



[Re]Imagining Indigenous Educational Design: A Conceptual Manifesto to Grow Disruptive Indigenous Digital Activists

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Abstract

The ubiquity of digital technologies and the harvesting of individual data has modified global societies, reinforcing systems of oppression. While a contemporary phenomenon, the convergence of technology and human subjugation is historical, with links to the racialised reproduction of settler-colonialism. Australia, a settler-colonial state, has escalated the prioritisation of digital competitiveness with a recent policy directed at stimulating infrastructure and research-industry-government partnerships. Strategically, Indigenous communities remain constrained, where the ubiquity of technology and the escalation of digital competitiveness compounds the socio-economic impacts of continuing colonisation. Offline, Indigenous communities continue to face rigid political constraint that limits online access and denies opportunities for their people to live anchored to ancestral lands, seas, languages, and knowledge systems. Given the rapid advance of digital disruption, the inability to limit racialised socio-technical systems, or compete at parity in cyberspace, suppresses Indigenous digital activism, governance, and entrepreneurialism. This conceptual paper (part manifesto, part vision statement) offers initial thoughts intended to stimulate further research on twenty-first-century Indigenous educational design. Central to future design considerations is the search for pragmatic solutions capable of overcoming the racialised challenges limiting the collective development of digital activists essential for Indigenous nation-building. In [re]imagining an alternate digital educational agenda, Indigenous communities must collectively advance strategies that deliberately shift away from Australian schools toward local community digital learning hubs.

Keywords Postdigital · Data colonialism · Digital divide · Indigenous education · Indigenous futurism · Australian curriculum

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Technology, Data, and Colonialism

Technology and oppression have an enduring alliance. For those outside marginalised communities or the theatre of techno-ethics, the dystopian realities of cyber-subjugation are most likely confined to the imaginaries of science fiction (Enteen 2007). With the advent of colonialism during the Age of Discovery, fictionalised post-Apocalyptic dystopias became the lived experience of Indigenous peoples. Metis scholar Sandra Matters (2019) emphasised the consequences of contact with ‘an alien other’ that resulted in ‘war’, ‘oppressive regimes’, ‘forced removal of children’, and hyper surveillance through ‘the creation of reserves’ (7). In parallel with sophisticated technology, race has also been pivotal to Indigenous subjugation. The link between race, colonisation, gunpowder, advanced navigation, and transportation technologies offered significant military advantages for European nations (Dixon 2001). Coinciding with the civilising mission of white manifest destiny, racialised principles, like terra nullius—empty land—and the doctrine of discovery, emboldened white superiority and engendered a God-given right to possess Indigenous lands and peoples (Madsen 2010).

While offering substantial promise to humanity, the convenience and ubiquity of digital technology have reinscribed global inequality within and between nations (Hornborg 2019). Like then, oppression in the twenty-first century shares a similar basis in history and race. Ceislik and Margoscy (2022) argue that ‘data collection and storage techniques’ are not new, instead have long been essential colonial techniques for political administration and population management (358). Responding to scaling digital inequality, Couldry and Mejias (2019) theorised a structural link to imperialism, coining data colonialism. In their work, Couldry and Mejias (2019) identified that colonialism, historically, operated through four primary functions:

- i the appropriation of resources,
- ii the formation of new social orders,
- iii an extreme concentration of wealth, and
- iv the creation of ideologies to justify the appropriative practices.

While they argue that data colonialism is not entirely a systemic clone of historical colonialism, similar exploitative dimensions, extractive industries, and concentrations of power and wealth are characteristic of its function. Like historical colonialism, which sought to control human and material resources for strategic benefit, data colonialism controls vast amounts of individual and population data as human-corporate-government data relationships and presents a new technique in the enduring racialised reproduction of settler-colonialism. The collection and commercialisation of human data footprints online are particularly nuanced in the methods technology employs to prey on the developing world and minorities in affluent countries. In *Surveillance Capitalism*, Zuboff (2019: 8) explains that human-data relationships function as a technique of surveillance functions in ‘a new global architecture of behaviour modification’. Multinational corporations deliberately exploit geo-specific regions with tenuous environmental and labour

laws, using economically vulnerable communities as dumping grounds for e-waste, mining, or ghost workers (c.f. Souza 2020; Kaunda 2020; Gray and Suri 2019). Cukier and Mayor-Schonberger (2013: 29) identified that ‘computer memory, powerful processors, smart algorithms, clever software, and math’ increasingly operate autonomously, recognising patterns and predicting behaviour without human-guided scientific modelling. Worryingly, in a short operational span, predictive or deep learning algorithms—the heart of these autonomous systems—have been revealed to contain overt racialised biases and perpetuation of gender and ethnic stereotypes (c.f. Stark et al. 2021). Increasingly, governments, militaries, and intelligence agencies are employing predictive algorithms alongside advanced digital technologies¹ to surveil, police, and wage war on populations deemed *more susceptible* to crime and political agitation (c.f. Jooste 2021; Benjamin 2020). Social media platforms, Internet browsers, and streaming search engines also employ racialised practices. Utilising predictive algorithms to perpetuate cultural assimilation via the tactics of hyper nudging (c.f. Reviglio and Agosti 2020), the developing world is strategically flooded with Western information, while the local opinions of minority peoples are suppressed.

Advancing technologies, surveillance, and unchallenged data extraction pose existential threats to communities already made vulnerable by historically determined oppression. Despite the anticipation and promise, digital technology operates in a socio-political milieu (i.e., as a racialised socio-technical system), where human design and operation have been revealed to exploit and suppress minority peoples. In so far as digital technologies have significantly reinforced global power structures (Couldry and Mejias 2019), the inability to limit technology-enhanced human oppression (i.e., digital surveillance, intelligent devices, and weapons) or participate in digital economies undermines Indigenous resistance and self-determination (Huggins 2014). The widespread use of predictive, autonomous systems would significantly impact Indigenous communities in Australia. Comprising the smallest demographic in Australia, Indigenous communities continue to occupy the lowest rungs on social health and wellness indicators (Ring and Griffiths 2022). Indigenous peoples are less likely to complete school, gain employment, or own houses, while being more likely to be supported by social welfare (National Indigenous Australians Agency (NIAA) 2022). Indigenous peoples are also the most incarcerated demographic; particularly disproportionate are the percentages of deaths in police custody (Gannoni and Bricknell 2019) and children in juvenile detention (Ewing and Sarra 2023). Notwithstanding the Robodebt scandal,² extractive mining, and hyper-nudging, racialised issues of digital hyper-surveillance,

¹ E.g., facial identification, voice recognition, telephonic triangulation, and remote or autonomous weaponry.

² Operating from 2016 until 2020, the Australian Federal Government initiated the auto-debt recovery system (e.g., the Robodebt scandal). The system matched Australian Taxation Office (ATO) data with Centrelink (social welfare agency) data to identify potential debts. During its operation, the system had identified approximately \$4.5 billion in overpayments, raising more than 1.2 million debts against welfare recipients, with some receiving debt notices for thousands of dollars. However, the predictive system was found to be flawed, unfairly targeting Australia’s most vulnerable welfare recipients, many of whom were Indigenous families.

policing, and labour exploitation are yet to impact Indigenous communities overtly. However, large-scale deployment of predictive systems, particularly in social welfare and criminal justice, seems inevitable. Predictive sentencing and surveillance would further increase the likelihood that incarceration rates would remain high. In social welfare, shifts toward biometric scanning in exchange for essential goods would further exploit those already most vulnerable. Techno-ethicist Rachel Adams posed the question (2021: 190), ‘If colonial modes of [power] and dividing practices of racism are being re-instituted through a veil of technocracy, what is the precise form of this re-institution of race and colonialism?’

In this conceptual paper, first, I situate Indigenous digital futures as part of Australia’s escalation of digital competitiveness. Second, I problematise the possibility of growing large-scale Indigenous digital capability³ in Australian classrooms by revealing the racialised basis of schooling. Third, as part manifesto, and part vision statement, I offer preliminary thoughts on an alternate Indigenous educational agenda necessary to develop digital activists essential for nation-building. I summarise the discussion and offer thoughts on future research in the space of Indigenous Australian educational design.

The Complexity of Indigenous Digital Futures

Digital information reflecting the economy’s and society’s development, especially data emitted by people’s use of technological devices and services, has political and practical implications for how the state and private sector view and treat people (Taylor 2023). Despite the evolving scale of this phenomenon, Australia has been lethargic in prioritising strategic digital policy, upgrading vital infrastructure, or directly stimulating research-industry-government partnerships (Ali et al. 2020). In 2015, Australia ranked as high as ninth on the IMD World Digital Competitiveness (WDC) scale⁴; however, by 2018, it had fallen from the top ten, ranking thirteenth out of sixty-three countries assessed (Meltzer 2018). The federal government launched the Digital Transformation Strategy (DTS) (2018) to quell competitive

³ The term ‘digital capability’ is used in parallel to the Nussbaum ideas of Indigenous digital capability being different from acquiring literacy alone. Capability denotes a broader sense of human agency and the conditions (internal and external) necessary for a shift from potential to actual. As Nussbaum (1990) states:

Internal capabilities are conditions of the person (of body, mind, character) that make that person in a state of readiness to choose the various valued functions. External capabilities are internal capabilities plus the external material and social conditions that make available to the individual the option of that valued function (228).

Crocker (1995), in reference to Nussbaum’s conceptualisation, notes, the ‘state of readiness to choose an actual functioning would be based on or include general powers that can be nurtured, acquired, developed, maintained, exercised, impeded, diminished, lost and (sometimes) restored’. .. ‘Having these internal powers is necessary but not sufficient for good functioning, for one must also have available certain and social conditions’ (161). The qualification of the social or socio-political conditions being contingent for Indigenous capability to be realised is a pertinent distinction this discussion emphasises.

⁴ The IMD World Digital Competitiveness (WDC) scale measures capacity and readiness to adopt and explore digital technologies as a key driver for economic transformation.

decline. The unveiling of DTS was pivotal, as it targeted the modernisation of technology infrastructure, online government service delivery, the promotion of innovation, entrepreneurialism, business growth in a digital economy, and population-wide acquisition of twenty-first-century skills (Ali et al. 2020). Australia also initiated a consultation to generate a list of critical technologies in the national interest to attract investment and concentrate future research and development.⁵ Yet, the turn toward strategic policy, sector stimulation, and visioning of future technologies led to Australia's WDC ranking cratering, falling to twentieth in 2021, its lowest position on the WDC scale. In 2022, Australia renewed its strategic policy, releasing the Digital Economy Strategy,⁶ which aims to elevate Australia to a top three digital government by 2025, and a leading competitive digital economy by 2030.

Implicated in Australia's missteps toward digital competitiveness, vulnerable families and minority communities lack basic digital literacies, and remain restricted from participating online. In January of 2023, the recently elected Albanese Labor government unveiled a program to deliver free broadband Internet to 30,000 families for 12 months. Beyond the 12-month honorarium, however, economically vulnerable families without industry and sector support will again revert to digital exclusion. Of those most vulnerable, Indigenous communities, particularly those living in the remotest 1100 regions, are recognised to be most at-risk due to material, skill, and support divides (Thomas et al. 2014; Rennie et al. 2010). This phenomenon is termed the digital divide (Kral 2019), and for Australian Indigenous communities across a diaspora of urban to remote, significantly undermines opportunities to limit a racialised socio-technical system or exploit competitive entrepreneurial and social development opportunities in a digital economy (Meston et al. 2023a; Kral 2016).

Indigenous digital exclusion is nuanced. Offline, Indigenous communities remain subject to layered challenges stemming from ongoing colonisation, which cycles racism, the socio-economic stresses of poverty, health inequality, and educational limitations (Rennie et al. 2019). While online, Indigenous communities experience digital-centric challenges, such as disproportionately fewer homes with access to broadband Internet, computer ownership, digital literacy, and often with only pre-paid mobile handset access (Wilson et al. 2019). Contextualising the extent of the digital divide, in 2021 the Australian Digital Inclusion Index reported:

- 71% of Indigenous Australians have access, compared to 90% of non-Indigenous Australians.
- 14% of Australians experience affordability issues accessing the Internet, which is most pronounced for low-income households and those living in regional and remote areas.

⁵ Through this discussion, advanced manufacturing, artificial intelligence, bio and quantum technologies, energy and environment, transportation, robotics and space, and cyber-security, all emerged as areas of strategic need.

⁶ DES 2022 prioritises interconnection between the spheres of digital governance, digital economics, and data, with secure cloud hosting.

- 52% of Australians have the skills and confidence to use digital technologies effectively, compared to 40% of Indigenous Australians. (Thomas et al. 2021: 19)

The importance of Indigenous digital inclusion was elevated by the Albanese Labor government again in January 2023 with the establishment of the First Nations Digital Inclusion Advisory Group. Led by a panel of Indigenous sector experts, the group aims to accelerate progress toward the Federal government's Access to Information target (*Target 17*), which ascribes that Indigenous peoples should have equal levels of digital inclusion by 2026.⁷

Central to the Indigenous relationship to technology is the necessity for communities to have the power and acumen for discrimination to determine if and when technology might be used in community contexts. Notably, in the growing advocacy for community control of technology is the Indigenous data sovereignty movement (c.f. Trudgett et al. 2022; Rainie et al. 2019). Forming in part as a counter to the pervasive histories of non-Indigenous community data extraction (c.f. Smith 2021), Indigenous data sovereignty responds to the escalating scale of data colonialism (Walter et al. 2021). The ethical orientation of Indigenous data sovereignty is anchored to the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) (2007), and researchers working with Indigenous communities are contributing to global movements⁸ centred on activism and control. In Australia, organisations such as Community First Development (n.d.) Maïam nayri Wingara Indigenous Data Sovereignty Collective, the Australian Institute of Aboriginal and Torres Strait Islander Studies (2017), the Australian Research Data Commons (2022), and the Commonwealth Scientific and Industrial Research Organisation (2021) have all initiated institutional data sovereignty agendas.

Data sovereignty is significant and much-needed progress in the relationship between technology, research, and Indigenous communities. Agendas at this time, however, primarily centre activities designed to control and access community-centric data. This narrow scope largely ignores the manifest techniques of surveillance and control of minority-corporate-government data relationships inflicted on the third world and marginalised communities in the West. In addition, there is an over-reliance on non-Indigenous researchers, organisations, businesses, and government agencies to ethically guide Indigenous communities through navigating complex digital infrastructures, data encryption, secure housing, and licensing agreements. As momentum rapidly increases across the sphere of data sovereignty, without a critical mass of Indigenous digital leaders needed to create and deploy counter-systems and strategies, communities will remain ever-reliant on the assistance and expertise of those outside communities for

⁷ Target 17 is part of the broader National Agreement on Closing the Gap (2020), Australia's overarching Indigenous social-welfare policy framework. Closing the Gap grew from an enduring life expectancy differential between Indigenous and other Australians. Incidentally, after more than a decade of research monitoring and targeted policy, the 'gap' remains.

⁸ See for example, the First Nations Information Governance Centre in Canada (n.d.), Cormack and Kukutai (2022), from Aotearoa, Calzati (2022) from Africa (c.f., 2022), or Yellow Horse and Huyser (2021) from the United States as a recent snapshot across this space.

fundamental human rights. Logically, how best to adapt to, counter, or negate the scaling myriad of technology-enhanced human oppression remains a fundamental challenge for Indigenous peoples.

Growing Digital Capabilities in Australian Schools?

Today, access to technology and the acumen to properly wield it is innately tethered and must be considered part of any realistic Indigenous education strategy. Acquisition of digital capabilities, however, is complex. As discussed already, many Indigenous homes need Internet or digital devices and collectively need more complex digital proficiencies. As a solution to the socio-economic and geographical limitations of access and acumen, Narungga, Kurna, and Ngarrindjeri scholar Lester Irabinna Rigney (c.f. 2009, 2011, 2014, 2017) has been at the forefront of schools assuming a leading role in the development of Indigenous digital capabilities. Rigney (2017: 15) acknowledges that Indigenous Studies in Australia is a valuable starting point to begin theorising on the development of school-based Indigenous digital learning contexts and should be constructed around the following inclusionary elements:

- Indigenous funds of knowledge and epistemologies;
- Community engagement, improving teacher pedagogy and high student expectations;
- Anti-racism and social justice education; and
- Student at-risk strategies.

Building from his previous works, Rigney (2017) sought to define a model he termed Culturally Responsive Digital Schooling (CRDS) for Indigenous peoples of the Pacific. Rigney's (2017: 1042–1043) CRDS synthesises key learnings from local and international Indigenous educational practice, technology education, and culturally responsive pedagogy (CRP), offering ten considerations:

1. Ensures teacher qualifications in ICT teaching and student e-learning;
2. Provides students and community access to technology to build skills to participate in online environments and economies;
3. Engages parents, local elders, and community as partners to develop local Indigenous digital content;
4. Provides e-learning that builds on students' cultural epistemologies, ontologies, and cosmologies;
5. Advocates a strengths-based approach to Indigenous e-learning by recognising the skills, funds of knowledge, and world views students bring with them to school;
6. Emphasises web-based financial, social, and individual cyber safety;
7. Cultivates twenty-first-century workforce skills of problem-solving, adaptability, communication, and analytics;
8. Expands languages available on the Internet by prioritising local Indigenous languages and cultures;
9. Engages three digital learning purposes: (a) provide all Indigenous students who want to learn with access to technology, (b) empower all Indigenous students

- to empower others, and (c) connect e-learning to ways that take into account the sovereign status, self-determination, and digital entrepreneurial goals of Indigenous First Nations communities; and
10. Reconnects traditional Indigenous engagement and communication across the Pacific and builds core competencies in global awareness of other diverse cultures.

Rigney's (2017) ten considerations are a valuable contribution to nurturing large-scale Indigenous digital capability. Aligning with schools to provide access to technology and nurture digital capabilities is logical, as schooling remains compulsory until year ten, is outfitted with multiple technologies and digital platforms, and is guided by curriculum and assessment programs geared toward Science, Technology, Engineering, and Mathematics (STEM). Rigney, however, also rightfully acknowledges the complexity of the school's role in this task.

In works preceding articulation of CRDS (c.f. Rigney 2009, 2011, 2014), Rigney astutely positions Indigenous learners as fringe dwellers in the classroom. They are caught between continuing colonisation, catastrophic educational underachievement, and the needs of a rapidly changing digital world. Indigenous Australian learners continue to face layered challenges, such as institutional racism, hidden curriculums, superficial inclusion of Indigenous voices, histories, languages and knowledge, and low thresholds of cultural competence by a majoritarian non-Indigenous teacher workforce (Lester and Munns 2020). These systemic challenges hinder the development of binding affinities for learning and have led to pronounced disparities in school performance, attendance, skill acquisition, and year 12 completion (Lowe et al. 2019). The confluence of past, present, and future orients as the perfect educational storm and, critically, the transformative Indigenous futures imagined by Rigney's CRDS remains, I argue, contingent on an enduring negative buoyancy in Australia's school system.

Rigney, in full view of the historical and contemporary limitations of Australian schools, qualifies the role of the school by tethering CRDS to culturally responsive pedagogy (CRP) (c.f. Ladson-Billings 1995, 2014). CRP is a scholarship that attributes pedagogy with the ability to mediate the profound racialised limitations of Western school systems. Proponents of this approach, however, acknowledge CRP has limitations. In 2011, Sleeter, in responding to the neo-liberal incursion into the scope of CRP, noted,

As the work of teachers becomes increasingly prescribed, attempts to work with culturally responsive pedagogy are increasingly complex. Teachers need more time to research and develop curriculum that students can relate to, non-tested curriculum disappears under pressure to raise test scores, and teachers are increasingly patrolled to ensure they are teaching the required curriculum. (19)

Critical race scholar Gloria Ladson-Billings (2017), one of the conceptualising figures of CRP, acknowledges that white teacher's cultural unawareness, fixed or reductionist viewpoints on the cultures of learners, and wilful setting aside of the critical dimension also undermine the potency of CRP in dominant settings.

Notwithstanding the incursions of neoliberalism and majority teacher divergence from CRPs theoretical roots, the most significant limitation of CRP is the lack of empirical evidence to support proponent belief that pedagogical strategies can counter the racialised challenges of dominant school models (e.g., layering of policy, curriculum, and a majoritarian white teacher workforce) (c.f. Morrison et al. 2019). Central to the question of Australian schools' ability to nurture Indigenous digital capabilities is Māori educator Linda Tuhiwai Smith's assertion that dominant schooling models function as 'Trojan horses of cultural assimilation' for Indigenous learners (2005).

At the heart of the school's assimilationist function is the broader role of dominant institutions—in which schools are vital—in undermining Indigenous sovereignty and maintaining Australia as a settler-colonial state which must not be discounted. Kamilaroi and Wonnarua scholar Debbie Bargallie (2020) demonstrates in her work on Australian racism how Australian governments, from the onset, have issued a succession of legislations and policies, such as the Aboriginal Protection Acts (1869–1971), the Assimilation Acts (1937–1973), and the Immigration Restriction Act (1901–1973), intended to sanitise and whiten Australia. Bargallie (2020) draws on the late philosopher Charles W. Mills's Racial Contract Theory (1997) to unmask the racial contract underpinning the operations of the Australian Public Service. The racial contract—albeit not a formal written arrangement—is the dark underbelly of modern political theory's social contract (c.f. Hobbes 1615; Locke 2003; Rousseau [1968] 2018) where white supremacy is the political system and non-white peoples are deliberately excluded or constrained from fully entering the affairs of the political state (Mills 1997). Bargallie (2020: 54) demonstrates how the racial contract functions in Australia to exploit Indigenous peoples. This includes leveraging key socio-technical mechanisms such as legislation, policy, and discourse and in doing so, creating a racial-colonial state. In operation, the racial contract reproduces racial hierarchies, which are policed and reinforced to sustain a system of control. Goenpul scholar Aileen Moreton-Robinson theorises the intersection of race, whiteness, and Indigenous sovereignty in Australia (c.f. 2004, 2006, 2009, 2015, 2018, 2020). Moreton-Robinson offers complex insights into how whiteness operates as a racialised technique to possess Indigenous lands and regulate Indigenous peoples. For Moreton-Robinson (2005: 62), 'patriarchal whiteness is Anglicized, institutionalised and culturally based' and is 'an invisible unnamed organising principle that surreptitiously shapes [...] social structure and national culture'. Central to her theorisation is the conceptualisation of whiteness as white patriarchal sovereignty (WPS), where she reveals how it regulates relationships between state power, white supremacy, and Indigenous subjugation. Importantly, WPS, operationalised as it is through institutional spaces, designates and orchestrates the hierarchical boundaries of the racial contract, reifying white supremacy through its self-appointed right to possess and punish in parallel with its ability to shift, reproduce and maintain.

Considerations for the future of Indigenous education then must, in some way, counter the racialised function of Australian institutions and the prevailing expanse of digital exclusion while also acquiring essential literacies (e.g., English and STEM) and access to advanced technologies (Costanza-Chock 2020). This makes Rigney's CRDS somewhat limited in its ability to disrupt Australian schools' function.

Similarly, limiting the locating of CRDS in schools assumes that Indigenous learners want to attend and learn in these spaces (c.f. Dreise et al. 2016). Gamilaroi scholar Michelle Bishop (2021: 419) offers insight into the position of learners, asserting, 'Under the pretence of "getting a good education", many Indigenous students feel coerced into compliance, with schools used as vehicles of institutionalisation, indoctrination and assimilation'. Cultural geographers make clear that physical spaces are produced through human interaction, where place and body inscribe on each other via socio-spatial dialectics (c.f. Soja 1980; Sundstrom 2003). Sara Ahmed (2007), in her *Phenomenology of Whiteness*, asserts that 'spaces acquire the shape of the bodies that "inhabit" them' (156) and are 'orientated around some bodies, more than others' (157). Primary within this dialectical function is the entanglement between habits and place. Notably, the legacies of historical assimilation essential to establishing Australia (e.g., acculturation into the English language, Christianity, and the values of colonial Britain) are maintained in contemporary school models, albeit through different race-based practices and under different guises (Moodie et al. 2019; Gillan et al. 2017). Central then to resisting the assimilationist tactics of Australian schooling, any Indigenous ability, emboldened as it might be by CRP, must heed the warning of whiteness expert Richard Dyer (1997: 10) as he explains, 'White power nonetheless reproduces itself regardless of intentions, power differences and goodwill, and overwhelmingly because it is not seen as Whiteness, but as normal'.

A further challenge of relying on Australian schools to serve the needs of Indigenous learners is the reliance on the agency of teachers to disrupt the space. Indigenous learners comprise 5.7% of all students in school. In comparison, Indigenous teachers comprise a little over 2% of the teacher population and are recognised to 'be underrepresented', 'unevenly utilised', and 'employed' in Australian schools (Australian Institute of Teaching and School Leadership (AITSL) 2021: 10). Therefore, Indigenous learners' education rests predominantly in the hands of non-Indigenous teachers. Without a critical mass of Indigenous teacher representation, large-scale opportunities to insulate and guide Indigenous learners while in dominant classrooms significantly undermine opportunities for positive outcomes. In fact, despite only comprising approximately 4% of Australia's population, Indigenous peoples, particularly males, are more likely to go to jail than complete school, which makes attending university and graduating as a teacher an unlikely possibility (c.f. Morgan 2019). Given the enduring underrepresentation of Indigenous teachers in Australian classrooms, the imperative of Rigney's CRDS falls to a majority non-Indigenous workforce. Lowe and colleagues (2021) reveal, however, that many non-Indigenous teachers lack the 'socio-historical' ability to adequately 'recognise that current schooling practices are foundationally shaped by racialised pedagogies born in the estates of dispossessed Indigenous peoples' (474). I would further argue that non-Indigenous teachers similarly lack racial literacy (Bargallie et al. 2023; Leonardo 2013). Operating in this context, many teachers, influenced by the dominant white way of thinking privileged in schools, unwittingly prioritise integration into mainstream societies, often at the expense of Indigenous cultural traits and traditional languages (Pang et al. 2021). As Webb and Mashford-Pringle (2022: 68) identify, some teachers' 'lack of confidence' and 'fear

of offending Indigenous peoples' stem from their discomfort 'in acknowledging and discussing the assimilative and destructive impacts of colonisation in education'. Critically, assimilationist spaces and lack of Indigenous educators are prevailing systemic challenges by design and, therefore, cannot be negated through CRP alone.

[Re]Imagining Indigenous Educational Design: the Challenge of Nurturing Disruptive Indigenous Digital Activists

Indigenous educational design in the twenty-first century is complex. It is vital for Indigenous education to now include digital disruption as a tactic to resist Australia's racialised socio-technical system. Technology, however, is not the definitive answer to Indigenous problems, nor is Western education. They are part of a broad array of tools necessary for Indigenous communities to advance social justice and better realise self-determination. While it is beyond the scope of this section to discuss in detail the ideas offered, the [re]imaginings that follow are intended to be preliminary conceptual thoughts on twenty-first-century Indigenous educational design. The ideas presented are intended to release the essential design principles embedded in Rigney's (2017) CRDS model from the limitations of Australian schools. Although I consider Rigney's CRDS (2017) to be a high-water mark for Indigenous educational design, community reliance on Australian schools to deliver on the promise of this work is unrealistic, given the role technology might play in advancing self-determination. As the recent response to the COVID-19 pandemic has proven, rapid turns toward online communication and digital home-schooling programs were more or less successful, despite the small windows presented to educators to operationalise the shifts (Riley et al. 2022). In the skills acquired and the pedagogies enacted, learning away from schools was accessible for families with access to the Internet and digital devices. Indigenous communities, therefore, must not settle for poor or assimilationist outcomes offered in Australian schools. However, shifting away from schools is a theoretical possibility (c.f. Lachney et al. 2021; Kral and Renganathan 2018). Although the reality of initiating and maintaining large-scale shifts is constrained by in-community financial, digital and social infrastructure limitations, the lack of human funds of knowledge capital and physical-digital learning resources is a complex challenge. In full view of these systemic challenges, to seed local vision and initiate a broader conversation on the continuing question of Indigenous education in Australian schools, I offer preliminary thoughts on three possible areas of action:

1. Critical Indigenous Futurology—a theoretical tool to problematise future Indigenous educational design;
2. A multi-front strategy designed to shift away from Australian schools toward community-controlled digital learning sites; and
3. Curricular considerations for the development of Indigenous digital disruptors.

Critical Indigenous Futurology: Braiding the Imaginary Landscape

Metis scholar Sandra Matters (2019) identifies the need for Indigenous peoples to look toward future studies to strategise for positive futures. Future studies are employed to vision and map possible, probable, and preferred scenarios and subject those to analysis and comparison (Michael 2017). By interlinking the onto-axio-epistemologies⁹ of Indigeneity with the methodological process of future studies, Indigenous futurism emerges, presenting a visually interpretive view of the world from a uniquely Indigenous perspective (Matters 2019). Onto-axio-epistemologies summarise Indigenous ways of being, doing, and knowing (e.g., Indigenous Ways). Colloquially termed ‘Indigenous ways’, these philosophical determinations denote culturally specific orientations on the world and our place within it. Anishinaabe and Métis scholar Elizabeth Le LaPensée (in Keene 2018) explains interpretive scenarios on Indigenous Futures build from Indigenous worldviews and ‘are about the past, present, and future—the hyperpresent now’. Fricke (2019: 109) acknowledges that Indigenous futurism is unique as it braids ‘the lasting effects of conquest, colonialism, and empire’ in a mode ‘where colonialism is absent, or perhaps a place where it never was’. Such a viewpoint is distinct, as future thinking is usually constrained by the link the present shares with the past (Henry 2022). Dine and Navajo artist Will Wilson (2002: 4) observes that such viewpoints on time allow the possibility to dream about potential futures in ways that are ‘as much about reading into the past, as it is about remembering the future’. Indigenous futurism, with roots also in Afro-futurism, is primarily expressed as a visual aesthetic, drawing traditional and popular culture together through digital media and traditional art practice (e.g., literature, poetry, painting, beadwork, and photography) (Fricke 2019). While valuable in its current form, to better prime this site of research to contest the tensions of Australia’s socio-technical system, drawing ideas from postdigitalism together with Indigenous futurism offers specific advantages for this discussion.

Theoretical synthesis offers the opportunity to assemble a novel theoretical tool for problematising the complexity of Indigenous digital educational design. The critical repositioning of technology via postdigitalism departs from essentialist understandings of technology’s utility for progressive, linear advancement (Peters and Besley 2019; Jandrić et al. 2018), articulating instead messy relationships with imperfect and complicated systems and the human beings who are changed by them (Macgilchrist et al. 2023). Postdigitalism reveals the contradictions inherent in the ubiquity of digital tools, interwoven

⁹ In Australia, key work has been completed by Noonuccal and Bidjara scholar, Professor Karen Martin. Martin and Mirraoopa (2003, p. 209) write, ‘We are part of the world as much as it is part of us, existing within a network of relations amongst Entities [*human and non-human*] that are reciprocal and occur in certain contexts. This determines and defines for us rights to be earned and bestowed as we carry out rites to country, self and others—our Ways of Being. These are indelibly driven by our ontology through our Ways of Knowing and serve as guides for establishing relations amongst the Entities’. ‘Our Ways of Doing are a synthesis and an articulation of our Ways of Knowing and Ways of Being. These are seen in our languages, art, imagery, technology, traditions and ceremonies, land management practices, social organisation and social control’ (210). For this paper, I use shortened anglicised terms for the sake of brevity and to enhance broad readership.

as they have become in the fabric of life (Fuller and Jandrić 2019). Postdigitalism recognises that technology is no longer a cure-all, nor is it free from limitation (Macgilchrist 2019; Cramer 2015). Instead, in a socio-technical system, human-techno relationships are gritty and now well-worn, offering both at once the possibilities of utility and oppression (Savin-Baden 2021). Recent theorisation (c.f. Knox 2019; Macgilchrist 2021a, 2019) has argued for nuanced scholarship, which centres a critical gaze on the studies of technology and the border spaces shared with education. This scholarship calls toward engagement with the transformative potentials of technologies on society and education and the struggles it shares with enduring socio-economic-educational inequalities.

Considering Indigenous communities face broad challenges across many sites of Australia's racialised socio-technical system, a multi-faceted theoretical tool is essential to properly consider future educational design. For this discussion, disparate theoretical threads are braided to form Critical Indigenous Futurology (CIF), so as to enable the possibility of imagining a range of possible, probable, and preferred Indigenous educational futures. While offering immediate value for educational design, with future articulation, a braided theoretical tool would open the possibilities of multi-disciplinary research, which visions and maps strategies to better disrupt many of the sites of operation essential to the function of Australia's racialised socio-technical system. As shown in Fig. 1, CIF would draw from a range of disciplines to better vision and map possible, probable, and preferred Indigenous futures.

Through non-linear synergistic layering and alignment, concepts, principles, and properties from a range of theoretical domains can be drawn in and interwoven, producing a theoretical tool greater than the sum of its parts. Figure 2 presents the non-linear layered relationships that comprise this tool. Indigenous ways, along with Indigenous futurism, are located as connective tissue, anchoring this model and enabling it to interact with the outside domains (domains from Fig. 1 and postdigitalism) so as to remain true to Indigenous-orientational positions on imagined futures.

A detailed discussion on CIFs' synergistic alignment and mobilisation is beyond the scope of this section. Although, by drawing concepts, principles, and properties from some of the surrounding disciplines shown in Fig. 1, CIF has enabled the ability to vision and map beyond the current limitations of Australian schooling and the challenge of the digital divide. The following educational design considerations are preliminary thoughts offered to release the promise of Rigney's (2017) CRDS from its locatedness in Australian schools and extend its curricular scope as part of an alternate Indigenous educational agenda.

Shifting Toward Community: A Multi-Front Strategy

In a comprehensive systematic literature review on remote Indigenous learning, Britton and colleagues (2020: 16) outlined the following five essential features of an alternate model of Indigenous education:

- i cultural connectedness and awareness;
- ii being contextually designed;
- iii fosters relationships with peers and adults;

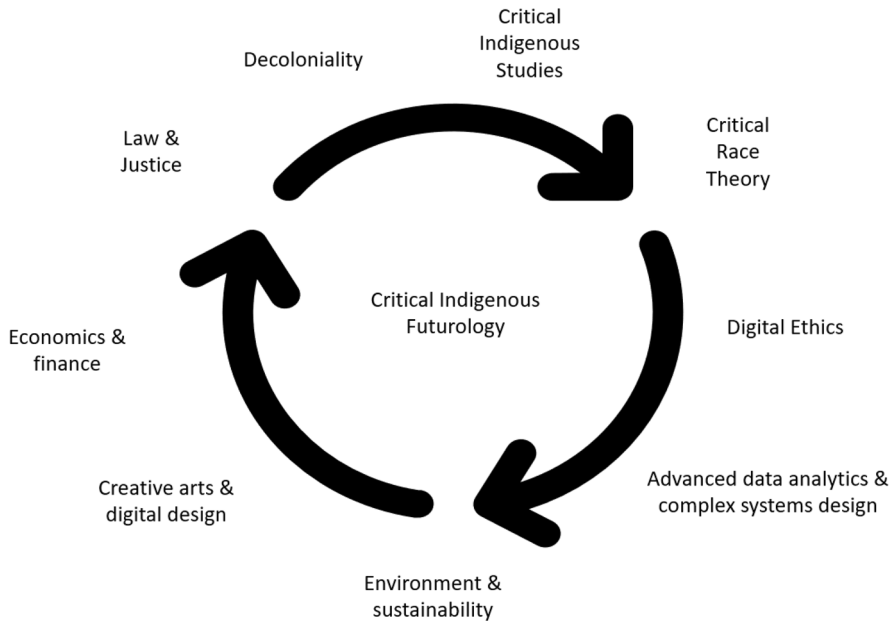


Fig. 1 Possible interchangeable domains

- iv specific teaching and learning strategies; and
- v holistic outcomes.

In other work, Michelle Bishop (2021), as part of her critique of Australian schooling, has called toward the need for alternate models of education, noting that Indigenous peoples had thriving education systems for thousands of years. In her discussion (2021), similar to elements of Rigney's (2017) CRDS, she advocated for a return to the onto-axio-epistemologies (i.e., Indigenous Ways) of these foundations, orientated toward the pursuit of Indigenous educational sovereignty. As Rigney's (2017) model demonstrates however, alternative educational approaches must now be consistent with advancing the developmental goals of learners as they mature in an increasingly digital world, in parallel with Indigenous socio-political needs. In conceptualising future design principles, the release and empowerment of human agency must lie at the core of an alternate digital educational agenda. In my view, disrupting the challenge of school while also acquiring digital capabilities for Indigenous learners requires a multi-front strategy that (1), deliberately extracts essential digital capabilities from Australian schools and (2), prioritises the creation of community-centric digital learning hubs. Depicted in Fig. 3 are three vertical circles in parallel representing essential elements of an alternate Indigenous digital educational agenda. The middle circle represents Indigenous learners who would gain knowledge and skills from schools, and once established, from in-community digital learning hubs. The arrows in the figure represent the movement of knowledge and skills toward

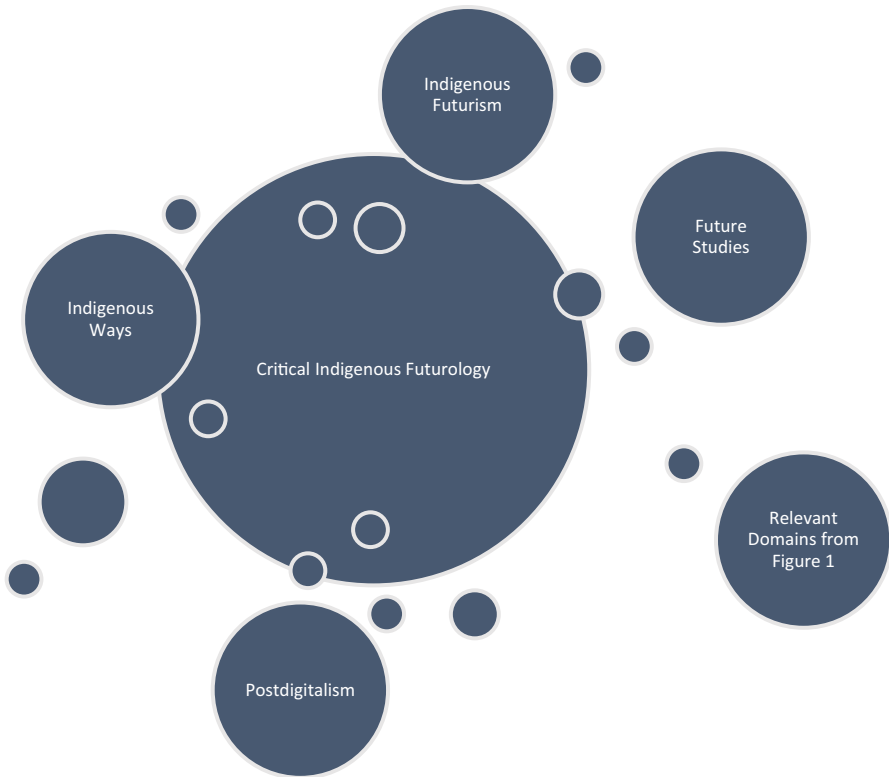


Fig. 2 Synergistic amalgamation

the learners, with the larger, curved arrow denoting a one-way extraction process from schools toward in-community control of education. In my view, extracting from schools and redeploying knowledge and skills into community learning sites represents the beginning phase of educational sovereignty and Indigenous control of education.

Embedded in this agenda is the need for a strategic succession plan to, in some way, wrest control of education back from Australian schools. The imperative of Indigenous educational sovereignty, where learning is driven by Elders and knowledge holders, in Indigenous languages and on traditional lands, are central components of the UNDRIP (2007), yet are not deemed essential or recognised by Australian governments. Over time, the strategic resource extraction from Australian schools would feed into the community-controlled digital learning hubs. However, it can only be deployed if communities first wrestle with attracting investment and establishing the infrastructure necessary to maintain these spaces. In-community design discussions could utilise a social-enterprise model such as The National Centre of Indigenous Excellence in Redfern and lessons learned from distance education, flexi-schooling structures, and the turn toward homeschooling during the COVID-19 pandemic. Already educational designers are integrating

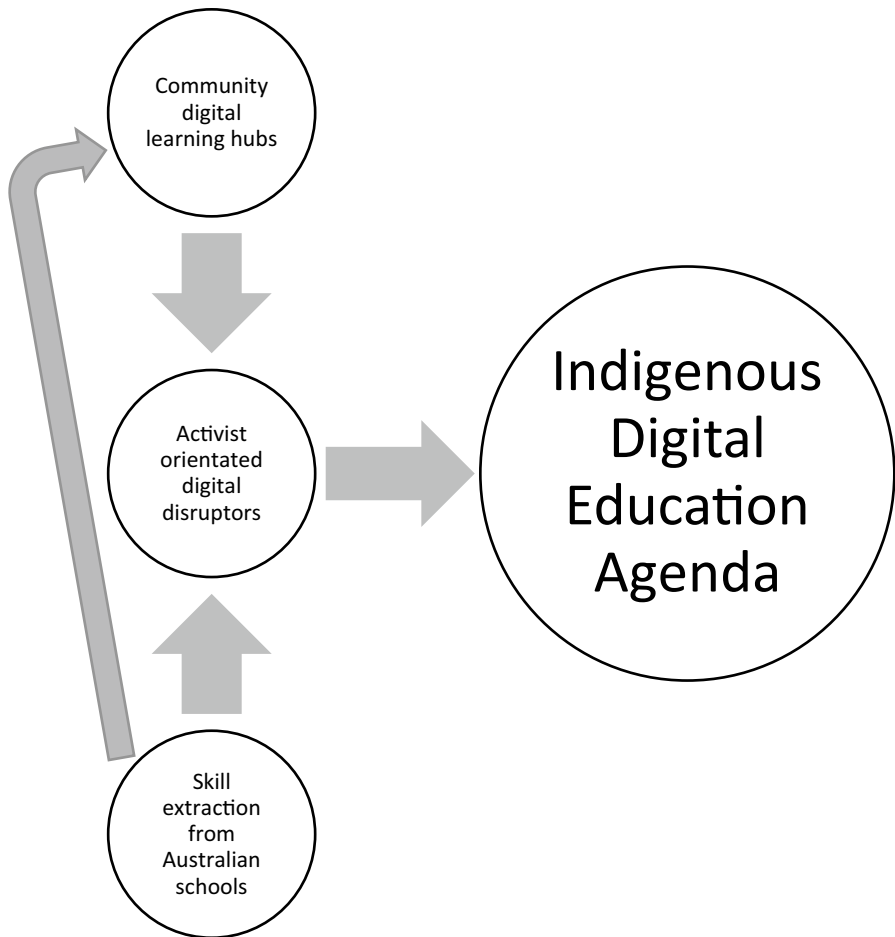


Fig. 3 Three aspects of an alternate Indigenous education agenda

cutting-edge digital tools like extended reality, artificial intelligence, and machine learning to overcome the challenges of distance and time, while offering immersive and interactive learning environments optimised for specific learning goals (Williamson et al. 2023). Investment in community-controlled digital learning hubs could also satisfy the absence of Indigenous teachers in Australian schools, as community learning would draw upon human funds of knowledge already in-community. Guided by the onto-axio-epistemologies of Indigenous knowledge and language systems, Elders, knowledge holders, and Indigenous families would lead learning in parallel with strategic partnerships outside the community that would provide immersion in advanced technologies, digital literacies, and complex system design and data analytics. However, investment in a multi-front strategy to deliberately shift away from Australian schools must be driven by the necessity of redepositing Indigenous digital capabilities back into communities, so overtime

outside community support would not be required. When complex digital capabilities are normalised in-community, Indigenous peoples would have the potential to participate in digital economies without having to move away from traditional lands and families.

Curricular Considerations: Racial Literacy and Complex Digital Capabilities

In parallel with the advance toward in-community digital learning hubs, Indigenous communities must also accelerate the development of activist-orientated disruptors. Indigenous educational design must prioritise leveraging technology as a tactical instrument to counter racialised injustice and further self-determination. To effectively focus collective agency, Indigenous learners and communities must acquire the ability to dissect the historical-contemporary underpinnings of power and their roles in this complex. Indigenous education must empower learners to challenge racialised social structures and institutional systems; therefore, racial literacy must be a foundational component in an alternate Indigenous education agenda (c.f. Twine 2004; Guinier 2004). Racial literacy refers to the capacity to reveal and negotiate the complicated processes of race and racism in society, thoroughly understanding how these socially constructed phenomena link with other systems of power and privilege (Bargallie et al. 2023). This component of critical education builds into Paulo Freire's concept of conscientization.¹⁰ Conscientization involves a process of reflection and action (i.e., praxis) to nurture deep understandings of the socio-historical political foundations of the world to transform it (Freire 2021). Learners create opportunities to design new, just institutions and social structures when they are active participants in history (Magee and Pherali 2019). Through pedagogies of debate and reflection, conscientization directs students to examine their own experiences and ideas. This gives learners the tools to confront and oppose oppressive institutions (Thomas et al. 2014).

To seamlessly complement critical praxis, a twenty-first-century Indigenous educational design must grapple with the possibility and deceit of advanced technologies, systems, and platforms (c.f. Macgilchrist 2021b). Complex digital capabilities and resourcing of smart devices into Indigenous communities must, therefore, become focal points of an alternate Indigenous education agenda. The current focus of Australian governments and schools is basic Indigenous digital inclusion. The extent of this wave of inclusion primarily consists of digital tool and platform use (Guenther et al. 2022) rather than learning through fields connected to advanced technology roles of the future (Meston et al. 2023b). For Indigenous communities to feel secure in the digital world, learners require strategic exposure to a range of skills and technologies, such as those shown in Table 1.

Indigenous communities must then prioritise a shift from digital exclusion to master designers, engineers, and analysts. To facilitate mastery of advanced systems and scaffolded platforms, age-appropriate training is essential (c.f. Meston et al. 2023b).

¹⁰ The English term 'conscientization' is a translation of the Portuguese term *conscientização*, which is also translated as 'consciousness raising' and 'critical consciousness'.

Table 1 Advanced technology roles

Digital field ^a	Roles
Computing power	<ul style="list-style-type: none"> • Data scientist • Artificial intelligence (AI) engineer • Robotics researcher • AI architect • Robotics designer
Smarter devices	<ul style="list-style-type: none"> • Data scientist • Product tester • Product manager • Automation engineer
Datafication	<ul style="list-style-type: none"> • Big data engineer • Robotics engineer • Information and technology (IT) architect • Business intelligence analyst
AI and machine learning	<ul style="list-style-type: none"> • AI research scientist • AI engineer • machine learning engineer
Extended reality	<ul style="list-style-type: none"> • Extended reality architect • Front lead engineer • Software developer • AR/VR support engineer • Game designers • Pro gamers • Creative directors
Digital trust	<ul style="list-style-type: none"> • Cybersecurity analyst • Penetration tester • Security engineer • Security architect • Security automation engineer • Network security analyst
Genomics	<ul style="list-style-type: none"> • Bioinformatics analyst • Genome research analyst • Full stack developer • Software engineer • Bioinformatician • Genetics engineer
New energy solutions	<ul style="list-style-type: none"> • Energy specialist (solar, thermal, hydro-power) • Solar plant design energy • Climate strategy specialist • Project manager • Chemical energy • Biotechnology specialist • Renewable energy technologist
Robotics process automation (RPA)	<ul style="list-style-type: none"> • RPA developer • RPA analyst • RPA architect
Edge computing	<ul style="list-style-type: none"> • Cloud reliability engineer • Cloud infrastructure engineer • Cloud architect and security architect • DevOps cloud engineer

Table 1 (continued)

Digital field ^a	Roles
Cyber security	<ul style="list-style-type: none"> • Ethical hacker • Malware analyst • Security engineer • Chief security officer

^aThis table is adapted from Nikita Duggal's Jan 24 (2023) article on *Simplilearn*, titled, 'Top 18 New Technology Trends for 2023'. Inclusion here of a broad list of tech-related industries is intended to present how far current Indigenous digital inclusion needs to travel at the level of policy and educational design. In addition, Duggal's list is intended to function as an orientation guide for in-community Indigenous discussion

Advanced data capability and complex system design could engender the capacity to design autonomous systems and platforms that better represent the needs and interests of Indigenous communities (c.f. Dencik et al. 2019). A broad understanding of complex systems could also guide collective scrutiny of publicly available data sets, enabling the ability to conduct audit trails of government-corporate institutions (Weible et al. 2020). Complex in-community digital capabilities could also strengthen policy advocacy positions. Informed advocacy, drawn from the collection and analysis of data on issues directly impacting Indigenous peoples, could level inequitable policy design forums. Policy advocacy from positions of strength might better enable regulation of the design and implementation of autonomous or predictive algorithms currently used to police minorities or could enhance bargaining positions which might minimise the environmental impact of e-mining and waste (Beraldo and Milan 2019). Considering the threat cyber security already poses to government, economic systems, and multinational corporations (c.f. Li and Liu 2021), collective complex digital capabilities could also enable the deployment of ethical hackers as countermeasures to safeguard basic human rights, should they come under threat (Hartley 2015).

Conclusion

Unceded Indigenous sovereignty remains a primary threat to Australia's political order. Australia's racialised socio-technical system is unrelenting in its function to maintain possession of Indigenous lands and suppress Indigenous peoples. The interchanging and layering of old and new techniques deployed through Australia's system render large-scale change for a diaspora of Indigenous communities highly complex. I have argued that for Indigenous self-determination to advance, communities must have access to a range of complex technologies and the acumen to deploy these critically. While technology alone is not a panacea for Indigenous resistance and self-determination, considering the epochal shifts digital technology has already brought to the world, critical use of complex digital capabilities must become an essential component of an alternate Indigenous educational agenda. Considering Australia remains intent on paternalisation while escalating its own digital competitiveness, communities should prioritise the growth of disruptive Indigenous digital activists and the establishment of digital learning hubs. Progress toward

nurseries that produce digital disruptors must be co-designed, led by strategic governance which privileges the voices of Elders and communities, and integrates future research from distance education, homeschooling, and community-orientated flexi models. I acknowledge that my conceptual offerings are idealistic; however, these thoughts are intended to seed local discussion and should become the subject of future research, where they are critiqued, extended or discarded.

While this discussion has problematised the role of schools in educating Indigenous learners, this special issue draws attention to the broader complexity of whether education, particularly digital education, can be designed at all. In this spirit, I offer a cautionary warning for Indigenous communities and our allies. The movement away from dominant school models toward large-scale Indigenous control is unlikely to be openly supported by governments, nor will such movements be tolerated without resistance. At the heart of Australia's democracy are WPS and the racial contract, where white fragility, wilful epistemic ignorance, and paranoia cycle to reproduce the systemic racism and aggression Indigenous communities and 'other' peoples of colour continually face. Should Indigenous agendas advance in Australia's racialised socio-technical system, it would be the exception to the well-established and reinforced norm and might come at a great cost for progressive communities. Yet, despite these systemic limitations and potential dangers, Indigenous imaginings on the future must continue to evolve.

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Declarations

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