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educating for extraction: digital literacy, international organisations, and planetary defuturing

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This article examines how digital literacy, as increasingly mediated through international development agendas, operates as a developmental technology that draws schooling into extractive digital economies. Drawing on critical development studies, decolonial scholarship, and the concept of planetary defuturing, the article examines how three differently positioned international organisations—UNESCO, the World Bank, and the OECD—frame and advance digital literacy through distinct yet convergent agendas around technological adaptation, economic participation, and 'future readiness'. Situating these organisations within a wider assemblage of states, corporations, philanthropic actors, and technological infrastructures, we trace how digital literacy connects schooling to data-intensive, energy-dependent infrastructures that carry profound social and ecological costs while constraining alternative educational futures. Rather than a neutral skills agenda, digital literacy can draw schooling more deeply into extractive digital economies while translating structural problems into demands that learners adapt, reskill, and remain 'future ready'. We conceptualise this buffering role as a form of planetary defuturing and consider how refusing such a role might reopen questions of what technologies are needed, on whose terms, for whose purposes, and toward what futures.

Keywords: decolonial critique, defuturing, digital economies, digital literacy, international development

Education is increasingly positioned as a solution to crises it did not create and cannot resolve (Andreotti et al., 2015; Escobar, 1995; Silova et al., 2025). Through the promotion of digital literacy, international organisations present schooling as a technical lever for development, inclusion, and progress (OECD, 2019; UNESCO Institute for Statistics, 2018; World Bank Group, 2019), promising to equip learners—particularly in the Global South—for participation in an increasingly digital future. Yet this promise raises questions about the economic, technological, and ecological infrastructures into which learners are being prepared to enter.

This article argues that contemporary digital literacy initiatives must be understood not only through their emancipatory promises, but also through how they participate in the defuturing of planetary futures (Fry, 2015) by drawing schooling into systems dependent on fossil fuels, mineral extraction, and energy-intensive artificial intelligence. In tracing how three different international organisations—UNESCO, the World Bank, and the OECD—frame and advance digital literacy through distinct yet increasingly convergent frameworks, standards, and policy agendas, we situate these organisations within a wider assemblage of states, corporations, philanthropic actors, and technological infrastructures. While their mandates, institutional logics, and modes of influence differ, their digital literacy agendas converge in important ways around technological adaptation, economic participation, and 'future readiness'. We show how, through these convergences,

schooling becomes increasingly entangled with extractive infrastructures in ways that can marginalise local knowledges, normalise unequal relations of power, and prepare learners for futures whose promises of opportunity and inclusion rest upon increasingly extractive material, data, and energy relations. We understand this contradiction as a process of planetary defuturing: education promises to prepare learners for the future while helping normalise participation in digital economies that undermine the social and ecological conditions upon which those futures depend. Throughout the article, we therefore distinguish between schooling, referring specifically to formal education systems and institutions, and education as the broader social and pedagogical processes through which learning takes place.

International organisations have long exercised epistemic authority in shaping educational purposes and possibilities, including what counts as legitimate knowledge, desirable skills, and meaningful progress. From mid-twentieth-century literacy campaigns to contemporary regimes of benchmarking, indicators, and competencies, institutions such as UNESCO, the World Bank, and the OECD have positioned education as a key instrument of development, although they have done so through different mandates, normative commitments, and modes of influence (Elfert & Ydesen, 2023). These differences matter: UNESCO's historically humanistic and rights-based orientation cannot be collapsed into the economic rationalities more strongly associated with the World Bank and OECD. Yet across these institutional differences, education has increasingly been expected to deliver outcomes extending far beyond education itself—from economic growth and poverty reduction to employability, social inclusion, and competitiveness (Silova et al., 2025).

Digital literacy represents a contemporary site where these distinct agendas increasingly intersect. Presented as an increasingly important response to inequality—and standardised, measured, and scaled across contexts—digital literacy can reproduce universalising assumptions about the knowledge and capacities required for desirable futures. By establishing what counts as digital competence and future readiness, such frameworks can privilege particular epistemologies and developmental trajectories while rendering other knowledges, priorities, and possible futures less visible. These dynamics invite closer attention to what digital literacy does as a technology of development, beyond the skills it ostensibly provides.

Digital Literacy as a Developmental Technology

Digital literacy is widely framed as a key skill set required for participation in contemporary social, economic, and educational life. Yet this framing obscures the extent to which digital literacy functions as a developmental technology—an infrastructure of governance through which education systems are aligned with global economic, political, and epistemic priorities (Escobar, 1995; Ferguson, 1994). Rather than emerging solely from locally articulated educational needs, digital literacy has been institutionalised through intersecting initiatives of international organisations, governments, corporations, philanthropic actors, and development agencies that have helped establish technological competence as an increasingly taken-for-granted condition (Andreotti et al., 2015).

The COVID-19 pandemic intensified this logic. As education, work, and public life moved online, digital literacy was rapidly recast as a prerequisite for basic functionality and productivity. In Sub-Saharan Africa, this urgency was frequently articulated through a discourse of deficit and catch-up, despite long-standing infrastructural inequalities (Fietz & Lay, 2023). Under crisis conditions, global development frameworks such as the Sustainable Development Goals (SDGs) gained

renewed authority as pathways to technological advancement, further normalising externally driven digital initiatives as a condition of participation (Gillwald et al., 2019). What appeared as an emergency response thus helped consolidate digital literacy as a developmental imperative.

This consolidation reflects a longer history of educational governance by international organisations, although their mandates, values, and capacities to shape policy differ substantially (Elfert & Ydesen, 2023). UNESCO has played a central role in defining the normative language of literacy, from post-war campaigns of functional literacy to contemporary digital skills frameworks (Castro Varela, 2020; UNESCO, 1970). Through instruments such as the Digital Literacy Global Framework, UNESCO translates digital literacy into a set of competencies that can be standardised, measured, and aligned with global indicators (UNESCO Institute for Statistics, 2018). The framework itself defines digital literacy in relation to the capacity to use digital technologies "for employment, decent jobs and entrepreneurship" (UNESCO Institute for Statistics, 2018, p. 6), while simultaneously emphasising that digital literacy pathways should respond to countries' specific social, economic, and cultural contexts. This juxtaposition reveals a tension at the heart of the framework between contextual responsiveness and the universalising demands of global measurement and comparison. Read through decolonial critiques of educational technology, such tensions risk reproducing epistemic hierarchies even in the absence of explicit colonial intent (Castro Varela, 2020; Couldry & Mejias, 2019; EdTech Hub, 2022).

The World Bank approaches digital literacy through a different institutional logic, more explicitly grounded in economic development and human capital. A 2023 World Bank study describes digital skills as "essential for learning recovery and productivity growth" and argues that strengthening them enables "more robust human capital" and economic and social transformation (World Bank, 2023, p. 7). The Bank's digital-skills framework seeks to "equip the future workforce with required digital skills" (p. 8), linking education and skills development to anticipated economic and technological demands. Digital literacy is thus positioned as one means of addressing poverty, unemployment, and inequality through improved skills and economic participation, while structural conditions—such as infrastructural dependency, data extraction, and geopolitical asymmetries—receive considerably less attention (Abimbola et al., 2021).

The OECD, in turn, exercises epistemic power through measurement and comparison. Rather than advancing a single definition of digital literacy, the *OECD Skills Outlook 2019* acknowledges that "there is no widely agreed, comprehensive definition of digital skills" and treats them as a continuum from basic functional capacities to advanced ICT expertise (OECD, 2019, p. 187). Through skills assessments, indicators, and policy benchmarking, the OECD renders digital preparedness legible and comparable across countries (Ydesen, 2019). The *OECD Skills Outlook 2019* captures this adaptive logic succinctly: "In our rapidly digitalising world, skills make the difference between staying ahead of the wave and falling behind" (p. 3). Measurement thus does more than describe digital transformation; it helps establish adaptation as a benchmark of educational preparedness.

It is precisely against these differences that their points of convergence acquire particular significance. Viewed within a wider assemblage of states, corporations, philanthropic organisations, civil society actors, and technological infrastructures, their agendas contribute in different ways to a policy environment in which digital literacy is simultaneously moralised (as inclusion), economised (as human capital), and quantified (as measurable skill) (Andreotti et al., 2015; Banda & Chinkondenji, 2025). Convergence here does not imply coordination, consensus, or equivalent

power. Rather, it reveals overlapping assumptions about technological participation and desirable educational futures. Within this assemblage, learners in the Global South are often positioned as users and adopters of digital systems whose infrastructures, standards, and platforms are largely designed and governed elsewhere, rather than authors of digital futures. Design assumptions, language hierarchies, and platform dependencies embed Western epistemologies into educational infrastructures, reproducing what decolonial EdTech scholars describe as digital neocolonialism—a form of control exercised through standards, systems, and data flows rather than direct coercion (Couldry & Mejias, 2019; EdTech Hub, 2022).

Reframing digital literacy as a developmental technology thus reveals how international organisations do more than promote skills: they participate, alongside other actors, in shaping educational futures. Their influence lies not in governing those futures alone, but in framing problems, circulating norms, constructing measures, and legitimating particular responses. As digital literacy becomes increasingly articulated to participation in data-intensive digital economies, attention shifts from what these organisations intend to the economic and technological arrangements their agendas help normalise (Crawford, 2021; Parikka, 2015). What is at stake, then, is not only whether digital literacy initiatives are effective, but also how they reconfigure the purposes and possibilities of schooling itself—whose knowledge they legitimise, whose interests they serve, and which futures they render possible or impossible.

The Technological Fix That Does Not Fix

Technology integration initiatives across diverse Global South contexts have repeatedly reflected a logic of solutionism, in which complex educational, social, and political challenges are reframed as problems to be solved through technical intervention. These initiatives are frequently driven by a saviour imaginary that privileges rapid deployment, scalability, and visibility over locally grounded pedagogical practice, community agency, and contextual expertise (Pinkston, 2019). Within this logic, education risks becoming a delivery mechanism for externally designed solutions rather than a relational and political process shaped by context.

The One Laptop per Child (OLPC) initiative is a canonical example. Framed as an egalitarian response to educational inequality, OLPC placed extraordinary faith in access to devices and connectivity as catalysts for learning, privileging models of self-directed, technology-mediated instruction. Despite claims of contextual adaptation, its design and implementation afforded limited roles to teachers, policymakers, and community knowledge holders (Adamu, 2023; Kenny & Sandefur, 2013; Nussbaum, 2010; Shah, 2010; Warschauer & Ames, 2010). Rather than building sustainable educational capacity, OLPC revealed how technological interventions at scale can entrench dependence on external expertise and infrastructure.

The rapid acceleration of EdTech during the COVID-19 pandemic gave this solutionist logic renewed urgency, although under different circumstances. As school closures threatened learning continuity, international organisations and development actors promoted technology-mediated responses to sustain educational continuity, while framing digitalisation as part of education's longer-term transformation. In practice, responses varied widely across contexts and included the distribution of devices such as tablets as primary responses to educational disruption, alongside television- and radio-based learning and massive open online courses (MOOCs) (Male, 2021). Their diversity notwithstanding, the speed and scale of emergency deployment often left little space for deliberation over whose technologies, pedagogies, and knowledge should shape educational

responses. Some interventions consequently reproduced externally designed pedagogical assumptions, including individualised, standardised, and content-driven approaches to learning (Samuel, 2024). Local experiences of crisis management, including prior responses to epidemics and systemic disruptions, were rarely treated as sources of knowledge (Ndlovu-Gatsheni, 2020).

Although OLPC and pandemic-era EdTech emerged under very different historical conditions, both reveal a persistent technological imaginary: the expectation that educational problems can be rendered tractable through technical interventions designed to scale and travel across contexts. By prioritising access to technological tools over meaningful collaboration with local communities and educators, such interventions risk bypassing questions of consent, ownership, and long-term sustainability. Technologies can thus be presented as neutral instruments of progress, even as they embed particular pedagogies, power relations, and dependencies within education systems. What these interventions share is not simply a failure of implementation, but a structural logic that treats education as a site for technical intervention rather than as a domain of collective decision-making. As this logic becomes normalised, digital literacy initiatives increasingly function to align schooling with external economic and technological agendas, privileging scalability, efficiency, and output over local agency and collective governance. The consequences extend beyond pedagogy, drawing schooling more deeply into digital economies structured through increasingly extractive relations of data, labour, infrastructure, and planetary resources.

Educating for Extraction

The extractive consequences of the digital economies into which schooling is increasingly integrated become visible when education is examined as part of the broader infrastructure of platform capitalism. Through certification regimes, digital platforms, and skills pipelines, schooling is increasingly positioned as a feeder system for data-intensive economies that rely on unpaid interaction, precarious digital labour, and externalised risk. Digital literacy thus operates not only as an educational project but also as an enabling mechanism that integrates education into circuits of extraction.

These extractive alignments unfold within a global digital economy structured by profound asymmetries of power. Technological capacity and ownership remain heavily concentrated in corporations headquartered in the Global North, while major platform corporations (e.g., Microsoft, Google, Facebook, Amazon, and Uber) exercise substantial control over the infrastructures through which data circulate and value is generated (Kwet, 2019). When digital literacy initiatives prepare learners to operate within these ecosystems, education becomes implicated in the reproduction of existing economic and technological asymmetries, further reinforced by weak or unevenly enforced data protection and digital governance frameworks in many Global South contexts (Gwagwa & Mollema, 2024).

Certification-based digital literacy programmes make this alignment particularly explicit. Corporate-led digital skills initiatives can orient competence toward the tools, platforms, and labour-market demands of dominant digital ecosystems, while marginalising forms of knowledge essential for local technological autonomy, such as data governance, collective agency, ownership, sustainability, and critical engagement with digital infrastructures (De Freitas, 2025). Framed as neutral benchmarks of competence and backed by substantial financial and technological resources, such certifications can function as gatekeeping mechanisms, normalising participation in external digital ecosystems and positioning education systems as pipelines into labour markets shaped elsewhere.

The extractive character of these arrangements becomes more visible in relation to data and labour. Educational platforms increasingly monetise routine interactions—clicking, liking, submitting assignments, sharing, or communicating with peers—transforming everyday learning practices into data that can be aggregated, analysed, and leveraged for commercial and technological gain (Casilli, 2017; Iyer et al., 2021). Learners and educators often have limited visibility into the value generated through these interactions or how their data are collected, aggregated, repurposed, and potentially incorporated into algorithmic systems. Participation is framed as inclusion, even as control over data, algorithms, and outcomes remains firmly externalised.

The framing of technological intervention as emancipatory and efficiency-enhancing has also consolidated philanthrocapitalist logics within digital education and development, extending private influence over public domains such as education, labour, and civic life (Burns, 2019). A different account of the digital future emerges from the Fair Digital Kazi Manifesto (Pollicy, 2025), a collective statement produced by African platform workers, labour organisers, and civil society actors. While digital labour is widely promoted as a pathway to opportunity and inclusion for young people in the Global South, research documents persistent precarity, surveillance, and unequal value capture within platform economies (Anwar & Graham, 2021). The manifesto describes a digital economy shaped by algorithmic management, opaque data practices, precarious contracts, and the systematic erosion of worker dignity. Against international policy narratives of digital skills as pathways to opportunity and inclusion, workers describe legal ambiguity, invisibility, and extraction of data and labour (Iyer et al., 2021). The manifesto thus functions as an epistemic counterpoint, rendering visible the human consequences of extractive futures that education systems are increasingly asked to support (Pollicy, 2025).

Taken together, these dynamics show that digital literacy initiatives are not merely responding to technological change but can also draw schooling more deeply into the infrastructures and relations of digital economies. Schooling becomes infrastructural support for platform capitalism, normalising participation in systems that concentrate value elsewhere while externalising precarity, risk, and environmental cost. These alignments do more than reproduce inequality in the present; they shape future possibilities by foreclosing alternatives. It is here that educating for extraction becomes a problem for planetary futures.

Defuturing Education, Defuturing the Planet

To understand the consequences of educating for extraction, we move beyond questions of access, inclusion, or skills to examine how digital literacy participates in the defuturing of education and planetary life. Defuturing, as articulated by Tony Fry (2015), names the processes through which dominant systems secure short-term continuity by undermining the conditions of their own persistence and rendering alternative futures increasingly difficult, if not impossible, to realise. In education, defuturing draws attention to how schooling can become enrolled in trajectories that foreclose possibilities rather than expand them.

Digital literacy is routinely framed as future-oriented, equipping learners for rapidly changing economies, technological disruption, and uncertain labour markets. Yet the infrastructures that sustain these imagined futures are materially intensive and environmentally costly. Cloud-based learning platforms and artificial intelligence systems depend on data centres with substantial and growing demands for electricity and water, while the production, maintenance, and disposal of digital devices rely on extractive mineral supply chains and fossil-fuel–dependent energy systems

(Crawford, 2021; Parikka, 2015). These material conditions remain peripheral to many digital literacy frameworks, abstracting digital education from its ecological and geopolitical foundations.

By preparing learners to participate in digital economies dependent on intensive resource extraction and energy consumption, schooling becomes implicated in sustaining futures that are materially untenable. The promise of digital literacy as opportunity and resilience thus becomes entangled with systems implicated in climate instability, resource depletion, and environmental injustice—burdens unevenly distributed and disproportionately borne by communities in the Global South. Digital literacy does not merely respond to an uncertain future; it can help normalise forms of participation whose social and ecological costs constrain the very futures it promises to secure.

Within this configuration, education increasingly functions as a buffer zone for extractive digital economies. As automation, platformisation, and ecological crisis generate anxiety, schooling is mobilised to absorb these pressures, translating systemic instability into individual demands for adaptability, reskilling, and lifelong learning. Structural conditions of precarity and environmental harm are thereby reframed as pedagogical challenges, normalising adaptation to extractive systems even as their planetary consequences intensify and their social costs are displaced onto communities least responsible for them.

Defuturing education, then, cannot be separated from defuturing the planet. When digital literacy operates as a developmental technology and schooling is positioned as a buffer against crisis, education can become locked into trajectories that undermine its own ethical and ecological grounds. What appears as preparation for the future can become accommodation to the very conditions that foreclose alternative futures, making refusal not a rhetorical gesture, but an ethical necessity.

Refusing the Education Buffer Zone

This article has argued that digital literacy, as increasingly mediated through international development agendas and a wider assemblage of public and private actors, draws schooling more deeply into extractive digital economies, contributing to the defuturing of both educational and planetary futures. We conceptualise this displacement of structural responsibility onto education—absorbing the social consequences of technological, economic, and ecological crises and translating them into demands for individual adaptation—as the education buffer zone.

Refusing this role is not simply a matter of proposing alternative skills frameworks, developing more inclusive models of digital literacy, or designing better technologies. It requires releasing education from the expectation that it should compensate for extractive economic arrangements and deferred political responsibility. Such refusal does not entail rejecting digital technologies or denying the educational challenges they may address. Rather, it begins with sustained questioning of the terms on which technological solutions are offered, including the false choice between what is currently available and nothing at all, often rationalised through the claim that ‘something is better than nothing’.

What is at stake, then, is not only how digital literacy might be improved, but whether education should continue to be mobilised in service of futures whose possibilities are being foreclosed by extractive logics. To refuse the buffer zone is to insist that education cannot remain the site where technological, economic, and planetary crises are quietly absorbed and normalised. Refusal, in this

sense, interrupts the assumption that existing technological trajectories are inevitable and reopens questions of what technologies are needed, on whose terms, for whose purposes, and toward what futures.

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