information. "So, I think, again that technology is one other tool that kids can use to gain more content, more knowledge … providing kids with the tools and the supports to create their own knowledge … [another way] how we include windows and mirrors in our curriculum … how can we make sure everyone feels like they are seen and heard and valued."

Participant teachers took care to not let the technology detract from the task. Jason described this dichotomy of opportunity and caution.

> I think that from a social justice standpoint, that's what we can best use technology to do, is to amplify the individual. use the tools in a way that doesn't hinder his or her ability to express his or herself. I think the technology needs to be—it needs to be behind and almost obscured by the quality of knowledge the student's able to demonstrate.

Winnie, a middle grade teacher, appreciated the amplification of student voice:

> It [technology] highlights students' strengths, especially students who might not feel traditional pen to paper work is where they shine … [where] alternative viewpoints that aren't normally brought forward with a topic are sort of exalted so that a child can see that they're just every issue is multifaceted and they can see experts from many different perspectives and from many different walks of life.

Karen, a teacher of young children, was aware of the power of technology to bring a voice to a child who might not be able to use traditional communication tools effectively just yet:

> That, to me, I think is the biggest benefit and the biggest way to use it as a tool, both for them to feel like they can—I think especially in kindergarten, but still true in 2nd grade—that they can have all these things to share, but they can't write them all down yet, but also for me, I get to hear all those voices … with the iPads, all the dictation and recording things that you can do, I can give children a voice before they have a voice in writing… I just came to see it as this really valuable tool, especially in the younger grades.

Kiera also wanted to know more from the students rather than her making assumptions about their unexpressed thinking: "By using technology with students, it gives them power to have their own voice recorded instead of just me recording what I am assuming about them." Access to this unique student voice and experience was important to many participant teachers. "I think that it is most concrete for me when I see the way kids are able to tell stories and share ideas with the technology," explained Charles.

Another way participant teachers used technology to build knowledge in their students was by leveraging resources to provide better differentiated instruction for their students of diverse backgrounds. Teachers saw technology resources as excellent tools for reaching a range of learners. They found specific tools for gathering assessment information on children as learners to design even more targeted instruction. They utilized other tools to adapt the instruction and to assist students in meeting objectives and learning goals.

Teachers were excited to describe all the ways they used technology resources to collect information on students that could improve their instruction. Many found it challenging to take detailed notes in the moment when they were observing students working but found recording devices to be a real advantage in ongoing record keeping. Audrey, an early childhood educator, shared.

> I've found that there's been real benefit in using the technology to keep records because in the moment, the class—the pace of the classroom is so fast that I can snap a quick picture or I can set up an iPad to record a kid reading that maybe I wouldn't be able to listen to or wouldn't be able to see in the moment, but then I can go back and listen to it and then make the necessary accommodations or plan next steps.

Another early-childhood teacher, Leah, used organizational strategies to tag student information and keep track of student change over time:

> I also put it onto a computer, so it's easier for me to access and to manipulate and to move things around and to really see things in an easier way, like using specific colors to highlight. I think it's easy because then I can also like if I'm using excel, I can go back

> and create another page where I can look at the beginning of the year, compare it to the end of the year or the middle of the year … to really see how they were in the beginning of the year and what we need to work on … to look at to really inform [my] practice.

Erin also talked about managing essential student information in useful ways. "When it comes to documenting, as I gather information, if I hold it in one place, I use technology to refer back to it so that I don't necessarily have to hold it all in my head at once, but then I can document and look at perhaps trends over time or just a way to practice and look for patterns."

Many teachers had used conferencing with students as a strategy for gathering useful data on their learners. Technology allowed them to better record than traditional notetaking. Charles said:

> We've also done a lot of audio recording of conferences we have with kids about their writing or a math problem or reading to us, and having that moment recorded I think we find helpful in assessing kids because then, we don't have to remember the way they responded to a particular question. We can go back and listen to it again, and maybe we have a new perspective on it after seeing what they did in subsequent days. I think those audio recordings of the kids have been really helpful for us.

An early grade teacher, Kiera, found that the iPad allowed children to independently record their problem-solving strategies:

> When working on a number string, I can't hear 25 voices at once, but when they do it independently and dictate it into the iPad. Later on, I can hear all those voices and really know what they're doing and what they're thinking and how they're going about the problem. It helps me plan going forward. So, it helps make groups; it helps show gaps, it helps know what the next step is for each kid, and to see trends in the whole class, like where might there be gaps in the whole class, where might they be ready to go next. I think the same thing in reading and writing, just really helping plan going forward.

Teachers were using the documentation of student work to plan future instruction that was relevant and timely based on current student understanding. They used off-the-shelf products but also adapted tools to suit their needs.

Some participants highly valued expedient feedback and evidence of student learning. They connected rigor and differentiation to goals of equity and inclusion. A quick assessment engaged the students but also gave Winnie, an older grade teacher, an assessment of the students' ability to apply concepts and skills in a new context:

> I sent them in real-time a design challenge and they had just the class time to complete it. I think it created a mystique around the challenge and everything and they were really invested in this whole thing. I use it for checking for understanding, for example, if I've

> taught something and I want to make sure that I know where the kids are at with a particular concept. Cultural competency starts with preparedness, empathizing and making sure that as teachers, we're really thinking about the child's experience and what they walk away with, making sure that they walk away with the things that we want them to leave with.

Technology resources were often cited as giving valuable quick and "real-time" access to student understanding for the teacher to plan and adapt instruction.

In addition to using technology resources to assess student understanding directly, many teachers noted the value in leveraging technology resources to gather information on students from a range of colleagues. This use of collaborative assessment tools allowed them to expand the viewpoints on a student and not rely on their own limited personal experience. "In terms of sharing, technology offers many different ways to, I guess, record my own thoughts, to gather the thoughts of others when I'm trying to share information about what people need, and then to connect to me so that I can share, maybe, the most appropriate information so they can help their children," described Erin, who worked with students in many different classes. Most participant teachers worked with other teachers and found technology to be indispensable to their shared assessments. Byron described his team's collaborative process enhanced by technology resources:

> I think that Evernote is really important, one of the things that we've found is that having a single place to put all of our notes is really helpful, especially for those of us that teach with another teacher in the room. I have an associate teacher, but then also how we can—if we're sharing those folders or documents with learning specialists and our literacy and math liaisons, we can all be on the same page where all of our information is in one spot.

One collaborative team member, Karen, found it essential: "I think it allows us to do best practice. It allows us to support kids at a different level because you have all this information."

Another group of teachers found the multi-media aspects to be particularly useful when collaborating. "We can see the way a teacher is conferring with a read-a-loud or have just the audio of it and seeing—and then having them compare, 'What you're seeing is that different from what you heard?' You couldn't do that with any other thing, or it wouldn't be as exciting. So, I think technology allows that," explained Terra.

Karen described one such tool: "We use Seesaw and it's an app and each kid has like you can tag them and so we'll note-take in there and tag the kids that we talked about and then

also tag is it math, is it reading, is it writing, is it character, is it social studies, so it's easy to sort." Digital portfolios were also commonly described by participant teachers like Kiera:

> We've tried to develop ongoing portfolios of the students, both things they have created and have uploaded or that we have seen them create and upload for them. So it helps paint a whole picture of a student, and it's not always paper and pencil and then picture of the paper and pencil, but it's also audio recordings or movie recordings, videos, that show the children engaging in different activities, but how we sort of show their change over time is captured digitally so that it's a full picture and not just a snapshot.

Teachers collected audio, visual, and video to document student progress, and sometimes they even had the students collect it on their own for the teacher to review later.

Teachers referred to many adaptive uses of technology to better teach the students as unique learners. Teachers noted that students were acutely aware of how they were grouped or what material they were given to work with, yet also benefited from differentiation. Using the assessment data, teachers could see that students had wide-ranging skill sets and that one lesson or resource would not meet the needs of all their students. Teachers found technology to be a useful tool for adapting lessons individually without revealing obvious differences for the group. Ronnie described adaptive technology approaches in her math class:

> I think the inclusion piece is the big one because I can make everybody do the same thing when we're in fact completely not doing the same thing. And kids will be less aware than if it's physically clear. Kids are starting to feel really aware of being different and embarrassed and any different number of things. So, I think that can help minimize it. We talk a lot about all of those things, but I think it still makes people feel bad when they're doing different things. They see everybody working on a Chromebook. They see everybody going to a number of different websites. It feels much more like everybody's doing the same thing. And they can even talk about—but I can provide significantly different things that look on their faces to be somewhat similar and that will allow me to be more inclusive.

Teachers had many examples of tools that helped them differentiate in whole group lessons. Sarah also talked about adapting reading material: "Newsela differentiates—Newsela has articles around different topics. So, for instance, during our social justice research—And you can actually differentiate the article in different ways." Sharonda described a virtual workspace where students employed choice. "Now I'm using Blendspace by Tes, T-E-S. You can create a menu of classes. You can scaffold, and you can have extensions or challenges based on your topic. It encourages students to work at their own pace and can also provide opportunities for extended exploration of particular topics that doing a traditional lesson might

not allow for."

Some teachers referred to the advantage for the teacher in these situations. Teachers were aware of the enthusiasm children had for technology resources when doing school assignments that were self-directed: "The way they're presenting it is personalized in some way, that's the hook," explained Sharonda. One described individualized work time as a "classroom management style of everyone is working on this thing and I then have the time to go around and talk with each kid. It can be a device to allow me to get all the kids that I need to get to talk to."

The final differentiation approach was an often-cited opportunity to employ technology as an assistive tool for students who needed support or an alternative approach to content. Charles found technology to support many students, but especially kids who struggle academically and would have a hard time writing it out with a pencil, but they share more when they're talking, or they're making a video on their iPad, or whatever it might be that just more comes out, and I find we find out more about what those kids are thinking and what they understand in that way.

Audrey gave the same example: "There was a child who had difficulty writing so I used technology as a way to be—to tell his story as opposed to write his story. So that was one way that I was able to meet his needs." Cory, another middle grade teacher, also used tools to focus the task on the aspect she was most concerned about:

> I've tried apps that create lists for them and that have the timer on them. [For] the students who really have a hard time getting their ideas down on paper and they really need to—it's easier for them to either interact one-on-one with someone else or when that person isn't there. They're talking to the computer and the computer is writing for them. It's putting them on the same playing field as someone who can readily just write down their brainstorm or who doesn't need that help.

Reading tools were also often found to be supportive of students not yet reading fluently with their peers. Byron described a student who was able to fully engage because of adaptive technology.

> We provided her with an iPad and with an app because she didn't have material at home; she could access this app, so we allowed her to bring home an iPad and an app that had the book, an audio version of the book. So, she was able to participate in book clubs at the third-grade level for having the comprehension conversations even though she was also working on her decoding skills at the first-grade level.

Mira found that, at times, all of her young readers benefitted from the model of a computer partner.

> We have them read leveled books to their partner. There are different things that they can do with physical books, but there's also benefit of having Listening to Reading [a technology resource] where a voice is reading to you in a fluent way, where they could follow along with a text that lights up. So, getting that fluency exposure that they might not necessarily get from a reading partner who is at their grade level.

Overall, teachers emphasized the power of technology to allow them to better meet the needs of their students or to separate skills in assessments of understanding.

All participants characterized technology as a learning tool where they accessed meaningful content that was not readily available in their classrooms. They found technology resources to be a productive tool for students of diverse backgrounds to generate their own content and share their knowledge with each other and a larger audience. They also found that technology tools allowed them to differentiate instruction in effective ways to meet the needs of their disparate students.

High Engagement and Authentic Collaboration

A second theme that emerged was that the participant teachers uniformly ascribed positive outcomes to their use of technology in the classroom. These positive outcomes most often included examples of high engagement as well as authentic, collaborative practices.

Teachers were asked to explain how they perceived the value or quality of their use of technology in their culturally responsive classrooms. They described how they knew if students were benefitting or were having a meaningful experience or not when they chose to integrate technology resources into their teaching practice. Participants described the evidence they used to make this determination.

Every participant described specific positive outcomes they attributed to their use of technology in the culturally responsive classroom. They described high engagement of their students when incorporating technology, especially student ownership, self-motivation, and enthusiasm. They also saw as an additional benefit an increase in family awareness and engagement in school.

In addition, teachers noted greater authenticity in their work with students of diverse backgrounds. They saw more authentic collaboration between students and increased

confidence in 21st century skills for students.

Eighty-seven percent of participants (or 26 out of 30) interviewed described an increase in student and family engagement from wide-ranging backgrounds as a positive outcome of using technology resources in their classrooms. The examples provided as evidence of engagement included increased student effort, greater student ownership, student expressions of motivation and enthusiasm, and improved parent engagement and awareness of school events. These behaviors were all described as essential to the teachers' culturally responsive practice and philosophy.

Many participant teachers appreciated the active engagement of students when they were interacting with technology resources on class lessons. Jason echoed a common refrain from interviewees where the technology immediately engages students: "If the technology's used as a hook to get the students really involved in the assignment, I think that's a good use of technology."

Byron described a lesson where students were conducting research on their own using online resources and began to offer classmates tips and tools they came across pertinent to their topic. "One of the most exciting parts of that unit, in particular, was seeing kids getting up, showing a new website, or a new video that they found. Saying, "Oh, aren't you doing this person, I found a video about them."

He was aware that they were actively engaged in their own work but also in the work of their classmates, doubling their learning opportunity and expanding the equity and inclusion in the classroom community.

Technology use that increased student independence was frequently mentioned as a positive outcome. "Independence is my marker for things," said Cory, an older grade learning specialist. Greg described this increased independence and ownership as evidence that the technology approach was succeeding in his goals:

> All the students are able to internalize the class goals, then you see children actively communicating, you see children sharing information, collaborating, and you see them regulating, appropriately, for their developmental age, regulating their emotions in a way that allows them to continue to do their work…. I try to create a space where children understand that they have the abilities to have conversations, negotiations, and even pushback on anything that's presented in the classroom.

Teachers were careful to select tools that were accessible in order to foster this independence and ownership. For example, Kiera cautioned that too much complexity for young students did not encourage independence. "We think about the interface and we think about how easy it is for students to navigate that independently. If it's something that relies a lot on reading or requires a lot of steps that might be hard for children to have the memory to go through all of the steps, that doesn't seem appropriate, necessarily. So, we sort of think about how well they can navigate that independently and feel empowered with that technology."

Other teachers described student autonomy to differentiate as an indication of the usefulness of technology. "They get to take it to their comfort level," described Sharonda.

Empowering students to pursue learning on their own was frequently mentioned as a positive outcome. For example, Mary said, "Each child feels ownership over the technology. They feel like it's something that they all have access to, it's not for some." Teachers leveraged this access to allow students to monitor and design their own learning plans.

Teachers frequently highlighted the engaging and multi-sensory quality of technology resources as increasing motivation and a positive outcome of their integration of technology resources. Teachers described technology as a resource to help students get needed practice in rote skills necessary for further learning in their culturally responsive classrooms. They described some of the more rote practice as dull but necessary and students didn't practice enough to master skills that were needed to progress. "If there something that I just need kids to do a bunch of times, this can help them have that road to practice when it's necessary," reflected Ronnie. They found many engaging tools that motivated their students to practice skills that they were less successful in motivating children to practice in more traditional mediums. Byron used a range of applications to provide much needed practice:

> I think one other way to also look at applying skills, so thinking about – kind of you can play math games with manipulatives, you can play math games with digital manipulatives, you can do practice things online… or to practice skills that they've learned in school…. So that's one way in which she was able to access the curriculum through technology, through the ways in which we provided it to her…. So I think, again that technology is one other tool that kids can use to gain more content, knowledge.

Sharonda thought about the need to offer a variety in her class and was intentional about keeping students and herself motivated and applying effort:

> I think the challenge for me on a daily basis is walking in that classroom and making it as exciting for me as I want to make it for them. It can't be lima beans every day. Who wants to have a steady diet of lima beans? You gotta (sic) mix it up. You want to get them in the mix. You want them to be on task. If I do [the same thing] all the time, I'm habituating, and it will lose its luster. In other words, it won't the ju-ju or the gizmo; it won't be as attractive and as exciting. When they get to use [the technology resource], they're saying – Wow!"

Teachers had a "by any means necessary" approach to planning instruction. If something motivated and engaged students to push through challenges, they wanted to use it. Though not a particularly high-level application of a valuable resource, time on task and repeated practice do impact learning, and teachers were aware of the disadvantage to students who did not effectively engage in much needed practice. Technology motivated some students to work longer and harder, and participant teachers saw benefits to this increase of effort and engagement on their success in school.

Teachers found technology resources to be an empowering tool when connecting and engaging with families. Delivering effective family engagement is a continuous struggle for teachers. Such engagement improves student outcomes and empowers families to have a positive impact on their child's school success (Mapp & Kuttner, 2013). Family engagement efforts that build trust between home and school and that support families in academic socialization, (where families can connect student learning in school to family values and aspirations), lead to the most robust outcomes (Mapp & Kuttner, 2013).

Some teachers found that multi-media tools allowed them to better show, rather than tell, what children were doing in their learning so the family and the teacher could work together on next steps to support learners. Priya explained how the images were better able to convey than her words and led to a stronger partnership with families:

> It was hard to explain to a parent what math time looked like for their student and where the struggles were. And so, I recorded the math and at the conference I was like, "So, this is—" They were able to see it and it wasn't until then that they were like, "We get it" and got some support. Because it was just hard to put into words what it is that was giving their child a challenge and they saw it for themselves with the prompting and the questioning and the support—the scaffolding—they were like, "Whoa, thank you for this."

Some teachers also used these tools to share positive accomplishments, not just challenges, about individual students. Dierdre found sending home evidence of student work

particularly beneficial:

> But I have communicated with families differently, just showing them some of their student's work. Sharing a particular family, the young lady did a very nice job—this was in my gym class—on a presentation and the mom wanted it shared so she said she wanted to show it to some friends at work. Something that can be fruitful and enhancing to the parent, child, and teacher relationship, especially where there's data records and you can see, check-in and, "How are you doing?" It's a conversation starter.

Some teachers leveraged technology resources to bring school into the home instead of families into school. Charles described setting up a class Instagram and sending out tutorials for sign up:

> We did do a how-to sign up curriculum night, and we sent out a little video with a whole tutorial about how to do it, and I think we found a lot of families that signed up specifically this year to see our Instagram, and I think people liked it … to teach people how to get on there, and they did it. The only account they were following was ours … and we posted maybe two or three photos or videos a week from the classroom, and the feedback we got was that it just is a window into what goes on in the classroom that doesn't always come through in the emails we send or the descriptions we give at a conference or something like that. Being able to see what the class looks like when they're sitting there together, families liked that.

Kiera described a first-grade study that engaged families similarly:

> When we're doing the family study, we talk about music in families, and for some families' music is a very big thing to them. It's very important. It holds a lot of cultural significance. It's a way to bring people together. It's a way to pass on traditions. So, thinking about how you record your family singing at home and allowing that to be played in the classroom even if the family can't be present, technology can sort of provide that bridge and show the rest of the students what's important to the student and the family.

Another noted usage was for communicating with families in equitable ways. Many teachers used technology resources for most of their family communication but were aware of the dynamics in school where families vie for limited resources like teacher time on conference days. Erin made sure to communicate in a range of mediums:

> If parents don't have the time to sit and meet with me, I reach out to all the parents of kids I support, and some parents don't have the time, that they say, "Can I call you during my lunch hour?" And so I say, "Okay, I'm going to send you an email about what we'll discuss, and then just try to have it in front of you when we discuss it." Just the use of email and PDF images and things like that can be helpful, in terms of equity, access to materials.
>
> Teacher time is a precious commodity in schools, and teachers found some of these

technology uses to improve their reach to a greater range of families.

Effective family engagement was an active goal of many of the teachers interviewed. Participant teachers had found many ways to use technology resources to connect families to school and to their child's learning experience, an essential component of their self-described efforts to create equitable and inclusive learning communities.

Authenticity. Participant teachers described authenticity as a positive outcome of technology use in their classrooms. They saw authentic collaboration between students, a stronger and broader sense of identity in students, demonstrated confidence in 21st Century skills, and an expanded reach for individual student ideas. They also found greater authenticity in their own work as educators; they felt they could target instruction more authentically and had expanded their network of educators through the use of technology resources in their practice.

Collaboration with peers. Teachers sought collaborative opportunities between students and between themselves and students. Some described an increase in this collaboration through the integration of technology. Some described the opposite, as will be described in the negative outcomes section. Cory looked for evidence that her use of technology influenced peer connection. "[Did it] facilitate a conversation between them and someone else? I think that for me, that's the marker that the technology worked."

Other teachers described successful projects where they felt the technology use had sparked inspiration between peers and allowed deep collaboration to occur. Byron talked about another historical research project where students connected their topics:

I think that that gives them a lot of freedom to explore, and if they're comfortable in that exploration, then they're able to kind of reach out and make the connections between what they're learning, what they're friends are learning and support each other in that learning. "Oh, look! Our people are the same … this is a song about both of the people that we're studying."

Projects leveraging technology resources were described as authentic collaborations, where students could learn and influence each other.

21st Century skills. Participant teachers were focused not just on class goals but also on life readiness when describing technology use outcomes. Teachers wanted their students to

be successful in the classroom and confident in life skills. Jerry thought about her resource selection beyond what her colleagues were using:

> I feel like it's appropriate for the age group as well as where we are right now, like what needs to happen and what kids need to learn math, but so much more than math needs to be taught…. I also know that it's something that—technology changes so frequently that it's important to makes sure that students aren't stuck in one set of workflow where they have to save everything in this one place and then they have to move it to this one file because as systems change they need to be able to adapt to all of that.

Karen, who worked with much younger students, also thought beyond her class goals when making resource decisions:

> I think there is the piece of that part of our job as teachers is to prepare students for what's in front of them and I think that it's a very digital world that's in front of them and giving kids who might not get this exposure at home, might not have an iPad, might not have a computer, might not learn how to type otherwise, things like that, does speak to the equity discussion in that those are skills that they will need … understanding that one child's or one family's experience is going to be very different than other families or other children based on what they're bringing to the table.

These early grade teachers were mindful of the importance of student fluency with technology tools. In addition to encouraging all of her students to gain 21st Century skills, Greg thought deeply about the current demographics of the STEM field and the opportunity she had to change the landscape through her teaching. She described her commitment to using technology with the youngest students: "Technology in the lower grades is so important is because it's an opportunity to get children of color and girls very interested in technology in a very level playing field." She went on to describe her impact. "Coding is a place that is predominantly White and male, but we have girls that are very good at coding and boys who actually respect them for being wonderful at coding. And we have kids of color who are also extremely marginalized in this [STEM] community, who have an opportunity."

Teachers recognized that it wasn't enough to provide equitable opportunities to use resources, but also to have access to those tools through guided instruction instead of assumed fluency. "Now I don't just assess them for no reason. I usually create videos—tutorial videos—to teach them how to use technology. They have to learn how to use the technology, too. So, in that sense, it's part of the assessment," mused Hera. Jason cautioned, "I think that I do a good job of not assuming any technology competencies necessarily and am able to scaffold the lessons so that everyone is able to get up to speed."

Participant teachers described how they knew if students were benefitting or having a meaningful experience or not when they integrated technology resources in their teaching. They saw multiple ways their use enhanced their curricular, pedagogical, and community goals. Every participant gave examples of positive outcomes they felt were the result of specific uses of technology in their classrooms. These included high engagement of their students of diverse backgrounds, increased student effort, student ownership, self-motivation, and enthusiasm for learning. They also saw an increase in family awareness and engagement in school. Teachers noted greater authenticity in their work with students when incorporating technology purposefully. They saw more authentic collaboration between students and increased confidence in 21st Century skills for students.

DISCUSSION

The data show that participant teachers applied their culturally responsive approaches to their implementation of a relatively new resource in classrooms. Participants reported that technology's unique characteristics could make it a particularly useful tool for implementing culturally responsive pedagogy.

In the literature of culturally sustaining pedagogies, including culturally competent, culturally proficient, culturally responsive, culturally relevant, and multicultural education, researchers and practitioners advocate decentering Whiteness in classrooms and expanding upon the historical approaches to teaching and learning in American classrooms. Such classrooms are no longer predominantly White spaces, and the diversity of the student body is growing. The teachers in this study, purposely selected for their self-identified qualities of cultural responsiveness and technological proficiency, have important perspectives on technology as a multi-faceted learning tool that allows students of diverse backgrounds to access academic resources that reflect their lived experiences and therefore engage them more directly in the academic work at hand.

Gay (2000) defines culturally responsive teaching as using the cultural characteristics, experiences, and perspectives of ethnically diverse students as conduits for teaching them more effectively. She further believes that teachers need to learn how to convert this awareness into culturally responsive curriculum designs and instructional strategies and to create classroom climates conducive for learning when students are of diverse backgrounds. As one of the focus

group participants remarked:

> I feel technology can be a unifier for the playing field for kids to produce work, but also for kids to access work…. But then I also think that the way that we think about using technology with the kids is beginning to understand (sic) how it can be a tool for access for the world. So, it brings in more stories and more perspectives and more tools for learning. We're bringing the Harlem Renaissance Study to my school this year, so we can use the technology to listen to the music of the time; to look at paintings from the time to bring those resources into the classroom that if we only had our read aloud book, would limit us in a way. It's also a window to bring more of our studies to life for the kids in a variety of ways.

Teachers need to know how to use cultural scaffolding in teaching students who are different from themselves (Gay, 2009). A culturally responsive classroom balances both a "mirror" and a "window" approach, supporting children in feeling known and on solid footing while also opening their world to develop new understandings through exposure to unknown content and perspectives. A "mirror" approach holds a mirror up to a student and allows them to see ideas from a familiar perspective that reflects their own prior knowledge and experiences. Celia, working with young children, brought this awareness to her planning:

> I think particularly now that I'm in a kindergarten classroom, many of my students it's their first year at school, and so, for me, I want to honor what they bring to the table and their identities and make sure that the stories that I read aloud have characters that look like them in some capacity; so that it is relatable to them, and it's not going to be somewhere down the line, like maybe in third, fourth, or fifth grade where they're saying this is the first time I've heard my story.

In this qualitative research, all participant teachers found that technology allowed them to provide their students with perspectives and content not readily accessible in the physical classroom, including contrasting viewpoints on historical events, which allowed them to challenge their students and discuss the very idea of history and facts from a critical perspective. A focus group participant described this:

> I would say that because my class currently is not as visually racially diverse, it's important to bring other voices into the classroom and help kids understand that there are different perspectives to things. I would say that also being culturally competent is also knowing my personal biases that I bring into the classroom, and how that may affect how I presenting things, and just being aware of that and knowing that there are parents and there are families in the classroom [who] also have their biases coming in trying to figure out, not to butt heads, but trying to find some common ground.

Teachers sought to leverage technology to empower students; for example, they saw technology resources as an opportunity to expand the audience students could reach with their

social justice initiatives. Hera was typical of participant teachers in her thoughtful analysis of integrating technology:

> That's how I actually discover all kinds of tools that are appropriate for meeting my goals—not as the other way around—which is people learn tools and then try to figure out how to use this tool for something else and I think that's backwards because you need to figure out what you're trying to teach and then figure out what tools are possible for achieving that goal…. I was part of the National Writing Project—where they teach basic principles on good teaching, what is good teaching. But what I learned about good teaching principles applies to what software solution actually meets the rigor or the rule of good teaching.

Thus, we see that the teachers in this study found that technology resources supported their efforts to develop inclusive and equitable learning communities. They found uses of technology to support their culturally responsive instruction, such as providing students with content that reflects their experiences more broadly.

This study provides critical insights into how self-identified culturally relevant teachers use technology. Although numerous research studies have investigated ways to help teachers learn to integrate technology (Brown & Warschauer, 2006; Darling-Hammond et al., 2005; Mishra & Koehler, 2006; Nadolny, 2011; Pierson & Cozart, 2005), few studies have looked at the specific integration of technology with culturally responsive pedagogy. This study provides previously undocumented data on teacher practices in leveraging technology resources in diverse classrooms. The interviews and other data sources capture rich descriptions of how teachers use technology for these purposes. Participants provide evidence that technology can be an active dimension of their work toward equity and inclusion. Thus, this research expands upon existing literature on pedagogical practice in both technology in education and diverse classrooms.

CONCLUSIONS

Based on the major findings and interpretations, there were two major conclusions:

1. Technology can enable engagement of students in a wider sphere, increasing their learning opportunities.
2. Technology does hold the potential to positively impact teacher's goals for equity and inclusion.

This first conclusion connects to the specific uses of technology teachers described in their culturally responsive classrooms. Many teachers found that technology could provide a

more diverse and expansive landscape of content for their students. This enabled teachers to expose students to contrasting perspectives and viewpoints as well as viewpoints that reflected the students' own values and experiences, no matter where they came from. This expanded sphere of reference also allowed teachers to feel they were able to differentiate instruction authentically and effectively.

This second conclusion stems from the many positive outcomes described by participant teachers when they leveraged technology resources to support their classroom goals. The teachers found uses that supported differentiated instruction when serving wide-ranging groups of students. They especially appreciated tools where they could collect formative assessment information on students in collaborative teams that could influence their instruction. They found uses that supported collaborative student work in disparate communities where students could work together on problems they had identified and seek solutions they could communicate with larger audiences. This critical consciousness is an essential component of culturally responsive pedagogy described in the literature. Additionally, teachers found that technology allowed them to have stronger home-to-school connections where they could partner with families and have effective engagement at home to support academic success in school.

This research study sampled a very small group of individuals. The participant teachers all pursued a similar pedagogical practice. They all worked in urban, private, and relatively well-resourced schools, often with a highly selective student group. Future research should look at a far larger sample size with a broader demographic. A longitudinal study, where students in diverse classrooms were tracked to see the progress of the students over time, would give a more in-depth insight into the success of technology integration in culturally responsive classrooms. It would be essential to define success more broadly, beyond just school performance in academic benchmarks. Measures of success should also include more 21st century competencies in students, such as critical thinking, openness to diverse perspectives, and cultural competency.

This study sought to understand how teachers who consider themselves to be culturally inclusive teachers use technology to support a culturally responsive pedagogy in culturally diverse classrooms. Participant teachers were actively using technology in ways that map onto their pedagogical values. Teachers described learning using technology in informal ways rather

than through formal professional development. They observed other teachers who shared their values, took risks, and engaged in trial and error with technology resources to discover ways to leverage tools for specific teaching goals. Participant teachers found practices for integrating technology resources that supported their values of equity and inclusion primarily through informal means.

As schools continue to enroll increasingly diverse student bodies, all teachers must continue to explore and implement pedagogical practices that respect the diversity of the teachers' classrooms and serve the needs of students from a range of cultural backgrounds. The perspective of these participant teachers, committed to broadening the opportunity for diverse learning in their classroom, is essential. Their voices can guide us as we seek to develop effective practices that allow teachers to integrate technology resources successfully in diverse classrooms in order to engage and prepare all students for 21st century skills. At a time when the world is shrinking, these issues are more critical than ever.

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APPENDIX

Table 1 Consistency of Research Questions, Findings, Discussion, and Conclusions

Research Question	Finding	Discussion	Conclusion
How do teachers who identify as culturally responsive characterize the use of technology in their practice?	All participants (100%) conceptualized technology as a learning tool that allowed them, as self-identified culturally responsive teachers, to develop and provide knowledge building and knowledge sharing uses that were more relevant to the diverse perspectives of their students.	Pedagogical Content: The unique affordances of technology lend themselves as a critical resource for teachers engaged in culturally responsive pedagogy.	Technology enables engagement of students in a wider sphere, increasing their learning opportunities.
When incorporating technology, how do teachers describe the extent to which they feel they are achieving equity and inclusion with their students of diverse backgrounds?	Participants described both positive and negative experiences related to their culturally responsive teaching goals, but all (100%) most frequently described their positive experiences. They felt these uses supported efforts in cultivating stronger and more confident students and families.		Technology holds the potential to positively impact teacher's goals for equity and inclusion by providing unique resources that enable teachers to act on their goals for inclusivity.
What factors and conditions do teachers report as helping and/or hindering their learning regarding technology use that supports equity and inclusion efforts in their classrooms?	All participants (100%) indicated that they were self-directed and learned about their use of technology resources for culturally responsive approaches through informal means, including from peers who held the same values.	Teacher Learning: The teachers in this study perceived themselves as self-directed learners and sought learning opportunities through informal approaches, in particular with peers they saw as culturally competent and aligned with their own thoughtful practice in service of their beliefs and values for equity and inclusion.	Formal Learning is not necessarily the primary vehicle by which teachers learn to use technology in ways that support equity and inclusion.