Foregrounding Technoethics: Toward Critical Perspectives in Technology and Teacher Education

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The Teacher Educator Technology Competencies (TETCs) were created to help all teacher educators support teacher candidates as they prepare to become technology-using teachers. The TETCs largely focus on teaching *with* technology. However, one of the 12 competencies, TETC 9, offers an opportunity to delve into teaching *about* technology which might allow for the foregrounding of technoethical issues in everyday classroom uses of technologies. In this article, we offer theoretical critique of epistemological, ontological, and historical commitments that are implicitly or explicitly communicated in TETC 9, but also more broadly in the field, profession, and society. Specifically, we draw attention to commitments to behaviorist learning theories, accountability reform measures, visions of democracy, and the need for diversity or equity in methods and findings. We conclude by offering suggestions for how teacher educators might inquire into technoethical conundrums through ethical, democratic, legal, economic, technological, and pedagogical explorations of technologies.

In the 1993 film *Jurassic Park*, entrepreneur John Hammond invited consultants to his park of de-extinct, cloned dinosaurs to rubber stamp the park's safety after the death of a dinosaur handler. Chaos theorist Ian Malcolm, paleontologist Alan Grant, and paleobotanist Ellie Sattler express awe at the technological advancements, but also raise ethical and pragmatic concerns about unintended consequences. These concerns are encapsulated by Dr. Malcom's concern that, "Your scientists were so preoccupied with whether or not they could, they didn't stop to think if they should." At its core, Jurassic Park is a story about *technoethics*—that is, the social implications of technologies—which we argue need to be *foregrounded* when making decisions about the uses of technologies. If Hammond (or Oppenheimer or Zuckerberg) had asked technoethical questions from the beginning and returned to them throughout their projects, might they have avoided some of the ensuing harms inflicted by technologies?

The technologists of Silicon Valley often march forward without foregrounding technoethical questions (Chang, 2019; Martínez, 2018). While Facebook may have sought to "connect" people, Google to link human knowledge, and YouTube to "broadcast yourself," Facebook has amplified disinformation (McNamee, 2019; Vaidhyanathan, 2018), Google has returned oppressive search results (Noble, 2018), and YouTube's algorithm has recommended conspiracy theorists and extremists (Tufekci, 2019), each with harmful social implications. Mark Zuckerberg's mantra for Facebook developers was to "move fast and break things," and then issue apologies once the metaphorical dinosaurs wreaked havoc (McNamee, 2019; Vaidhyanathan, 2018). What worldviews, assumptions, ethics, and questions guide technologists' decision-making? As the literature suggests, many technology entrepreneurs tend to *foreground* capitalist profit-motives, presume a modernist ontology of *technology-as-progress*, and rationalize social harms through a neoliberal lens that burdens individual users with responsibility for finding fixes to design drawbacks and any negative social implications. Thus, technoethical questions are often passed down the line for users, citizens, journalists, politicians, or as we will discuss in this paper, teacher educators and teacher candidates, to confront.

Like Hammond's Jurassic Park consultants, critical educational theorists often pose questions about the social implications of technologies that are embedded in the theoretical assumptions of their designers. Watters (2014) contended that educators must "ask the difficult questions of technology" with the aim "not to condemn but to understand, to explicate, to place in perspective" (pp. 46-47). Similarly, Postman (1992) argued for a skeptical perspective that considers the burdens and blessings of technolo-

gies, their embedded values, and unintended consequences. These questions are critical because the educational technology field has often marched to the modernist tune of technological progress that has resulted in cycles of hope, hype, and disappointment (Cuban, 1986; Selwyn, 2017; Watters, 2014). As numerous historians and scholars have detailed, new technologies from televisions to computers have promised to transform educational outcomes and even replace teachers, but regularly fall short of the hype and result in disappointment. Our argument is not that the effects of technologies are exclusively harmful, but that it is the professional responsibility of teacher educators to aim to *do no harm* for teacher candidates, PK-12 students, and our world. Unfortunately, many teacher educators often do not perceive technology integration as their main concern (Foulger, Graziano, Schmidt-Crawford, & Slykhuis, 2017; Tondeur et al., 2012).

We are pursuing a line of inquiry which began for us in discussions about technologies in our K-12 teaching careers and continued in educational technology literature and conferences in teacher education. For example, we searched the program at the International Society for Technology in Education (ISTE) Conference to find many sessions on how to integrate Google into classrooms, but rarely found any that center on a critical examination of the surveillance capitalism profit model which allows Google to sell products at low costs but then extract students' data in exploitative ways (Singer, 2017; Zuboff, 2019). Because Google is particularly adept at targeting teachers to encourage adoption, teacher educators should consider how to help teachers weigh the pedagogical, financial, and ethical benefits and drawbacks of adopting Google products in their classrooms.

It is from this perspective that we respond to the editors' open call in this special issue to comment on and examine the use of the Teacher Educator Technology Competencies (TETCs; Foulger et al., 2017; see the TETCs at https://site.aace.org/tetc/). We begin our response by acknowledging the work of these researchers who seek to improve the ways teacher educators are equipped to prepare teacher candidates. As a hundred years of reforms suggests (Cuban, 1986), there are no simple answers for improving technology and teacher education. Thus, we utilize the TETCs as an illustrative example of pervasive issues in the field, noting we could have just as easily critiqued the ISTE technology standards, school technology adoption patterns, or teacher education technology journals. In this article, we describe why we believe TETC 9, in particular, should be foregrounded; we explore this competency, unpack implicit and explicit commitments, and offer suggestions for the field. We offer this response to TETC 9 not as declaration-of-fact but as an invitation into critical conversations.

WHY FOREGROUND TETC 9?

Each competency includes related criteria, but avoids pedagogical commitments of other frameworks (e.g., TPACK, C3 Framework for Social Studies Standards), thus allowing for broad interpretation by teacher educators. On one hand, such brevity provides educators broad leeway to make professional decisions about interpretation, implementation, and interrogation appropriate to their contexts. On the other hand, it can result in teacher educators interpreting the TETCs through the worldviews grounded in the technologies, schools, and the larger society. Both technological design and educational technology cultures can be pervaded by modernist assumptions of *technology-as-progress* apparent in the rhetoric (e.g., Technology Acceptance Model), approaches (e.g., integration over critical investigation), and initiatives (e.g., one-to-one models) of the field. For example, progress narratives even pervade social studies standards about historical technologies. The Texas high school standards fail to encourage students to consider drawbacks to any historical technologies even when social harms are obvious as with the case of World War I poison gas, which was described simply as a technological "innovation" (Krutka, 2018).

We therefore focus our exploration using one TETC in particular, which may offer teacher educators space to explore critical questions. While the focus of the other 11 TETCs is more explicitly on teaching *with,* or professionally using, technology, TETC 9 and its related criteria focus more on teaching *about* technologies. TETC 9 reads as follows:

Teacher educators will address the legal, ethical, and socially-responsible use of technology in education.

    a.   Model the legal, ethical, and socially-responsible use of technology for teaching and learning.

    b.   Guide teacher candidates' use of technology in legal, ethical, and socially-responsible ways.

    c.   Provide opportunities for teacher candidates to design curriculum following legal, ethical, and socially-responsible uses of technology.

Because TETC 9 addresses the larger effects of technology, we use this TETC to interrogate epistemological, ontological, and historical commitments toward technology for teaching and learning. In the tradition of theoretical scholars in education (e.g., Davis, 2004; Eisner, 2003), we will unpack phrases, language choices, and absences without always knowing the precise meaning of the TETC authors and their Delphi participants, but with the larger aim of considering new possibilities for the field. For example,

we argue that within the high-stakes cultures of schools that narrow teaching and learning experiences, terms like *competencies*, *accountability*, and *diversity* need to be problematized or they could be enacted in problematic ways.

Moreover, we raise these concerns particularly because we have been prone to missteps in our own teaching with technologies. For example, we were early adopters of using Google apps and social media in our classes, but we failed to teach *about* these technologies. As we encouraged students to log into these services created by for-profit corporations, we failed to ask technoethical questions about these mediums such as: What data did these designers and corporations extract from our teacher candidates and what can they do with it? Did we expose teacher candidates—particularly historically marginalized groups—to toxic spaces online? Did our assignments result in teacher candidates being exposed to democracy-damaging conspiracy theorists, trolls, and echo chambers? Did we encourage the use of platforms designed toward addiction and distraction? Our technological optimism focused on affordances and benefits at the expense of considering constraints and drawbacks. We wrote this article to work through these issues ourselves with the hope that others might find insights for their own contexts.

EXPANDING TETC 9

TETC 9 references "the legal, ethical, and socially-responsible use of technology in education." We expand on the three categories included in the competency to offer possible considerations for the content and application in practice.

Legal

We take "legal use of technology" in TETC 9 to mean the laws which are in place to protect children and other users when schools use technology. While the Family Education Rights and Privacy Act (FERPA) provides parental control over students' educational records, teacher educators might also consider how the spirit of this law relates to students' digital data and rights to privacy. Schools often allow students or parents/guardians to either provide permission or opt out of policies that allow teachers to post identifying photos or work of minors. The Children's Internet Protection Act (CIPA) requires that schools and districts which receive E-rate discounts for

internet services must filter online content to prevent hate speech, pornography, or other lewd or vulgar results from displaying on a child's device. Although teacher educators and teacher candidates should understand the application of these laws, school districts and librarians tend to take responsibility for ensuring the proper processes and infrastructure are in place to abide by them. While we believe teacher educators should understand existing district policies and state or federal laws, we do not believe teacher educators should simply accept laws at face value.

We contend, instead, that teacher educators should interrogate "legal" uses of technologies and not simply teach existing laws. As Martin Luther King, Jr. pointed out, "one has a moral responsibility to disobey unjust laws" (n.p.) and we believe teacher educators and teacher candidates should collectively evaluate the justness of laws and policies. For example, numerous critical scholars and commentators have detailed the ways media technologies can reinforce, amplify, and spread racism and other bigotries online (Benjamin, 2019; Noble, 2018; Vaidhyanathan, 2018). Yet, Section 230 of the Communications Decency Act in the United States reminds us that technology companies have little legal liability for what is posted on their platforms. Many experts, lawmakers, and citizens are now demanding stricter regulatory laws on, particularly, Silicon Valley technology companies which subscribe to libertarian and neoliberal worldviews that fail to confront exploitation, bullying, and harassment (Krutka, Manca, Galvin, Greenhow, Koehler, & Askari, 2019). We contend that any discussion of legal uses of technology should be entangled with ethical advocacy for equitable and just outcomes, particularly for historically marginalized groups which are more often the targets of online attacks (Henry, 2013).

Ethical

Bunge (1977) first coined the term "technoethics" with the hope of foregrounding interdisciplinary attention to moral principles and ethical outcomes, particularly for technologists and engineers. Technoethicists generally do not critique technologies in isolation but draw on ecological metaphors and seek to understand cultures, relationships, and outcomes (Luppicini, 2009). Puech (2013) argued for a technoethics that "takes into account the implicit values in this ordinary involvement with artifacts and brings them to the forefront" (p. 39). As Weller stated in 2018, "edtech stands on the brink of a new era, one that has a substantial underpinning of technology but that needs to build on the ethical, practical, and conceptual frameworks

that combat the nefarious applications of technology" (p. 46). We believe teacher educators should interrogate and inquire into technoethical dilemmas particularly when those issues are controversial and contested.

We draw on skeptical views of technologies to consider a technoethics that might help us inquire into the legal, ethical, and socially-responsible mis/uses of technology in educational contexts. Postman (1992) contended nearly 30 years ago that "tools have a way of intruding on even the most unified set of cultural beliefs" in arguing that the United States was subsumed by the cultures of our dominant technologies (p. 26). Watters (2014) and Noble (2018) offered commentary on the ways in which the Silicon Valley is largely hostile to women, people of color, and people in poverty. Through a Black feminist perspective, Noble (2018) confronted the ways in which Google's search engine algorithm and corporate culture are sexist, racist, and serve neoliberal conceptions of capitalism—despite claims of neutral, value-free technologies. Benjamin (2019) has illustrated to how inequity can be engineered, design discriminatory, and systemic bias result in what she calls a New Jim Code. To foreground ethics with technologies requires us to suspend judgment, interrogate skeptically, and consider the ways technologies obfuscate, amplify, or promote problematic, unjust, or racist outcomes.

Socially Responsible

In their study of democratic education programs, Westheimer and Kahne (2004) conceived of three types of citizenship in democratic education: (a) personally responsible, (b) participatory, and (c) justice-oriented. For educational technologies, personally responsible citizens may abide by online community standards, participatory citizens may purposefully set up groups on more ethical platforms, and justice-oriented citizens may confront the systemic and disproportionate structures which allow companies to maintain toxic online spaces. Although these types of (digital) citizenship are neither mutually exclusive nor all-encompassing, we believe schools tend to primarily promote the thinnest form of "personally responsible" democratic engagement which simply prepare students for individual online decisions (Barber, 1984/2003).

The articulation of "socially responsible" uses of technology in TETC 9 is similar to *personally responsible* definitions, which correspond with *digital citizenship* programs in the United States (Krutka & Carpenter, 2017; Heath, 2018). Personal responsibility in and of itself is not an inappropriate

goal; however, narrow definitions of digital citizenship often prioritize kind-ness or appropriate behavior at the expense of interrogating or disrupting inequities and injustice. By contrast, justice-oriented visions of citizenship can help teacher educators confront neoliberal profit and power structures that privilege the White, male, cisgender, and Western normativities often programmed into technologies or allowed by the platforms. We believe that a critical, technoethical approach does not simply help individual teacher educators and teacher candidates address singular problems, but centers eth-ical behavior in the context of democratic citizenship for the common good.

CRITICALLY EXAMINING THE TETCS

While our primary focus is on TETC 9, we will briefly examine the larger context and framing of the TETCs to discern ways the competen-cies may be taken up within existing cultures in schools and the larger so-ciety. In educational technology literature, Mason (2018) similarly critiqued the commitments of educational technology scholars in the social studies through the metaphors implied in their word choices. For example, he ar-gued that the roots of technologies as "tools" that can be "leveraged" are rooted in manual labor metaphors and technologies which "evolve" are pre-sumed to be agentic forces whether authors and participants intended such meanings or not. Similarly, we do not assume the intent of TETC authors and Delphi participants, but instead seek to, as Watters (2014) suggested, "ask the difficult questions of technology" with the aim "not to condemn but to understand, to explicate, to place in perspective" (pp. 46-47).

Accountability

The TETCs are described as "the competencies (knowledge, skills, and attitudes) all teacher educators need in order to support teacher candidates as they prepare to become 'technology-using teachers'" (Foulger et al., 2017, p. 418). The suggestion that all teacher educators, regardless of their context, should abide by the same competencies can convey a Platonic or modernist epistemological commitment to truths that are generalizable, un-changing, and post-positivist. While we are not opposed to teacher educa-tors developing a framework for using technology, we contend that framing the TETCs as "competencies" can be (mis)interpreted as a commitment to standardization and proficiency models of education that are often grounded

in behaviorist assumptions about teaching and learning. Historically, educational competencies indicate an outcome that must be assessed via behavioral standards and indicate an epistemological belief that knowledge can be discreetly measured (Hopkins, 1998). Moreover, we believe asking teacher educators to hold themselves "accountable" — even to admirable aims such as "equitable, high quality technology experiences"— could be misapplied within educational contexts where accountability is often associated with standardized testing, the narrowing of curriculum, and the de-professionalization of educators (Foulger et al., 2017, p. 417).

   Within accountability cultures in education, any form of standardization— even with competencies which tend to be less prescriptive than content-based standards—can frame students (i.e., teacher candidates) through deficit lenses of what they cannot do as opposed to what they might do. This is evident as teacher educators are said to "typically lack the necessary knowledge and skills needed to effectively model technology use and integration for teacher candidates" (Foulger et al, 2017, p. 417). Since their historical foundations, competencies have been touted in human resources and organizational psychology as a way to measure and develop performance in job training (Shippmann et al., 2000). However, standardization can potentially narrow the work of teacher educators in unpredictable ways and be misused to require rigid compliance that stifles the ways adults learn and grow.

   During the public commenting phase of the study, one participant recommended the use of "digital badging as a tool to track and monitor teacher educators' mastery of the TETCs" (Foulger et al., 2017, p. 434). Such badging practices also tend to be grounded in behaviorist assumptions that learning requires external and positive reinforcements, but andragogy research suggests that many professionals with years of teaching experience can find such methods demeaning or unconvincing (Blaschke, 2012). During the public comment phase, another participant suggested "the need for the TETCs to be incentivized and integrated into yearly performance evaluations (standards of academe) and promotion and tenure guidelines." Institutional and organizational psychologists critique competencies as an overly prescriptive, over-simplified approach to enforce standardization at the expense of diversity (Markus, Thomas, & Allpress, 2005). In other words, the emphasis in the TETCs on generalizable competencies can be interpreted to convey an epistemological orientation toward objectivism, behaviorism, and accountability without consideration of the widespread failures and inequities associated with accountability-reform movements historically (Au, 2014). While we do not believe the TETC authors and participants from the

public comment phase seek to replicate negative features of accountability-reform cultures, we bring forth this critical interpretation so as to engage in dialogues that would avoid such interpretations or enactments.

Technology-Using

The TETCs also described teacher candidates as becoming "technology-using teachers" (Foulger et al., 2017, p. 418), suggesting that they are teaching *with* technology. However, the lack of definition for or examples of "technology" conceals the types of technologies to which the competencies refer. Definitions of technology vary across time and cultures with characterizations ranging from *skilled methods* (e.g., technique) to *invented objects* (e.g., computer technology) to *technocratic expertise* (e.g., technical problems; Krutka, 2018). For instance, an invented-objects understanding of technology means that teacher educators might apply the TETCs to training teacher candidates in the use of educational tools such as desks, pencils, and chalkboards. However, based on norms in the field, we presume the TETCs refer to *digital* technologies like computer tablets, mobile applications, or social media platforms. This leaves us with questions about the nature of the field: What makes digital technologies more important than analog counterparts? Should teacher educators be particularly concerned with *emerging* technologies? What are the possibilities and limitations of learning with technologies that have become accepted, ordinary, and integrated into our lived experiences? Such questions can return teacher educators to consider why teaching *about* technologies is as important as teaching *with* them.

While we agree that technology integration can be beneficial, teacher educators and researchers too often skip past asking *why* questions, which might offer clarification for *how* teacher educators go about their work. Selwyn (2017) identified at least three justifications for the integration of technologies. The TETC authors referenced that teacher educators can use technologies to "enhance teaching and learning" (Foulger et al., 2017, p. 431), which aligns with Selwyn's (2017) *internal imperative* for technology integration. The TPACK model which the TETC authors referenced does make efforts to highlight the importance of quality pedagogy with technology integration—taking teaching content-area into consideration as well (Mishra & Koehler, 2006).

Second, Selwyn argued that educators often reference an *external imperative* to respond to technological changes in society to help students keep up with the times and gain what are often described as 21st-century

skills. Similarly, external imperatives require quality pedagogy, which can potentially allow students to examine not only affordances and benefits but also constraints and drawbacks of any technology. This can be particularly relevant as Moore's law posits that ethical conundrums exacerbate as technologies take on increased, and eventually commonplace, roles in our social lives (Puech, 2013). The commonplace collection and selling of personal data are largely accepted on social media platforms and even institutionally-endorsed learning management systems (LMSs) despite recent scandals highlighting the ways data can be misused (e.g., the Cambridge Analytica scandal with Facebook data).

Finally, educational technology companies often claim a *disruptive imperative* that can draw on neoliberal narratives rather than pedagogical concerns (Watters, 2014). We do not presume educational technologies inherently improve educational experiences, and thus we believe it is important to explicate how we define *technologies* and further detail the conditions under which they may do so.

Learning and Achievement

Distinguishing among technologies requires clarifying which theory is used to define and assess learning. This is not new to modern technologies; theorists have long debated what it means for an experience to be educational. B.F. Skinner (1958) believed teaching machines allowed individual learners to follow step-by-step instructions to learn through efficient computer-assisted instruction. And as Watters (2014) pointed out, "ed-tech today draws quite heavily on Skinner's ideas because Skinner (and his fellow education psychologist Edward Thorndike) has been so influential in how we view teaching and learning and how we view schooling" (p. 14). On the other hand, John Dewey (1938) contended that distinctions between educational and miseducational experiences depended on the continuity and interaction of those experiences for individuals and societies. The ways teacher educators define what is educational can vary considerably depending on the learning theory to which they subscribe. These can vary from traditional (e.g., behaviorism, cognitivism, constructivism, constructionism, sociocultural psychology) to emergent (e.g., connectivism, connected learning) theories (Selwyn, 2017). While the TETC authors align with TPACK and its pedagogical emphasis (Foulger et al., 2017), this is not as clear in all of the competencies themselves. In the recent development of the C3 Framework for Social Studies (NCSS, 2013), the scholarly team utilized an inquiry ap-

proach, and other scholars have advocated for a *critical inquiry approach* (Crowley & King, 2018), which marries content (i.e., state standards) and pedagogy (i.e., inquiry or critical inquiry). While the TETCs can be used alongside TPACK, we believe teacher educators using the TETCs might benefit—like social studies teachers have with the C3 Framework—when the relationship between content, pedagogy, and technology are more clearly entangled.

It is likely that the TETCs were designed to be learning theory agnostic so as to allow educational professionals to make decisions about teaching and learning. While this can be beneficial for educators working in spaces and cultures where they are empowered, many educators must navigate cultures of compliance, accountability, and efficiency which can reduce "technology-using teachers" to behaviorist steps (Foulger et al., 2017, p. 418). We therefore wonder, what educational aims, pedagogies, and approaches do and could the TETCs support? When technology is separated from content and pedagogy, teacher educators can fall into a "tendency to only look at the technology and not how it is used" (Mishra & Koehler, 2006, p. 1018). The TETCs do hint at learning commitments in the various verbs (i.e., model, guide, evaluate, align, assist, facilitate, support, provide, communicate, collaborate, design, assess, demonstrate, use, address, define, engage, share, seek, configure, operate, find) from which teacher educators might draw pedagogical approaches. Davis (2004) contended that educators should unpack such vocabulary for teaching or assessment as each carries vastly different epistemological, ontological, and pedagogical meanings. For example, how might teacher educators design curriculum differently if the verb *guide* was replaced by *explore*? Would such shifts encourage teacher educators to create spaces for teacher candidates to share the wisdom, talents, and skills they bring to the class?

TETC 9 offers a *model-guide-provide* approach for teacher educators, which may encourage a scaffolding approach to technoethical concerns. While scaffolding can be a wise approach in some contexts, we wonder how teacher educators are to approach technoethical topics about emerging technologies on which they are not competent in the knowledge, skills, and attitudes needed to model-guide-provide? Although some teacher educators will be capable of modeling and guiding technoethical activities in some areas, we suggest a critical inquiry approach could allow teacher candidates to share their knowledge, skills, and attitudes that can inform not only their classmates, but also their instructors. For example, *all* teacher educators may not be prepared to use TETC 9's model-guide-provide approach to confront algorithmic biases inherent in the apps or social media platforms they use (e.g., Pangrazio & Selwyn, 2019). Some teacher educators may better

teach such educational technology content by *exploring*, *inquiring*, or *participating*.

Diversity

As three White scholars ourselves, we engage in this critique acknowledging that we are privileged in ways that can leave us with blind spots to inequities and injustices. Moreover, we cannot leave the responsibilities of anti-racist work to scholars of color. We believe that we can (and should) use our positions of privilege to critique marginalizing practices. Without scholars of color and critical scholars in leadership positions and widely represented in design processes, systemic and historical inequities often go ignored. Only through continuous engagement with critical scholarship and the work of scholars of color can we advocate for a more just field.

If the TETCs are intended to be applied to *all* teacher educators, then we wonder, did the TETCs' creation process ensure demographic and ideological representation of historically marginalized groups? We do not know whether the TETC work was representative, as the demographic information of the authors and Delphi participants was excluded in the publication. However, that the TETCs and accompanying research do not touch on ways scholars have recommended systemic inequities, racism and other bigotries, and unequal opportunities should be addressed by teacher educators (Benjamin, 2019; Howard, Schaffer, & Thomas, 2018; Noble, 2018). Moreover, there appear to us to be few scholars of color or critical scholars who might have posed such questions and topics. In addition, the "diversity" definition of the TETC authors excluded race or other typical demographic factors in reading: "Diversity: Collectively, individuals represented a wide range of content areas, associations, geographic regions, and institution types" (Foulger et al., 2017, p. 425). We believe our field as a whole has struggled to center the perspectives of critical scholars and this can be particularly critical if *all* teacher educators are to be held accountable to these competencies. Moreover, the publication also claimed to assure "the greatest diversity among the Delphi participants" but included only "country, responsibility with regard to teacher preparation, subject-matter expertise, size of university/college, professional associations, online/hybrid teaching experience, experience with professional development in teacher preparation" (Foulger et al., 2017, p. 425). We believe these categories represent a type of professional diversity, but do not address diversity in other ways that are also critical to the field of teacher education—including race, culture, gender, sexuality, and neurodiversity. Critical scholars and scholars of color

have written widely about equity issues in educational technologies (e.g., Benjamin, 2019, Howard et al., 2018; Noble, 2018); anti-racist education, culturally sustaining pedagogies, settler colonial criticisms, queer studies, feminist studies, and other justice-oriented projects are relevant across education and could inform how teacher educators confront these issues (e.g., Benjamin, 2019; Noble, 2018). We believe the TETCs could be strengthened by increased attention to the features by which marginalizations has occurred in education in the past and present.

IMPLICATIONS: TOWARD A CRITICAL TECHNOETHICS

We contend that teacher educators should not only foreground TETC 9 when teaching *about* and *with* technologies in everyday experiences, but also disrupt pervasive and normalizing worldviews that prioritize progress, power, and participation in preparing teacher candidates to apply a critical technoethics in their contexts. The field as a whole needs to more deeply engage with legal, ethical, and socially responsible understandings of teaching *about* technologies that seek justice-oriented pedagogies. By including TETC 9, Foulger et al. (2017) offered a starting point for conversations about what pedagogical approaches, technology definitions, criteria for success, and attention to diversity and equity might benefit the field.

In Table 1, we present critical inquiry questions for not only clarifying technoethical topics from TETC 9, but we also offer suggestions for expanding these topics beyond what TETC 9 or the TETCs in general address. We suggest that foregrounding technoethics in technology and teacher education might include addressing (a) ethical, (b) democratic, (c) legal, (d) economic, (e) technological, and (f) pedagogical uses of technology. Note that we chose to use the term *democratic* as opposed to the TETC 9 term *socially responsible*. We also clarify in our question, notes, and examples that we view *democratic* as being tethered to moral understandings of justice across all intersections of identity, particularly those which are historically marginalized, like race, in histories of the United States. Moreover, we added an *economic* category to investigate profit and exploitation, *technological* to explore unintended or misunderstood effects of technologies, and *pedagogical* to consider learning theories that prioritize liberatory and equitable learning experiences. We agree with Mishra and Koehler (2006) that pedagogy should not be separated from content and technology, and we advocate for teacher educators and citizens to think of technologies *as* curriculum. We believe teacher educators can lead important dialogues on technologies by simply asking, *is this technology ethical?*

In the appendix, we provide a structure for reflecting on the question, *is this technology ethical?* Teacher educators might use this guide as they see appropriate to engage in informed critical inquiries with teacher candidates, dialogue using evidence, communicate conclusions to the technoethical question, and take action in instances when technology developers or companies fall short. We suggest that future research include practitioner-focused studies examining practical and concrete applications for foregrounding technoethics in the field of technology and teacher education. For instance, an action-research study implementing the questions raised in Table 1, applied to a district's adoption of tablets, would be a welcome addition to the knowledge base.

Table 1

Critical technoethical topics for technology and teacher education

Topic	Compelling Questions	Contextual Considerations	Practical Applications
Ethical	Was this technology designed ethically and is it used ethically?	In the first question, teacher educators may focus on whether the technology was designed to be: • transparent • equitable • healthy • safe • democratic In the second question, teacher educators may focus on whether the technology is used in ethical ways.	Teacher educators must help candidates look beyond technological features. For example, teachers might benefit not just from learning to integrate YouTube videos into classroom practice, but also interrogate design decision to make user agreements opaque, algorithm recommendations problematic, and autoplay features unhealthy.
Legal	Are laws that apply to our use of this technology just?	While teacher educators are subject to abide by school or district policies and state or federal laws, they should also explore whether the laws are just in practice. Citizen-educators might challenge unjust laws or policies in the short or long term.	Teacher educators and candidates can critically assess laws pertaining to technology—and facilitate dialogues in classrooms. For instance, teacher educators might ask, does Section 230 of the Communications Decency Act in the United States provide social media companies too much leeway to avoid monitoring violent speech on their platforms?

Topic	Compelling Questions	Contextual Considerations	Practical Applications
Democratic	Does this technology afford or constrain democracy and justice for all people and groups?	Digital citizens should engage in democratic practices that are personally responsible, participatory, and justice-oriented. Teacher educators should consider exploring how technology privileges or marginalizes students at the intersections of identity (e.g., race, language, culture, gender, sexual orientation, class, disability, religion, age).	Teacher educators and candidates can critically examine the disparate impacts of technologies on different groups. For example, Google Earth offers far fewer street views of the African continent, which may convey imperialist perspectives of a continent devoid of rich cultures and geographies worth knowing.
Economic	Are the ways the developers profit from this technology ethical?	While corporations are responsible to increase profits for stockholders, they also have fiduciary responsibilities to stakeholders to operate in ethical ways. Despite claims of "connecting the world" or "do no harm," corporations too often extract profit from users in ways that are unknown, unethical and even illegal. We might confront companies which claim users' data as raw materials to be extracted and exploited, often without consent.	Teacher educators and candidates can critically inquire into economic models like surveillance capitalism, confronting how "free" platforms make enormous profits. For example, Google products are used widely by educators and are often free, but many educators are unaware of how Google extracts users' search and geolocation data and seeks to build consumer markets through schools.
Technological	What are unintended and unobvious problems to which this technology might contribute? (Postman, 1997)	Immediate, short-term benefits of technologies can often be more apparent than unintended or long-term consequences. Neil Postman (1997) posed numerous questions worthy of exploration, including: What is the problem to which this technology claims to the solution? Which people and what institutions will be most harmed by this new technology?	Teacher educators and candidates can investigate hidden and long-term consequences of adopting technologies such as social media. Twitter offers obvious short term benefits, but adopting this tool in the classroom can also subject students to conspicuous (e.g., harassment, distraction) and subtle (e.g., harming newspapers, Russian trolls, surveillance) problems.
Pedagogical	In what ways does this technology afford and constrain learning opportunities about technologies?	Technologies can replace, amplify, or transform learning experiences. Educators can often focus on the benefits of technologies without considering pedagogical drawbacks, including techno-ethical concerns.	Teacher educators and candidates might consider whether the drawbacks of financial costs, screen time, or the loss of common visual fields for learning in classrooms are worth the benefits of one-to-one tablets for learners.

CONCLUSION

We believe that the technoethical considerations of TETC 9 should be foregrounded as teacher educators and teacher candidates first teach *about* and then *with* technologies. Foregrounding critical technoethical issues might help confront the historical and contemporary shortcomings of the educational technology field and prepare future teachers and their students as justice-oriented digital citizens (Krutka & Carpenter, 2017; Heath, 2018). We offer this response to the TETCs with an emphasis on technoethics in the spirit of Hammond's Jurassic Park consultants. While teacher educators cannot always control the cultures in which we do our work, we believe our field can foreground technoethical considerations in ways that will encourage growth, democracy, and the common good for teacher educators, teacher candidates, and their future students alike.

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APPENDIX

Is this technology ethical?

Directions: Use the following table to (a) choose which ethical issues you will investigate, (b) add notes of your sources, positions, and evidence, and then (c) use evidence to communicate conclusions and take action that addresses the compelling question, *is this technology ethical?*

Technology: **Company/Designer:**

Compelling Questions	Sources, Positions, and Evidence
Was this technology designed ethically and is it used ethically?	
Are laws that apply to our use of this technology just?	
Does this technology afford or constrain democracy and justice for all people and groups?	
Are the ways the developers profit from this technology ethical?	
What are unintended and unobvious problems to which this technology might contribute? (Postman, 1997)	
In what ways does this technology afford and constrain learning opportunities?	
Arguments For	Arguments Against
Communicate Conclusions	Take Informed Action