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Confronting Tools of the Oppressor: Framing Just Technology Integration in Educational Technology and Teacher Education

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Power, privilege, and prejudice are embedded within technologies. While technologies can be designed and used for democratization and empowerment, they can also be used to undermine the foundations of democracy in a variety of ways. Using a conceptual framework of technologically embedded injustice, the authors engaged in a theoretical analysis of just technology integration in the preparation and professional development of preservice and in-service teachers. They investigated why the field of educational technology has been historically slow to incorporate critical approaches, in general, and in teacher education, in particular. They argue that educational technology's roots are deeply influenced by US policy prioritizing technology for purposes of defense and capitalism. They further suggest that big tech's surveillance capitalism and privatization of education creates a troubling tendency to overlook systemic power imbalances. The analysis suggests that educational technologies are tools *of* the oppressor, *made by* the oppressor, with power baked into their designs. As a result, they propose a clearer definition of "just technology" and suggest four intersecting approaches to move toward justice: turn toward critical approaches (e.g., critical theories); revise standards to make systemic change; wrestle with the role of education and technology in a democracy; and interrogate educational technologies. Their definition is not definitive, and their recommended practices serve as springboards, not walls. This work has been lacking in teacher education and educational technology and may open discourse, lines of inquiry, and new interpretations of justice in educational technology.

Power, privilege, and prejudice are embedded within technologies. While technologies can be designed and used for democratization, empowerment, and transformation of how individuals work and learn, they can also be used to undermine the foundations of democracy by sowing misinformation (Vaidhyanathan, 2018); amplifying conspiracy theories (Tufekci, 2017); violating data privacy (United States Government Accountability Office, 2020); reinforcing discriminatory design and algorithms of oppression (Costanza-Chock, 2020; Noble, 2018); cultivating inequality, both consciously and unconsciously (Eubanks, 2018); contributing to increased racialization (Benjamin, 2019; Noble, 2018), and fostering carceral pedagogy (Swauger, 2021; Watters, 2020). Although scholarship exists that addresses issues of justice and technology, critical technology scholarship has not been well integrated into teacher preparation or educational technology (Asim et al., 2020; Bradshaw, 2017, 2018; Heath & Segal, 2021; Krutka et al., 2019).

In teacher education, critiques of technology are rarely discussed or illuminated when preparing teachers to teach with technology (Heath & Segal, 2021; Krutka et al., 2019). Failing to question educational technology and the practices surrounding its integration perpetuates an assumption that technology is a neutral tool, often harming the most vulnerable in our schools (Asim et al., 2020; Heath & Segal, 2021; Manolev et al., 2019).

Too frequently, teacher technology education focuses primarily on how to use and integrate technology as tools (Kay, 2006), but it fails to explore its inherent and often problematic complexities (Asim et al., 2020; Benson, et al., 2017; Bradshaw, 2017, 2018; Heath et al., 2021; Subramony, 2017; Tshuma, 2021) or built-in injustice (Benjamin, 2019, Noble 2018). Technology is not neutral, and this understanding is critical for everyone involved in schooling to comprehend and interrogate. As Benjamin (2019) noted,

> By pulling back the curtain and drawing attention to forms of coded inequity, not only do we become more aware of the social dimensions of technology, but we can work together against the emergence of a digital caste system that relies on our naivety when it comes to the neutrality of technology. (p. 11)

We, the authors, take this quotation as a challenge, to ourselves and our peers who integrate educational technology, especially in the preparation and professional development of preservice and in-service teachers, to draw back the curtain and attend to the injustices that we perpetuate when teacher educators ignore the role of power, privilege, and prejudice encoded into the technologies that teachers and students use every day.

In our past scholarship (Asim et al., 2020), we wondered why the work of current scholars studying the intersections of justice and technology (e.g., Benjamin, 2019; Benson, 2017; Bradshaw, 2017, 2018; Nichols & Allen-Brown, 1996; Noble, 2018; Subramony, 2017) are not often cited by our field, and we have stressed the need for greater emphasis on race and justice (Asim et al., 2021; Heath, 2018; Heath & Segal, 2021). In this article we use a theoretical framing of embedded injustice (Benjamin, 2019) to

pursue the question, What does *just technology* mean in teacher education?

Theoretical Framing

Throughout the history of educational technology, a majority of scholars emphasized the possibilities of technology; however, several scholars emerged as contrarians and technology Cassandras. For example, Postman (1993/2011), McLuhan and Fiore (1967), and Turkle (1984) cautioned that technologies created new environments, fundamentally altering individuals and society. Cuban (2009) famously critiqued technologies as "oversold and underused," while Feenberg (1991) argued that technologies increase inequality and threaten democracy if society fails to democratize the use of technologies. Watters (2020) scrutinized educational technology's historical (and failed) attempts to "personalize" education. Selwyn (2016) reminded the field to explore technologies as socially embedded and to take a broader and, often, a more global, perspective to consider the potential harms of technologies.

Technologically Embedded Injustice

Echoing earlier critiques of technology, more recent scholars like Benjamin (2019), Costanza-Chock (2020), Noble (2018), and Buolamwini and Gebru (2018) acknowledged that technologies can be wielded as tools of oppression because of the socially embedded nature of technology. However, these scholars also argued that oppressive systems are coded deep within the technologies themselves. This critique signified an important shift in equitable technology discourses. It moved the argument from earlier criticisms of social embeddedness to an acknowledgement that oppressive systems are intersecting (Crenshaw, 2017), deeply rooted, and encoded within the system of "imperialist white-supremacist capitalist patriarchy" (coined by bell hooks, n.d., p. 1). While Feenberg (1991) argued that technologies can be contested and democratized through the choices and actions of users, recent scholars (Benjamin, 2019; Noble, 2018) pointed out that entire social systems of inequity must be dismantled in order for technology to become more equitable.

Lorde's (1979/2018) speech and essay, *The Master's Tools Will Never Dismantle the Master's House,* provides a powerful metaphor for understanding technology as both a tool of power and a process for crafting power. Lorde referred to tools for thinking, particularly patriarchal tools devised by white patriarchy and employed by white feminists. Lorde critiqued white feminists who applied those tools to make "reasoned" appeals to whiteness while simultaneously wielding the tools to oppress Black women. However, Lorde's metaphor also serves in conceptualizing technology as a process and a way of doing that demands interrogation. It leads one to wonder, which tools are the master's tools? How are the master's tools used and by whom? Who crafts and who brandishes the master's tools?

As we have engaged in this work, we recognize our own positionality and the tools we carry and employ. The theoretical analysis, findings, and conclusions of this article reflect the intersections of our own identities

and power. Marie identifies as a white female academic, researching technologies and social studies in teacher preparation. Sumreen identifies as a Muslim hijabi, South Asian, STEM (science, technology, engineering and mathematics) teacher educator and academic. Natalie identifies as a woman and first-generation, Colombian-American academic, who conducts educational technology research, including in teacher education. Jessa identifies as a white female educator and doctoral candidate with experience developing and delivering in-service teacher technology education.

All four of us research the area of educational technology in higher education and two of us in teacher preparation, specifically. We all believe in the possibilities of educational technology to enrich learning experiences, and our careers reflect our commitments to these potentialities. At the same time, we have growing concerns about the ways that technologies (within and outside of education) have embedded and exacerbated injustices, often without notice or deeper questioning from those who use it. This issue is especially important for teacher educators and teachers alike to examine, reflect on, theorize about, and act on.

Additionally, although this article centers issues of race and culture, it is not meant to exclude or ignore other injustices in the matrix of oppression. Examining the nexus of justice within educational technology and teacher education is much more complex and spans intersections beyond the scope of this article. We recommend further explorations of other embedded systems of injustice, including but not limited to ableism, ageism, classism, settler-colonialism, heterosexism, and patriarchy.

Interrogating Embedded Injustice in Educational Technology

To understand the current state of justice and critical approaches in teacher preparation and educational technology, we first needed to understand the field's historical approaches. We applied our theoretical frame of embedded injustice to historicize the mid-20th century through the present movement for increased educational technology integration, the rise of technology companies in public education, and reforms to close the digital divide.

Echoing the claims of Vossoughi and Vakil (2018), Wieb et al. (2021), and other STEM scholars, we argue that many reforms were rooted in capitalistic and militaristic assumptions about the role of education. US national policy uncritically institutionalized assumptions that technology in education must be a net positive for learning and society.

We also examined the outsized influence of technology companies in education as they commodify students, their data, and learning -- a problem exacerbated by the global pandemic. Finally, we amplify Warschauer et al.'s (2004) critiques of the digital divide literature and extend them using our theoretical framing of intersecting oppressions embedded in technology and society.

We conclude our historicization by arguing that the fields of educational technology and teacher education have historically upheld intersecting oppressions. We also suggest that the modern incarnation of teacher education and technology is too comfortable with big tech, and that relationship creates a troubling tendency to overlook issues of justice and systemic power imbalances. Given the potential and existing injustices of rapid technology adoption in education, in general, and the tendency of policymakers to overlook issues of justice in educational technology and teacher education, it is crucial to consider what *just technology* means for educational technology and teacher education.

Embedded and Intersecting Systems of Power in Educational Technology's Past

While notable exceptions exist (e.g., recent U.S. National Science Foundation grants for greater inclusion and access in computer science, such as Computer Science for All, Vossoughi and Vakil (2018) argued that a significant impetus for much of the federal STEM funding of the last 75 years was produced by and works to uphold the military industrial complex and the economy, reflecting hooks' (n.d.) observation of the interconnected "imperialist white-supremacist capitalist patriarchy" (p. 1), which works in concert to oppress. The push for increased technology in schools has historical roots to at least the mid-20th century, when US policy makers assumed that more technology (and more emphasis on STEM subjects) would strengthen education and provide overall benefits to US society.

Education reformers drew correlations between the health of the United States' ability to defend itself militarily and economically and the education system, proposing that teachers should more effectively teach science and math and integrate technology into schooling (Kliebard, 2002). The militarist belief that technology provided a solution to the problem of national defense, and the capitalist emphasis concluding that more STEM curricula would lead to an inherently stronger economy and better world manifested in national education policy. Based on these approaches to increased technology, the federal government offered billions of dollars to industry, practitioners, and researchers.

Often, these initiatives were grounded in a language of alarm and deficit. Both the *National Defense Education Act* (NDEA) and the report *A Nation at Risk (*National Commission on Excellence in Education [NCEE], 1983) utilized fear to motivate technology increase and adoption that promoted technosolutionism (Morozov, 2013). However, it lacked any critique of technology's disadvantages and potential for harm.

The space race of the 1950s led to the creation of the NDEA in 1958, sending over 1 billion dollars into science education (Jolly, 2009). Title XII of the NDEA called for increased media and technology use and money for "training teachers to utilize such media with maximum effectiveness…" (p. 1595).

In 1983, *A Nation at Risk* again sounded an alarm over failing science, technology, and math skills, opening the report with the statement, "Our

Nation is at risk. Our once unchallenged preeminence in commerce, industry, science, and technological innovation is being overtaken by competitors throughout the world" (NCEE, 1983, p. 112). Later, the authors of *A Nation at Risk* expressed concerns that "we are raising a new generation of Americans that is scientifically and technologically illiterate" and that there was "a growing chasm between a small scientific and technological elite and a citizenry ill-informed, indeed uninformed, on issues with a science component" (p. 116).

More recently, the emphasis on STEM curricula and the 2005, *Rising Above the Gathering Storm* report **(**Committee on Science, Engineering, and Public Policy, National Academies of Sciences, Engineering, and Medicine, 2007), as well as the follow-up report (National Academy of Sciences, National Academy of Engineering, and Institute of Medicine, 2010) and the *National Education Technology Plan [NETP] Update* (Office of Educational Technology, 2017), have suggested that technology knowledge will foster both national and individual economic wealth. An analysis of the NETP by Wiebe et al. (2021) concluded that "the NETP serves to promote a particular educational agenda that benefits corporate and private interests" (p. 282), raising even more questions about the implications of such a policy stance on K-12 education.

Institutionalizing U.S. Technology Policy Into Teacher Education Standards

The underlying assumptions driving national policy – that technology can ensure national preeminence in industry, military, and the economy – have also permeated teaching standards and teacher education. Technosolutionism (Morozov, 2013) and technology-as-progress narratives continue to influence discourse and practice in educational technology spaces (Greene, 2021; Krutka et al., 2019; Papert, 1988; Sims, 2017; Watters, 2019). Technosolutionist approaches presume that technology can "solve" a social – or in educational technology's case, an educational – problem pro forma. From Skinner's (2013) "Teaching Machines" through the possibilities of computers helping children conceive of abstract concepts (Papert, 1993) to using technology as mindtools (Jonassen, 1999), these approaches rest on a belief that proper implementation of technology will close an educational gap or fix educational problems.

Some scholars and educators (e.g., Cuban, 1986; Greene, 2021; McLuhan, 1964; Postman, 1993/2011; Warschauer, 2000; Watters, 2019) have challenged the assumptions that increased technology in education will lead to economic prosperity and global (or at least, global north) stability. Yet, the generally uncritical discourse that technology is necessary for (uninterrogated and normalized definitions of) personal and societal success has deeply influenced education and teacher preparation.

For instance, in *A Nation at Risk* (NCEE, 1983), its authors asked that "new instructional materials … reflect the most current applications of technology in appropriate curriculum areas" (p. 126), and this push is evident across national accreditation and standards, which drive curriculum, instruction, and teacher preparation programs. The Council for the Accreditation of Educator Preparation (for teacher preparation

programs in institutions of higher education) and the Council of Chief State School Officers' Interstate Teacher Assessment and Support Consortium (for ongoing, in-service teacher education) incorporated technology in their standards.

Additionally, content area associations such as the American Council on the Teaching of Foreign Languages, International Society for Technology in Education (ISTE), National Art Education Association, National Council of Teachers of English, National Council of Teachers of Mathematics, National Science Teaching Association, Association for Science Teacher Education, and the National Council for the Social Studies also included technology in their standards. This broad inclusion of technology into national standards suggests its assumed importance to education.

Recently, in recognition of the ways that technology might be unethically used, and to promote digital citizenship, teacher and teacher educator technology standards and competencies have mentioned the importance of ethical use and/or equitable access and use of technology (e.g., Council for the Accreditation of Educator Preparation, n.d.; International Society for Technology in Education, n.d.; National Council of Teachers of English, n.d). However, these standards appear to assume that users already possess a deep understanding of technology ethics and equity beyond the basic conversations associated with access (Krutka et al, 2019).

Further, although these organizations' standards documents include the vocabulary of equity, access, and digital citizenship, none of these standards connect issues of race, socio-economic class, identity, and power with technology standards. For example, the Teacher Educator Technology Competencies (Foulger et al., 2017) highlighted the importance of "addressing legal, ethical, and socially-responsible use of technology in education" (p. 433), which leave room for a more explicitly critical approach but do not directly call for one.

Similarly, the ISTE (2019) Standards for Coaches emphasized the role of coach as a "change agent" who "facilitates equitable use of digital learning tools and content" (Standard 4-1b). However, facilitating ethical and equitable use of technology is difficult when teachers, teacher educators or coaches, and administrators are unprepared to teach about the inherent injustices of technology. Consequently, this void means teacher educators and educators alike lack knowledge to ask critical questions about technology.

The standards and practices in the fields of teacher education and technology promote a solutionist approach to technology, suggesting that, if only schools had better and more effective technology integration, then educators could close learning gaps or repair existing educational problems. Our field of teacher education (and we, the authors, have contributed to this discourse in our roles as scholars and practitioners), often centers *how* to best teach technology integration and how to increase its use, but rarely considers whether we *should* be integrating technology.

For instance, teacher educators have engaged in decades-long debates about when and where to include technology courses in teacher

preparation programs (Kay, 2006), how best to model and teach holistic technology integration, such as technological pedagogical content knowledge (Koehler & Mishra, 2009), and how to center around pedagogy instead of schema like the SAMR model (Puentedura, 2013), the Technology Integration Matrix (Shaw et al., 2018), or the PICRAT model (Kimmons, et al., 2020). However, outside of a few contrarian critics, like Cuban (1986, 1993, 2009), McLuhan (1964), Postman (1993/2011), and Watters (2019), little discourse exists debating the merits of technology integration itself. An even smaller subset of literature has examined issues of justice within educational technology (e.g., Bradshaw, 2017, 2018; Tshuma, 2021) and its intersection with teacher education (Heath & Segal, 2021).

The Problematic Role of Technology Companies in Education Today

While US policy has consistently encouraged technology use in schools, the technology being integrated is almost always crafted by private companies who profit from the use of technology in public education (Regan & Khwaja, 2019). K-12 districts, individual schools, and institutions of higher education – teacher preparation programs included – increasingly purchase products and services sold by the major players in technology (often referred to as *big tech*) like Amazon, Apple, Google, and Microsoft. The COVID-19 global pandemic and the move to emergency remote teaching and learning amplified the role of big tech in education at all educational levels (Hodges et al., 2020; Milman, 2020).

Big tech has benefited from an educational dynamic that consistently underfunds public education but demands increased technology to prepare the workers of the future, providing low-cost solutions in exchange for data and the potential for future product loyalty (Klein, 2020; Krutka et al., 2021; Regan & Khwaja, 2019). Technology corporations embed themselves into the fabric of schooling, subsuming and consuming the traditional "public good" of schools in a democracy. Although their intentions might be considered positive and for the common good, there is a real or potential conflict and disconnect between the need to make profits (and survive in a capitalist society) and the desire to support schools and improve schooling (Boninger et al., 2017).

Big tech and other educational technology tools offer cheap and useful services to education (e.g., free or inexpensive video conferencing, collaborative learning tools, and online video journaling). However, ceding the power of educational choices to for-profit corporations has a variety of negative consequences. Children and students of all ages become a commodity first, and the public good of education is pushed down the list of priorities (Regan & Khwaja, 2019). For big tech, indoctrinating students early into a software or hardware encourages students to become customers for life. Further, companies gather data on students to increase usage rates and sell goods and services back to students and their families (Zuboff, 2019).

Besides dictating which technology must be used in a school, the design of big tech often molds pedagogical practices (Moeller, 2020), removing or limiting a teacher's choices about how and what to teach. This can

disenfranchise and deprofessionalize educators. For example, Google frames the practices of teachers toward the banking model of education (Freire, 1970), potentially setting up a dynamic wherein the teacher has the most power and students are present to "receive" the knowledge of the instructor (Gleason & Heath, 2020).

Another area of concern is the proliferation of surveillance technologies, not only for proctoring tests, but also monitoring the devices, technologies, and engagement of students. These tools raise myriad alarms including how they cultivate carceral pedagogy (Swauger, 2021; Watters, 2020), which Watters (2020) defined as "a pedagogy that draws on beliefs and practices that echo those of prisons — surveillance, punishment, and too often literal incarceration" (para. 13). They police student bodies and time (Silverman et al., 2021), and in the case of emergency remote teaching and learning, shift the burden of monitoring from the state to the family (Gleason & Heath, 2021).

Additionally, when K-12 and higher education, including schools, colleges, and departments of education opt to use big tech products and services, educators often have no choice in the use of these products. They are rarely prepared to critically assess and question potential negative outcomes from the tools they use with students, nor are they advised how to inform their own students and caregivers about the consequences of technology use, much less provide opportunities to select alternatives or the ability to opt out of using these tools in the first place.

The COVID-19 global pandemic facilitated rapid technology integration and changes to teaching practices as schools, teachers, and teacher educators quickly pivoted to emergency remote teaching and learning (Howard et al., 2020; Johnson et al., 2020). Because of the crisis, schools adopted many of big tech's technologies without the traditional vetting and critical questioning used to make just pedagogical and technological changes. Certainly, these abrupt changes were necessary to facilitate emergency remote teaching and learning during a time of crisis. However, the rapidly adopted technologies may remain moving forward. The potential impact from these unplanned changes contributes to the urgent need to recalibrate how we prepare current and future teachers, teaching them to examine questions of justice within their technology integration practices.

Beyond the Digital Divide

The global pandemic also vividly illustrated the unjust gap in access to technology, as families scrambled to find devices and broadband access in order for their children to participate in remote education. For several decades, educational technologists have debated the potentialities of new educational technologies to alleviate existing inequalities (e.g., Cuban, 1986, 1993, 2009; Van Dijk, 2020; Warschauer, 2000, 2004; Wenglinsky, 1998).

Early discourse settled primarily around two narratives: one of reform and one of inequality (Warschauer et al., 2004). Reformers posited that educational technology might be the push that schools needed to shift

toward student-centered and constructivist pedagogies (e.g., Papert, 1993; Sandholtz, 1997), while the inequality discourse focused on issues of access that could inhibit reform while exacerbating entrenched economic and racialized disparities (e.g., Warschauer et al., 2004; Wenglinsky, 1998).

Many definitions and conceptualizations exist for this *digital divide* (Van Dijk, 2020). To help clarify the definition, Van Dijk categorized it into the following three levels: Level 1 - physical access (1995-2003); Level 2 - skills and usage (2004-present); and Level 3 - outcomes (2012-present).

From the beginning of the inequality discourse, researchers cautioned that the term oversimplified complex social problems such as schooling, poverty, and racism and presented technology as a techno-utopian solution to equity through access (Warschauer et al., 2004). Dolan (2016) and Gonzales (2016) also noted the complexities associated with the term, with Gonzales asserting it should be understood "as embedded within a history of broad social disparities" (p. 234). These cautions reminded educational technologists, teacher educators, and decision makers to consider the social embeddedness of technology and reject the technosolutionist determinism that crept into the digital divide discourse. Despite these critiques, the notion (and the admittedly memorable and simple catch phrase) of a "digital divide" gained traction in scholarly and popular discourse, leading to the commitment of significant resources and research to "bridging the digital divide" (Hoffman & Novak, 1998; Servon, 2008).

Recent critiques of unjust technology framed and extended the earlier cautions of Postman (1993/2011), Feenberg (1991), and Warschauer et al. (2004) within a conceptualization of embedded injustices and discriminatory design. Benjamin (2019), Noble (2018), and Buolamwini and Gebru (2018) acknowledged that technologies can be wielded as tools of oppression because of their social embeddedness, but they *also* argued that oppressive systems are coded deep within the technologies themselves. Although they shared possible solutions, their warnings signified an important shift in equitable technology discourses. The critique moved from social embeddedness to deep-seated oppressive systems. These scholars ask researchers in technology studies to take a deeper and more explicitly critical look at technologies themselves and interrogate the very origins of a technology's creation.

Embedded Injustice

Current scholars, especially Black feminist scholars such as Benjamin, Gebru, and Noble, have argued that technologies themselves are not only "not neutral," they carry oppression within their deepest encoded designs (see also Costanza-Chock, 2020). Societies, companies, coders, and designers forge – often unwittingly – technologies in the fires of oppression, baking injustice into the bones of their designs, crafting architecture that can cause material and physical harm.

Facial recognition software, designed by companies like Amazon, IBM, and Microsoft, does not easily recognize the faces of women and darker

skinned individuals (Buolamwini & Gebru, 2018). As Benjamin (2019) noted, from automatic soap dispensers that fail to recognize dark skin, to Google maps pronouncing "Malcolm X Boulevard" as "Malcolm Ten Boulevard," to spell checks refusing to acknowledge "underserved" as a word, technologies reveal their racist and classist tendencies. While it may be tempting to dismiss these examples as glitches in the machine, emerging scholarship has exposed these flaws as deeply problematic and embedded in the design (see also Noble, 2018). The algorithms serve to reproduce existing power structures, while the so-called glitches signal attention to deeper, embedded racism within the design.

The design becomes the architecture that structures social interactions, and in educational technology and teacher education, the design becomes the architecture that structures and often is the foundation for students' learning. For instance, when Calloway (2020) searched for the phrase "unprofessional hairstyles" on Google, Google shared images of Black women's natural hair. When searching for the phrase "professional hairstyles," Google populated images of white men's hair (Kirchner, 2015).

Similarly, in educational technology, apps like Class Dojo present race-neutral monster avatars while normalizing performative behaviors of whiteness, such as sitting "appropriately" (a subjective notion, quantified by the use of Class Dojo; Manolev et al., 2019). The architecture of the technology itself actively blocks the success, equity, and justice for Black, Indigenous, and other people of color, while reinforcing the power and privilege of whiteness.

Discussion: Toward Just Technology Integration in Teacher Education

Part of the work of this article involved wrestling with *just technology integration* – the historical influences on technology integration, current technology integration practices, and the barriers and supports that exist for just educational technology. This discussion section opens with a proposed framing of just technology integration. The framing is informed by our interrogation of the field, as well as our prior work (Asim et al., 2020; Heath et al., 2021), the contributions of scholars involved in the Social Science Research Council (SSRC) project on Just Technology (see https://www.ssrc.org/programs/just-tech/), and Costanza-Chock's (2020) work on Design Justice (see https://design-justice.pubpub.org/pub/ap8rgw5e#design-justice). We are mindful of Marcovitz's (2022) caution that scholarship on social justice and educational technology tends to thinly define or undertheorize what justice means, thereby minimizing or offering thin conceptualizations of the concept. Thus, we return to our theoretical framing of this paper to draw on the queer (Costanza-Chock, 2020), and black feminist scholars (Benjamin, 2019; Noble, 2018) working at the intersection of technological justice.

We propose that just technology integration in education should lead to full liberation and the promise of a multiracial democracy for all learners. To achieve these aims, just technology should be considered a collective process of crafting and recrafting and using tools to dismantle injustice and rebuild education toward just ends. Just technology always requires

an acknowledgment of the existence and impacts of intersectionality and systemic inequality in educational spaces to challenge the system of "imperialist white-supremacist capitalist patriarchy" (hooks, n.d.).

Further, just technology integration invites a critical interrogation of the technologies themselves, while also scrutinizing their history, context, and intersections with systems of oppression, to ensure that institutions do not compromise the flourishing of people, regardless of their social group or identity (Gordon da Cruz, 2017). As in Lorde's (1979/2018) essay, *The Master's Tools Will Never Dismantle the Master's House*, just technology requires a reconceptualized understanding of tools. Educators might think through the design and use of tools as embodied in joy and Black (Benjamin, 2019; hooks, 1981), queer (Lorde, 1979/2018; Costanza-Chock, 2020), and Indigenous ways of knowing (Shorter & TallBear, 2021; Tuhiwai Smith, 2021), wielded with feminist notions of care and a righteous anger at injustice.

In the next section, we suggest moves toward just technology integration. Although we present them as individual suggestions, we understand them as interconnected. We begin with what are *not* practices of just technology integration. Our analysis throughout this paper suggests that just technology is not a continuation of practices that ignore power and presume neutrality of technology nor of schools. It is not an assumption, like that of the *Defense of Education Act* or *A Nation at Risk*, that technology in schools will save our economy or our military. It is not an uncritical insertion of technology into education standards. It is more than equitable access, bigger than the digital divide. It does not involve, to paraphrase Audre Lorde, using the master's tools to rebuild the master's house.

Further, if technology is not only a tool *of* the oppressor, but also a tool *made by* the oppressor with the oppressor's power and privilege baked into its design, no amount of increased access will change injustices. From this premise of encoded systemic racism, the question of "bridging the digital divide" presents as a settler-colonial solution wherein the oppressed are required to use tools of the oppressor to liberate themselves. This orientation suggests that technology exacerbates, entrenches, and extends systemic oppression.

What are we to do as researchers, teacher educators, and practitioners? Technologies are often helpful, and more than that, they are often necessary or required. School systems mandate teachers' use of certain technologies, even as they marginalize and harm students (Krutka et al., 2021; Gleason & Heath, 2021; Heath et al., 2021; Henderson & Milman, 2021; Regan & Khwaja, 2019). Educators face tensions when there are no other tools freely available to use, as well as when they must use technologies mandated or chosen by administrators. Certainly, teacher educators and school practitioners are not powerless – they may make intentional pedagogical choices to use technology as justly as possible. However, this circumstance creates a dilemma for educators, as they navigate advocating for themselves and their students while also being critical of tools they choose or must use.

We recognize this tension and, therefore, propose four intersecting approaches to confront the historical and current tendencies of the field to presume race-neutral, techno-utopian, and technosolutionist narratives in educational technology and work toward just technology integration. Again, we recognize that our definition is not definitive, and our recommended practices serve as starting points. That is, we find evidence that these understandings are absent in teacher education and educational technology, and we hope our work opens discourse, lines of inquiry, and new interpretations of justice in educational technology.

Turn to Critical Theory and Black Feminism

Teacher preparation increasingly addresses issues of justice; however, the field continues to "grossly under-theorize race" (Milner et al., 2013, p. 339). Scholars working at the intersection of teacher education and technology education are even less likely to theorize race (Heath & Segal, 2021). Consequently, we submit that just technology in teacher education requires more than simply addressing issues of access to technology; it also requires an acknowledgement that, to adapt a phrase from Krutka et al. (2020), neither schools, nor the educational technologies introduced to them, are neutral.

The fields of educational technology and teacher education should more fully understand and embrace logics of oppression, including Black feminist theory and critical theory to examine embedded oppression and hegemonies in educational technology. The discourse around access is important. Yet, framing technology justice simplistically and primarily as issues of equity and access allows (white and other privileged) scholars to talk around issues of systemic racism by conflating class and race (e.g., digital divide discourse), instead of directly confronting white supremacy in education and technology. Thus, there is an opportunity to broaden educational technology teacher education. We are not rejecting existing lines of inquiry, but rather we see a place to expand these lines, including that of digital equity, and explore not only the nexus of technology and education, but also its multidimensionality and dichotomies, including the ways it can simultaneously privilege some groups while harming others.

We encourage teacher educators and educational technologists to foster research and engage in reflexivity that explicitly considers issues of racialization in schools with and through technology. We also call for research exploring the potential harms of big tech and surveillance capitalism in classrooms, including strategies to protect children. What are the macro- and microlevel implications when all of the students in a school are using the Google Education Suite, Chromebooks, YouTube, Gmail, and other Google products now part of Google's data scraping (for a definition, see https://www.techopedia.com/definition/33132/data-scraping)? What does it mean for the most vulnerable populations to be unwittingly contributing to algorithms that refuse to see their faces, or worse, use their images to perpetuate racialized programs? Finally, what are the consequences of providing access to flawed tools? We have an obligation, as scholars and educators, to take a positioned stance on these abuses.

Work Through Standards as Systemic Change

Standards codify and institutionalize values. Currently, technology education standards institutionalize the NETP's technosolutionist approaches to technology, grounded in militarism, capitalism, and a belief that the US is in a "race" against other nations for global supremacy. Thus, we challenge teacher educators and educational technologists, as well as those involved in using and revising accreditation (e.g., Council for the Accreditation of Educator Preparation, Interstate Teacher Assessment and Support Consortium, and content area standards) to include technology justice explicitly in their curriculum and standards.

We recommend a purposeful and thorough revision of curriculum, standards, and competencies that demonstrate not only an understanding, but also a commitment to issues of technology justice. Certainly, full, thorough, revisions and creation of new standards that include a lens of justice will take time and resources. However, a targeted push that includes a true diversity of voices in an intersectional approach (Boda et al., 2022) to fully revise and update many of the frameworks in which we ground our thinking is necessary in the longer term for meaningful inclusion of justice-minded practices in education.

In the short term, pursuing expansions of existing curriculum, standards, and competencies can begin to advance our field forward in this work. This could take the form of deeper theorization of existing, albeit surface-level, curriculum, standards, and competencies that mention ethics in educational technology (e.g., ISTE and the Teacher Educator Technology Competencies [TETC]). For example, the TETC (Foulger et al., 2017) rightfully mentions ethics within their competencies; however, the mention of ethics is brief and assumes a level of ethical content knowledge that teachers or teacher educators may lack. Krutka et al. (2019) recommended including a more skeptical lens of inquiry toward technology in the TETC to counterbalance the historical draw as a field to technosolutionism and tech-as-neutral mindsets.

Creation of curriculum and standards is complex, and communicating this complexity in an efficient manner is important; however, the power of curriculum, standards, and competencies in our field to frame thinking and focus attention must be emphasized. After all, standards and competencies shape the content that is taught and assessed, particularly for purposes of accreditation. Topics of ethics and digital citizenship, and more specifically justice, in educational technology are too important and complex for a mere cursory nod.

Wrestle With the Role of Education and Technology in a Democracy

Our theoretical analysis suggests a third practice for more just technology integration: educational technology scholars need to engage with and incorporate broader critiques of the purposes of schools, colleges, and departments of education (SCDEs) as they relate to technology education and, more broadly, schools in democracy. SCDEs, as educational institutions, have historically been places of harm for students

marginalized by racism, ableism, and neoliberalism (Apple, 2004; Dumas, 2014; Ewing, 2018). The field of teacher education has begun to take up work investigating the implications of these unjust structures. Educational technologists working within the field of teacher education are invited to join their teacher education colleagues and consider the impacts, downsides, and structures that may be reinforced through uncritical use of educational technology.

One way to address these unjust structures may be through a more expansive notion of digital citizenship. In educational technology spaces, digital citizenship most frequently refers to conceptions of "good" citizenship as personal responsibility (Heath, 2018), epitomized in Ribble and Bailey's (2007) *Nine Elements of Digital Citizenship*. The term *digital citizenship* should include explorations of the relationship between democracy, technologies, and the (presumed) democratic spaces of public schools. In teacher preparation courses, this definition might include fostering *teacher* digital citizenship – that is, developing educators' understandings of the ways that schools and technology intersect and what, as a citizen teaching for a just and inclusive democracy, their responsibilities to action should be. It might also include education, such as critical digital citizenship (Logan et al., 2022) exemplified by the work of the Young People's Race, Power, and Technology project (Vakil, 2022), which explores civic resistance and civic remixing of antidemocratic technologies.

Interrogate Technologies

Our fourth recommendation is that technology and teacher education take a more critical approach regarding technologies themselves. We do not suggest that teacher educators stop using and teaching with technology, rather we ask teacher educators and educational technologists to teach with *and about* technologies, to help educators make informed decisions about technology use. They might do this by leading an exploration of educational technology expenditures, including fiduciary implications associated with who makes the decisions, how, and why, by using data from organizations such as the EdTech Evidence Exchange (https://edtechevidence.org/). Another possibility is to explore the curriculum and research of the Civics of Technology (n.d.) project**,** which "encourages teachers and students to inquire critically into the effects of technology on our individual and collective lives" (para. 1). The Civics of Technology project includes a series of critical questions to ask about technology, as well as numerous lessons including those involving technoethical integration (Krutka & Heath, 2022) and media education (Heath et al., 2022).

Educational technologists and teacher educators might also interrogate the history of educational technology in schools, to understand the purpose of technologies in schools. Historically, educational technology, like other institutions focusing on STEM subjects, has roots deeply influenced by US policy that prioritized technology for purposes of defense and capitalism. This is not necessarily a universally problematic origin story, but scholars should consider the historical and current techno-utopian and technosolutionist assumptions that might influence epistemological approaches.

As Vossoughi and Vakil (2018) asked,

> How do the discourses that position STEM as fundamental to national interests shape what – and how – students are learning? What, for example, are the pedagogical, curricular, and ethical implications of military-funded STEM intervention programs that target students of color in low-income urban neighborhoods? (p. 118)

Does this history influence educational technology research agendas in ways that might not be immediately clear to scholars? Are teacher educators and educational technology researchers framing research with the aim of "increasing technology integration" without consideration of its potential harm or simplistic technosolutionism?

Conclusion

Current practices in educational technology and teacher education often perpetuate perceived positive aspects of technology but ignore its negative impact on marginalized students (Heath & Segal, 2021). This is due, in part, to the historical tendencies of technology and teacher education toward techno-utopianism and technosolutionism, as well as the increasingly invasive practices of big tech in education. It also stems from a technosolutionist approach to technologies and schools and a perspective that fails to acknowledge that technology is not a neutral influence.

The fields of educational technology and teacher education have the opportunity to confront injustice and work toward more inclusive practices. Though written for the broader technology studies field, Noble's (2016) feminist perspective and words were prescient to educational technology and teacher education more generally:

What we need is to keep sufficient feminist pressure on the development of technologies, in the context of material consequences that diminish any liberatory possibility. An intersectional approach to the internet and to digital studies widens the scope of analysis to include the inequity of global development and the financialization and circulation of global capital that the internet both engenders and is supported by. It provides a point of entry to globalization, surveillance, control, and the power relations that are embedded within digital information and communication systems and infrastructures. (para. 33)

We hope our theoretical interrogation of educational technology and teacher education resonates with teacher educators who seek to promote just technology as a catalyst for positive, just change in teaching and learning. We recognize the commitment of this work, and we call on ourselves and each other to work toward justice in technology education.

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