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RESEARCH

EdTech and the Environment: A Research Program

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Abstract

The global EdTech market, valued at nearly USD 250 billion, generates not only revenue but substantial ecological and planetary costs that the EdTech scholarly community has insufficiently examined. This article argues that those working in and around EdTech bear a moral responsibility to move beyond (non)performative engagement with sustainable development goals toward serious, structural inquiry into the environmental impacts of EdTech. Drawing on a postdigital transdisciplinary framework, we identify key scholarly fields and approaches—Critical EdTech Studies, AI and education research, postdigital-biodigital approaches, Education for Sustainable Development, degrowth theory, ecopedagogy, and studies of unequal planetary conditions—and examine their respective contributions to understanding relationships between EdTech and the environment. We outline an open research program grounded in ontological, epistemological, ethical, political, pedagogical, positional, and community commitments that resist technological solutionism and growth-dependent development models. Rather than offering definitive answers, this paper extends an invitation to transdisciplinary collaboration, recognising that planetary challenges require planetary responses from a coalition of scholars willing to work across—and beyond—disciplinary boundaries.

Keywords EdTech · Environment · AI · Postdigital · Biodigital · Freirean ecopedagogies · Science Education · Degrowth · Education for Sustainable Development · ESD

From Billion Dollar Industry to Billion Tonnes of Emissions

According to the October Market.us (2025) report, '[t]he Global Edtech Market generated USD 247 billion in 2024 and is predicted to register growth from USD 277.2 billion in 2025 to about USD 907.7 billion by 2034, recording a CAGR [Compound Annual Growth Rate] of 13.9% throughout the forecast span. In 2024, North

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America held a dominant market position, capturing more than a 37.2% share, holding USD 91.8 Billion revenue'. Revenue estimates vary, for many reasons including different understandings of what is considered EdTech. Yet even the most modest estimates are huge—and Big Tech is inevitably linked to big environmental impacts (Peters et al. 2025a). Therefore, as Neil Selwyn (2021: 506) argues, 'the field of educational technology [needs] to move beyond a residual complacency when it comes to the ongoing environmental crisis'.

Those of us who work in and around EdTech have a moral duty and responsibility toward the planet, ourselves, and our children, to seriously consider the environmental impact of what we do—beyond performatively connecting our work with sustainable development goals. As Stein et al. (2022: 276) argue, even mainstream sustainable development presumes the possibility of 'perpetual growth and consumption on a finite planet' and can be understood as '"business-as-usual" but greener'—an effort to green the existing growth paradigm rather than replace it. This critique is particularly relevant for EdTech, where environmental concerns are often addressed through techno-optimistic solutions that leave core issues and questions about technological necessity, structural power, and political economy under-examined.

The market figures tell only part of the story. While global EdTech markets are dominated by a relatively small number of major technology corporations and venture capital–backed platforms, there are a growing number of local, grassroots, and smaller scale EdTech initiatives that operate outside of these mainstream technological systems. These local initiatives, from community-developed open educational resources and teacher-created digital tools to regionally specific learning platforms and adaptations of informal technologies, often resist or simply never achieve the kind of scaling that attracts market analysis or venture capital investment (e.g., Duarte and Vigil-Hayes 2021).

The environmental implications of this distinction are significant. Global EdTech, or Big EdTech, operates through extensive supply chains, data centre infrastructures, and continuous growth and expansion logics that produce substantial environmental impacts at planetary scale. Local EdTech initiatives, by contrast, may involve different materialities, repair cultures, and sustainability commitments (Macgilchrist 2024), though they are not automatically or necessarily more sustainable simply by virtue of being small or local. Understanding relationships between EdTech and the environment, therefore, requires attending to this full spectrum from billion-dollar platforms with global reach to modest localised innovations that may never extend beyond a single classroom or community. Both shape educational futures, but in profoundly different ways and often with vastly different environmental footprints.

As Freire (1972) would argue, every emancipatory journey starts with conscientisation. Indeed, the exploration of relationships between EdTech and the environment has remained under the radar because most people directly involved with EdTech—scholars, teachers, students, learning technologists, policymakers, programmers, companies, start-ups, and many others—have not sufficiently engaged with environmental questions. Vice versa, those scholars and educators who are deeply engaged with education and the environment have often had little interest in EdTech. Consequently, when it comes to studies of environmental impacts of our own practice, the EdTech community lags behind many other

communities (see Jandrić 2026a). Yet the predicament we face is not primarily rooted in ignorance and thus solvable with more knowledge, nor primarily rooted in immorality and thus solvable with normative values. Rather, as Stein et al. (2022: 274) contend, it is rooted in denials that stem from 'harmful desires for and investments in the continuity of the securities and satisfactions promised by modernity-coloniality'.

Admittedly, phrases like 'the EdTech field' and 'the EdTech community' are quite imprecise. The EdTech field consists of software and hardware; their development, regulation, and use (in a postdigital spirit, hardware also includes non-digital technology such as chalk and blackboard). In this view, the EdTech community equally consists of lithium miners, factory workers, delivery drivers, start-up or corporate computer programmers, students, teachers, and Ministers of Education; if we extend the list to parents and grandparents, then the EdTech community is pretty much everyone. This description is fitting in some sense, as all those people are indeed related to, or impacted by, EdTech. However, there is a world of difference between the community of people who are implicated by EdTech, or the broad EdTech community, and the community of people who research EdTech, or the EdTech scholarly community.

Attempting to describe the EdTech scholarly community, in their position statement written after the inaugural edition of the European Conference on Critical EdTech Studies (ECCES), 'Critical Edtech Studies Defining the field; envisioning the future', Decuypere et al. (2025) define Critical EdTech Studies (CES) in 6 main themes: Teaching and learning, Policy, discourse, and governance, Political economy, Histories and futures, Social justice, sustainability, ethics, and rights, and Methodologies. Further, the authors insist that CES needs to be critical—and that 'the overarching values that should define CES as a field – social and environmental justice, equity, and care – are oriented not only towards critical and reflexive analysis, but also towards the more concrete task of enabling and working towards transformative, hopeful futures'.

We can take this community-driven definition of the EdTech scholarly community as a rough map of a provisional description of the EdTech and the environment research field and community. Having said that, the map is not the territory. EdTech and the environment is indeed a topic of interest in, or subset of, CES. At the same time, however, EdTech and the environment also includes some other considerations outside of CES' usual scope, such as global carbon emissions, making EdTech and the environment a superset of CES. Whatever their exact relationship, definitions of the CES field and its scholarly community remain an important source of inspiration for the research program on EdTech and the environment.

In this loosely defined EdTech scholarly community, there is a lot of talk of AI and the environment (Coeckelbergh 2021), but there's (still) a lot of EdTech which is not based on AI. Admittedly, the recent Special Issue of *Learning, Media and Technology*, 'Minimal Computing and Educational Technology' does explore all kinds of computing technology, offering 'an alternative to the narrative of technological solutionism that drives Big EdTech' (Risam and Bessette 2024: 753). However, this minimal computing movement focuses predominantly on tools (this or that minimal EdTech) and offers only a part of the big postdigital picture.

Then, there are many exciting EdTech-related biodigital-postdigital developments (Peters et al. 2022) such as data-intensive educational genomics (Williamson et al. 2025), yet the environment is not necessarily in their focus. There is also a lot of environmental concern in Education for Sustainable Development (ESD) (e.g. about climate change); yet again, this concern rarely engages with the environmental impacts of EdTech. There is a large body of work on Freirean ecopedagogies (Jandrić and Ford 2022; Misiaszek 2023a, b, c), which could initially be seen as quite far from EdTech; however, postdigital-guided reinvention of (post)critical ecopedagogies is essential to, in turn, guide needed EdTech futures (Misiaszek 2023a, see Misiaszek 2022; Crain et al. 2026). Then, there is the digital degrowth movement (Selwyn 2025), which yet again with some exceptions (e.g. Selwyn 2024) has little focus on EdTech. While many fields and scholars are tangentially related to the relationships between EdTech and the environment, there is little focused inquiry or convergence between the approaches.

Based on a postdigital transdisciplinary research approach (see Jandrić et al. 2023a, b), this paper identifies main scholarly fields and approaches interested in the relationships between EdTech and the environment and outlines their key research questions, research methods, challenges, and opportunities. We begin by establishing main theoretical foundations. We then articulate core commitments and outline methodological directions as well as possibilities for transdisciplinary collaboration. The conclusion offers a synthesis and outlines rough contours of an open research program for transdisciplinary inquiry into relationships between EdTech and the environment. The choice of fields and approaches reflects its authors' interests and expertise, and we end the paper with an open invitation to join our efforts.

Points of Departure

The EdTech and the environment research program is built on three assumptions: what is meant by EdTech, what is meant by the environment, and what could be an appropriate way for studying their relationships.

EdTech Is Technique

According to the 'Environmental impact of EdTech: The hidden costs of digital learning' report (Shengjergji et al. 2024: 5), '[b]y EdTech, we refer to educational technology, that is technology designed with the specific intention to educate and support learning and teaching. Examples include apps, e-books, learning platforms and management systems used in schools and homes'. In a postdigital view, however, the report's definition is too narrow, as EdTech is all technology that is used for teaching, learning, and research, as well as administration and maintenance of teaching and learning infrastructures, from cloud services and AIs to computer operating systems and text or spreadsheet processors. The postdigital definition includes analog and digital technologies, biotechnologies and infotechnologies, low-tech and

high-tech, and practices that do not directly involve technological artefacts, such as EdTech politics and policy.

This holistic understanding of EdTech is inspired by Jacques Ellul's *technique*. 'In our technological society, technique is the totality of methods rationally arrived at and having absolute efficiency (for a given stage of development) in every field of human activity.' (Ellul 1964: xxv) Understanding EdTech as technique, our postdigital inquiry looks beyond instrumentalist notion of 'what works'. We insist on the centrality of context and ask whether the use of technology is at all necessary for the task; what are possible competitor technologies; and whether they offer a more environmentally friendly alternative. As Selwyn (2024: 187) argues, 'it makes little sense continuing to suggest that the ever-more intense digitisation of education somehow offers a path to universal improvements, flourishings and progression toward "better" forms of education'. Indeed, for decades EdTech scholars have admitted that there's hardly evidence of how those technologies work when introduced in the classroom (see Cuban 2001).

In this way, our work moves beyond criticising existing choices around technology toward making different, hopefully better choices. On the flip side, the all-encompassing understanding of EdTech complicates a lot of research. For instance, EdTech industry revenue is much harder to calculate as the list of included technologies gets longer, and as the included technologies serve more purposes than education. Of course, industry revenue is one of many indicators of environmental impact, and it is plausible to find lower-revenue technologies with high environmental impact and vice versa. However, researching EdTech industry revenue serves more purposes than assessing environmental impact; it is the basis of analyses of power relationships, political economy, and the similar.

The Environment Is The Planet

The second assumption is the definition of the environment. The 'Environmental impact of EdTech: The hidden costs of digital learning' report states:

> We conceptualise 'environment' by highlighting sustainability, which entails the ability to endure over time. Environmental sustainability refers to the responsible management of resources to ensure that current and future generations can continue living without compromising the health of the natural environment and maintaining ecological balance (see, e.g., European Environment Agency, 2024). This is broader than 'climate resilience', which focuses on adaptation and mitigation strategies (see also Section "The Challenge of AI"). Sustainable practices go beyond mitigation strategies by focusing on changes in our behaviour that aim to reduce environmentally damaging practices by offering more sustainable alternatives. (Shengjergji et al. 2024: 5)

The concept of behaviour change looks very promising, as it implies not just the development and usage of cleaner EdTech, but also the possibility to reject technology, or to develop radically new technology. Still, this definition carries some remnants of technological determinism and instrumentalism (see Jandrić

and Knox 2022), that is especially visible in the notion of 'responsible management of resources'—indicating business as usual, only sprinkled with an additional layer of responsibility such as recycling.

To avoid these and similar problems, our research program is based on epistemologically diverse planetary understandings of the environment, i.e. the many different ecologies of knowledges. This understanding has roots in the critical ecopedagogy movement (Kahn 2010; Misiaszek 2020; Jandrić and Ford 2022) and appears in recent writings such as Selwyn's (2025) *Digital degrowth: radically rethinking our digital futures*. Not all understandings of planetary views are the same, and we subscribe to Dora Kourkoulou's understanding that the planetary view

> invites thinking beyond the global, which too easily reduces to flows of markets or technologies. The planetary … names the entanglement of human and non-human, earth and climate, networks and technologies. It marks not only the reach of infrastructures but also their dependence on elemental conditions: water, minerals, atmosphere, energy. To call [EdTech] planetary, then, is to acknowledge that epistemology today emerges in circular movements of human–machine–earth systems, where cognition is distributed across ecologies rather than confined to individual minds or computational models. (Kourkoulou in Peters and Kourkoulou 2025: 1486)

Positioned in line with postdigital understandings of relationships between biology, information, and society, this view is well suited for postdigital research methodologies (see Jandrić et al. 2023a, b).

In a postdigital context where the digital and material are inseparably entangled, the planet itself becomes a learning environment, shaping and being shaped by knowledge practices necessary for equitable and sustainable development (Traxler and Jandrić 2026). The development of planetary-level literacy, as emerging from critical literacy (Murris and Somerville 2021; Jandrić and Hayes 2026), is urgent in the current era of Anthropocene described as 'a new phase in the history of both humankind and of the Earth, when natural forces and human forces became intertwined, so that the fate of one determines the fate of the other' (Zalasiewicz et al. 2010: 2231).

Planetary literacy implies the development of a positional narrative that 'speaks to an individual's physical, temporal, mental, biological, economic, social, or academic circumstances, in digital and analog society, and how such features combine to construct a narrative of the self' (Hayes et al. 2025: 117). Such postdigital positionality, i.e. 'how people understand and construct themselves within contemporary postdigital-biodigital global society' (Hayes et al. 2025: 117), is crucial for human deliberation regarding the use of new technologies with a high environmental footprint such as AI. While we are aware that education alone cannot resolve social problems (see Peters et al. 2019), the development of planetary EdTech literacy is an important aspect of our research program for EdTech and the environment.

A Confederacy of Dunces

Having delineated the objects of our study (EdTech and the environment), we now need to identify appropriate ways of studying those objects. This section's title, shamelessly stolen from John Kennedy Toole (2016), playfully offers a sense of general direction. A confederacy is 'a group of people, countries, organizations, etc., that are joined together in some activity or effort' (Britannica 2025). Indeed, we are a group of scholars joined together in an effort to make sense of relationships between EdTech and the environment—and to change it for the better. Dunces, in this context, are those whose vision is constrained by disciplinary boundaries—scholars who mistake their particular expertise for comprehensive understanding, risking disciplinary (and technological) chauvinism if they fail to work across boundaries.

Our transdisciplinary collaboration on writing this paper is therefore a proper confederation of dunces; joined for a higher purpose of understanding and improving relationships between EdTech and the environment, our knowledges intersect and enrich each other for the benefit of all Earth. Planetary challenges require planetary responses, so 'we' are not just the authors of this paper. As Selwyn recently argued in a slightly different context:

> It can be easy for critical scholars to presume that only *they* can see the true horrors of the digital age, and that it falls to them to reveal these insights to unsuspecting others. … Instead, we need a bit more humility and willingness to accept what is currently being said about the digital backlash as our starting-point. (Selwyn in Forsler et al. 2025a) (emphasis from the original)

A transdisciplinary research program for exploring relationships between EdTech and the environment should involve a wide variety of people and disciplines, as well as overlapping perspectives and intersecting concerns. It should explore how things are, how things could be, and possible routes for getting there. This research program needs to make good use of the many approaches and methodologies pertaining to the geopolitics of postdigital educational development (Peters et al. 2025a, b; Green et al. 2026) and studies of educational futures (Buch et al. 2024; Macgilchrist et al. 2024; Jandrić et al. 2025); it needs to delve into opportunities offered by different epistemic approaches and genres of academic writing (Jandrić and Forsler 2026). Situated in the dynamic between being and becoming, our research program for exploring relationships between EdTech and the environment is an exercise in (post)critical praxis (see Kester 2022).

The sections that follow share common ground in their critique of growth paradigms, attention to environmental justice, and engagement with the politics of colonisation, capitalism, and other hegemonic forces. Rather than viewing these convergences as redundant, we understand them as essential to transdisciplinary inquiry. Different theoretical traditions illuminate different facets of the same urgent problems, creating productive tensions and dialogues across (sub)fields. A Freirean scholar, for example, might ask different questions and point to different possibilities than one grounded in environmental economics or critical ESD frameworks, even when addressing the same technological systems. This multiplicity of entry points is

not a weakness but a strength, reflecting the complexity of planetary challenges and the diverse scholarly communities whose collaboration is essential for addressing them.

Critical EdTech Studies

While by no means a formal or delineated field of research, CES has emerged in various ways as a response to EdTech of our times. That is, EdTech at scale; the ability to extend technical functions and capacities, as well as to offer the promise of an increasing future audience, for the benefit of prospective investors. For tech entrepreneurs, EdTech is a domain in which to demonstrate technical innovation with a plan for range and magnitude. For already-established Big Tech players, it is a fruitful opportunity to diversify portfolios.

Scale is an expanse of infrastructure, economic potential, and rationality. In this sense, education technology has become a sub-category of digital media, where '[v]olume is the name of the game' (Klein 2023: 105). While not an all-encompassing definition, scale is undoubtedly a feature of the era of education technology we find ourselves in, where the opening of new educational markets seems almost indistinguishable from the promise of finally addressing long-standing inequalities, and where the pledge to give 'every student on the planet an artificially intelligent but amazing personal tutor' (Khan in Singer 2024) sits easily alongside an ever-evolving strategy for tiered product pricing.

While much EdTech is deliberately local, studying this kind of educational technology 'critically' has meant, at least to some extent, engaging with scale, principally through the examination of commercialisation (Davies et al. 2022) and datafication (Williamson 2017); the twin key pillars of the contemporary intensifications of digital media that now characterise EdTech. The emerging field of CES has, perhaps unsurprisingly, focused on the central educational concerns of teaching and learning, while interrogating the 'pedagogical, social, technical, political, economic and cultural dimensions' of technology (Decuypere et al. 2025: 3). Such a concern has often 'sought to uncover the underlying power dynamics, biases, or unintended consequences that often accompany the introduction of technological innovations into educational policy and practice' (Decuypere et al. 2025: 3).

Research on teaching and learning has often been concerned with disentangling technical functions and their related pedagogical assumptions, while examining the diverse and often unforeseen ways that technology shapes educational practice. The study of policy and governance has focused on the ways digital and data-driven technologies are increasingly incorporated into educational policymaking itself (Williamson 2016), while technology is conceptualised politically as a mode of governing educational practices. CES scholarship has also examined the political economies of EdTech, focusing on the ways technology adoption is incentivised in institutional strategies and boosted by powerful investor networks.

Critical perspectives on histories (Good and Hof 2024) and futures (Rahm 2023; Jandrić et al. 2025) have also been developed, uncovering many forgotten, intentionally unacknowledged, or otherwise overlooked examples of technology, where the

legitimate visions of future innovation are carefully crafted by vested interests. CES has also made important contributions to methodology, particularly in research-practice partnerships, collaborative and participatory approaches, and attempts to engage multiple stakeholders in the design, re-envisioning, of 'futuring' of EdTech. Work in CES also often includes an explicit concern for social justice and ethics (Swist and Gulson 2023; Sriprakash et al. 2025).

While certainly critical, and undoubtedly probing much further than instrumental accounts of the simplistic technological enhancement of teaching and learning, the sense of scale in CES has been primarily sociotechnical. That data infrastructures are 'global' is concerning to the extent that they transform how knowledge about schools is produced (Sellar 2015), commercialise educational institutions (Lingard 2019), or 'platformize' educational practice (Decuypere et al. 2021). Further, the scale of datafied EdTech has motivated critical responses to powerful rationales for the narrowing of teaching and learning to 'personalised' transactions, and the reduction of pedagogical care to the logics of performance metrics. These are all concerns which should not be taken lightly.

Such perspectives are, understandably, oriented toward examining the impact of scaled technologies on education, rather than on engaging substantively with the (socio)material realities of the infrastructure itself, and their impact on the planet. Aspects of sustainability certainly feature in the broad scope of CES (Decuypere et al. 2025), notably in Selwyn's (2024, 2025) discussion of degrowth. However, a much more substantive research undertaking is needed to excavate the increasingly planetary scale of our education; both the interconnected, transdisciplinary, and postdigital potentials for understanding our environment itself as a learning system, as well as the toll our current technical infrastructures take on the planet that sustains us.

The Challenge of AI

During the past few years, academic studies (e.g.Li et al. 2025; Spelda and Stritecky 2020) and popular media (e.g. The New York Times 2024; Zewe 2025) have started to pay increasing attention to the environmental costs of AI. Blanket statements such as '[e]very 100-word ChatGPT-4 response consumes 519 ml of water and 0.14 kWh' (Wright 2025) or 'Each "please" and "thank you" said to a chatbot costs millions of dollars' (Deb 2025) may be too generalised as they lack context. However, it is true that water consumption in large AI data centres is problematic (Ren and Luers 2025), alongside the extensive amounts of periodic elements, including the so-called rare earth elements, involved in the construction of digital infrastructures (UN Trade and Development 2020).

What is more, Big Tech's emissions have significantly increased in the last two years, with Google disclosing in 2024 that its greenhouse gas emissions had risen by 48% since 2019 due to the energy demands of AI data centres, and Microsoft reporting a 29% increase in its emissions since 2020 following the launch of its GenAI platform, Copilot (Sheffield 2025). The data centres powering EdTech, particularly GenAI tools and digital learning platforms, require massive water, mineral, energy,

and other resources. A recent United Nations Environment Programme report (2024) highlights the increased demand AI brings 'for both critical minerals and rare earth elements, as well as water resources to meet new data centre demands' (31) and that these demands contribute to 'intensifying competition over critical resources such as water, food, minerals and energy [in ways that are] reshaping global security dynamics' (72).

Recent conflicts in Tucson, Arizona, where residents opposed a data centre development threatening groundwater supply in the Sonoran Desert region of the southwestern United States, reveal how EdTech infrastructure intersects with environmental concerns that often disproportionately affect already vulnerable communities. Of course, AI may also have a positive environmental impact, as, for instance, advanced systems are already helping scientists predict the trajectory and evolution of extreme meteorological phenomena (United Nations Environment Programme 2024).

As Coeckelbergh (2021) argues, this dual role of AI—both as a contributor to environmental degradation and as a tool for climate mitigation—reveals that AI for climate is inherently an ethical and political project rather than a purely technical one. Powerfully illustrated in Crawford's (2021) *The atlas of AI: Power, politics, and the planetary costs of artificial intelligence*, the environmental footprint of AI cannot be separated from broader questions of responsibility, power, and justice at a planetary scale.

Geopolitical forces behind the use of AI are not limited to climate. Importantly, they also include other major global-scale implications such as the use of precarious labour [including the so-called immaterial labour related to cognitive capitalism (Wark 2021)], the coloniality of being, of power, and of knowledge (Farrow et al. 2023), the accelerated marginalisation and inequality, and the engagement of GenAI in political interference, security, and privacy (Bryant et al. 2025; Crain 2025). Planetary impact of today's AI-powered EdTech reaches beyond resource consumption, embracing broader discussions about sustainability in a multi-dimensional world (Burbules et al. 2020). According to Van Wynsberghe (2021), AI ethics must place sustainable development at its core, not being limited to AI for sustainability but also including issues related to the sustainability of AI per se.

This discussion aligns with ESD and with the emerging concept of Sustainable Learning and Education (SLE). Rather than education for or about sustainability, SLE focuses on sustainable learning itself: learning that is retained over time, transferable to new contexts, and grounded in processes of 'learning to learn' (Hays and Reinders 2020). Sustainable learning implies ongoing, purposeful, responsive, and proactive development, where learners continually rebuild and adapt their knowledge and skills as circumstances and environments change (Hays and Reinders 2020: 30). In this sense, integrating AI into education invites us to consider not only how technology can/should support sustainability goals, but also whether the learning it enables remains resilient, adaptive, and meaningful in the long term (Hayes et al. 2025).

As explained by Peters and Besley (2025), geopedagogy exemplifies the integration of AI and digital technologies in fostering sustainable learning practices within contemporary classrooms. This interdisciplinary pedagogical approach combines geographical concepts with experiential, place-based learning to cultivate spatial

awareness and environmental consciousness among students. By leveraging AI-enhanced Geographic Information Systems (GIS) and digital mapping tools, geo-pedagogy transforms local environments into dynamic learning resources where students can analyse spatial data, visualise geographical patterns, and connect theoretical knowledge with real-world contexts through virtual field trips and interactive experiences.

This SLE approach encourages students to examine not only environmental relationships but also the geopolitical dimensions of technology ownership and its role in shaping twenty-first-century economic and cultural development. In this way, AI becomes a tool for developing global citizenship and planetary literacy, enabling students to develop their postdigital positionalities (Hayes and Jandrić 2023; Jandrić and Hayes 2026) through a critical and empathetic understanding of North-South relations and worldwide sustainability challenges. Other recent research reports on the use of AI-powered technologies such as online mapping, computer games, and data science tools to augment high-school learners' decision-making in regard to anthropogenic environmental changes (Xiang and Meadows 2025).

While AI has intensified global attention to data security and privacy, including within environmental research (Layode et al. 2024), collective imaginaries of digital infrastructures often remain narrow and insufficiently critical. In postdigital education, where learners—particularly in marginalised contexts—are increasingly shaped by platformisation and datafication (Knox 2025), this constrained imagination becomes a form of geopolitical disempowerment. Although reversing the algorithmic expansion into all spheres of life may be unrealistic, educational stakeholders can and should assert agency by cultivating postdigital imagination: shaping the narratives, values, and imaginaries embedded in EdTech so that they support equitable development rather than passive dependency. As Crain (2025: 84) reminds us, '[h]ow we organize our planetary AI-driven future, for better or worse, is in our own hands'.

Postdigital-Biodigital Approaches

In a postdigital society, where our already messy, hybrid lives have intermingled with data-driven digital systems, '[n]ew technological ability is leading postdigital science, where biology as digital information, and digital information as biology, are now dialectically interconnected' (Peters et al. 2021: 370; see also Peters et al. 2022; Policy Horizons Canada 2020). This makes it hard to categorise biodigital developments in EdTech and their implications for the environment, without acknowledging that the natural sciences, digital technologies, and the humanities are 'increasingly integrated and conceived of as data production and scientific discovery entities on an equal basis' (Oras et al. 2025: 1).

The reference to a developing transdisciplinary research area of 'biomolecular humanities' is one of many new perspectives, language, and terminology arising to refer to forms of 'postdigital-biodigital convergence' (Peters et al. 2022: ix). Educational genomics and neuroscience are areas that reveal a complex convergence of biology, technology, information, ethics, environment, and diverse

stakeholders with vested interests, as for example, controversial consumer services enable parents to potentially 'screen and select embryos based on polygenic scores for IQ' (Williamson 2025; Williamson et al. 2025).

Such a case raises ethical, health, and educational dilemmas, as well as environmental issues concerning intense computing power and data storage impacts. Yet consequences for the natural environment of our planet 'raised during the intensive industrial revolution in the 1960s' still did not alter the rapid technological innovations that have happened since, under the banner of improving life (Mercier-Laurent 2015: xvi). This narrow technological focus shapes EdTech development, privileging computationally intensive solutions over low-tech or social innovations that might have lower environmental impact.

Our postdigital-biodigital challenges and the implications within EdTech 'requires connection and synergy with other innovations – in politics, society, education and behaviors' (Mercier-Laurent 2015: xvii). Exploring such behaviours, in line with our earlier discussion on *technique* (Ellul 1964: xxv), includes picking up on all stages in the EdTech design process, hardware and software creation, and their environmental and ethical impacts, as well as the power, energy consumption, and waste generation that occurs through use in the classroom on interactive screens, or virtually through online teaching and learning activities (Berquin 2021). This sort of break-down and scrutiny of EdTech and its use by universities seems to have been oddly missing from reports that examine the role of universities in the climate action agenda in their regions (Civic University Network 2022).

We now need a 'creative and inclusive convergence' of transdisciplinary research areas to address the environmental and ethical impacts of the innovation biosphere as it has flowed through into EdTech. Such a creative transdisciplinary convergence requires universities and other research institutions to also co-create innovations more inclusively across sectors, with diverse stakeholders, start-ups and 'citizen researchers' (Hayes et al. 2024). It involves a broader movement for change that also interconnects with dynamic public engagement initiatives that are co-creating change for more inclusive, sustainable and engaged educational futures (National Co-ordinating Centre for Public Engagement 2025, Place-based Climate Action Network 2024, Civic University Network 2025).

In a sense, such a proposal is also circular in nature, as part of a transformative bioeconomy that might underpin global futures (Peters et al. 2022: x), when education (and EdTech by association) relates to the self, and connecting self to society (May 2013). This future concerns praxis to grow awareness of our (wonderfully) flawed material state as biodigital beings (Ariel 2023) and then to develop our co-creative, innovative selves and diverse postdigital positionalities (Hayes 2023) to address challenges to enhance life and our 'postdigital nature connection' (Reed, 2025). This is inclusive also of 'an ethics of care' (Costello 2024) and many other interlinked complexities. A convergence of biodata, informatics, and AI capacities into EdTech may open up positive possibilities to also address both equity and planetary concerns. However, there are potentially conflicting commercial motivations, funding decisions, politics, and other interfaces to prevent, block, or disrupt such collaborative research.

What is clear though is the pressing need for postdigital-biodigital dialogue concerning the limits of human enhancement and potential existential and planetary crisis amongst all 'audiences interested in future-oriented biotechnology'. If education concerns emancipatory journeys (Freire 1972) to reduce inequities, then we now need visionary co-research to grow that path, amid programmable biology and biodigitally amplified intelligence. Working toward extending a postdigital social contract for higher education in the age of AI (Hayes et al. 2025) that develops innovative and emancipatory EdTech that is mindful of the Earth's biosphere and brings a contribution to enhancing life (Mercier-Laurent 2015) is key.

Degrowth

As noted earlier, the degrowth movement challenges one of the most fundamental assumptions underlying mainstream economy: that perpetual economic growth is both possible and desirable. Born from ecological economics, environmental activism, and research on social inequality, degrowth proposes a planned reduction of energy and resource use in wealthy nations to bring economies back into balance with planetary boundaries while improving human well-being (Kallis et al. 2018). This is not simply about doing less harm, but it represents a re-imagining of prosperity beyond the growth paradigm that has dominated policy and practice since the post-war era.

Education sits uncomfortably within degrowth discourse. On one hand, education is often championed as essential infrastructure for human flourishing, critical thinking, and democratic participation—all core degrowth values. On the other hand, contemporary education systems are deeply implicated in growth ideology, functioning as training grounds for workers and consumers in a growth-dependent economy (Vare et al. 2019; Bauwens and Jandrić 2021). The massification of higher education, for instance, has been justified primarily through human capital theory and promises of economic returns, not through commitments to ecological sustainability or collective well-being. Education systems reproduce growth imaginaries even as they teach about environmental limits, creating a profound pedagogical contradiction (Kerschner and Ehlers 2016; Balsiger et al. 2017).

A degrowth approach to education requires confronting this contradiction head-on. It means questioning the expansion imperative itself, asking whether more students, more universities, more degrees, and more EdTech serve human and planetary flourishing, or merely feed the growth machine (Ellul 1964). This tension is acute for academics themselves, who often find themselves trapped in growth-oriented publishing and career advancement systems even while advocating for degrowth principles (Kostakis 2025). Postgrowth education would prioritise sufficiency over expansion, conviviality over competition, and local rootedness over globalised mobility. This involves not just curriculum reform, e.g. adding sustainability modules, but radical institutional transformation (Balsiger et al. 2017; Kerschner and Ehlers 2016).

The implications for big EdTech are particularly stark. Its business models depend on perpetual expansion, continuous innovation cycles, and the creation of

new needs and dependencies. From a degrowth perspective, this raises urgent questions. Do we need this much EdTech? What purposes does its expansion serve? Who benefits from the endless proliferation of learning platforms, apps, and devices?

Selwyn's (2025) work on digital degrowth provides groundwork for thinking through these questions in educational contexts. He argues for radically rethinking our digital futures by moving beyond incremental improvements toward fundamental reductions in digital infrastructure, devices, and data. Applied to education, this might mean fewer devices in classrooms, simplified platforms with longer lifespans, rejection of planned obsolescence, and renewed appreciation for mid-tech, low-tech, and no-tech pedagogies. The challenge is that degrowth remains marginal in educational discourse, including in critical EdTech studies. Despite decades of academic criticism, EdTech solutionism is deeply ingrained in discourse, policy, and politics. Even critical scholarship often stays trapped within growth assumptions, while new technologies exacerbate neoliberal trajectories (Jandrić et al. 2024, 2025).

The postdigital turn offers a way beyond this impasse by emphasising entanglement and complexity and imagining alternative futures (Jandrić and Knox 2022; Jandrić et al. 2025). If the digital and physical are fundamentally entangled, then reducing digital infrastructure is not a retreat from the digital age. It is a reconfiguration of how digital and material resources are distributed across educational ecologies. Further, Forsler et al.'s (2025b) concept of future workshops suggests that growing public concern with technology's impacts might create openings for more radical critiques. Rather than dismissing concerns about screen time, data privacy, or technological dependency as reactionary, a degrowth-informed approach would take them seriously, linking them to broader questions of resource use, labour conditions, and planetary health.

There are significant tensions to address. Degrowth risks reinforcing digital divides if wealthy regions simply reduce their technology while poorer regions remain locked out. Yet the Global South's 'right to development' cannot mean replicating the North's unsustainable technological trajectories (Peters et al. 2022). A postdigital degrowth approach must attend carefully to geopolitical justice, exploring how technological sufficiency might be achieved differently across varied contexts (Peters et al. 2025a, b). Therefore, educational degrowth is not about nostalgia or technological refusal. It is about expanding our capacity to discriminate—and about recognising that human flourishing is entangled with more-than-human flourishing (Braidotti 2013). Which technologies are worth their ecological and social costs? Which forms of expansion genuinely serve human flourishing? Which practices of educational sufficiency might enable richer learning than perpetual growth ever could?

The question is not whether education needs technology, but how much? For what purposes? At what cost? And crucially, when is enough, enough? A degrowth research program for EdTech would prioritise these questions, developing methods for calculating full ecological costs, exploring mid- and low-tech pedagogical alternatives, and imagining educational futures beyond growth (Kostakis and Pantazis 2021). This requires a postdigital transdisciplinary approach outlined in this paper, bringing together insights from ecological economics, critical pedagogy, science and technology studies, the commons, and diverse educational communities.

Transdisciplinarity emerges as a defining strength of postdigital educational research through its capacity for dialogue across disciplines in confronting the interconnected technological, political, and environmental challenges facing education and wider society (Peters et al. 2025c, d, Jandrić 2026b). Only through such confederated inquiry might we build educational systems that fit within planetary boundaries while expanding human capabilities for collective flourishing. These degrowth commitments intersect with long-standing debates within environmental education, particularly around Education for Sustainable Development (ESD).

Education for Sustainable Development

Education for Sustainable Development (ESD), promoted by UNESCO, has emerged as the dominant framework for addressing climate and environmental crises through education globally. Yet the relationship between ESD and the degrowth perspectives outlined above is far from straightforward. As Tannock (2025) observes, degrowth scholars have engaged critically with ESD in two ways: some advocate for developing more critical forms of ESD that challenge growth paradigms, while others argue for replacing mainstream ESD altogether due to its incompatibility with degrowth scholarship.

The tension stems from what Stein et al. (2022) identify as mainstream sustainable development's foundational assumption that responsible growth and consumption remain achievable through technological innovation, market mechanisms, and/or policy interventions. This 'business-as-usual-but-greener' approach positions economic growth (SDG 8) as compatible with, even necessary for, climate action. Within this framework, ESD becomes primarily concerned with developing 'green skills' for a 'green economy', promoting sustainable consumption and fostering environmental literacy while leaving underlying assumptions about growth unchallenged (Getzin 2019). The result is often what Kopnina and Bedford (2024) term 'pseudo sustainability education', or approaches that prepare students to manage environmental impacts within existing structures rather than to critically interrogate whether those structures themselves are sustainable.

Critical ESD scholarship, by contrast, shares theoretical grounding with degrowth and critical pedagogy in fundamentally questioning growth-dependent development models (Kaufmann et al. 2019). Drawing on traditions of transformative learning, political ecology, and critical environmental education, critical ESD recognises that meaningful responses to the climate crisis require not incremental adjustments but radical socio-ecological transformation (Miglani, 2026; Stein et al. 2022; Vare et al. 2019). Critical ESD becomes less about training students for green jobs within existing economic structures and more about developing collective capacities for imagining and enacting post-growth, post-capitalist futures.

Yet as Tannock (2025) argues, much of the degrowth education literature has focused primarily on curricular and pedagogical questions: what should students learn about degrowth? How might critical ESD frameworks inform classroom teaching about environmental limits? While valuable, this focus on curriculum and pedagogy risks missing what Tannock (2025: 455) identifies as the crucial institutional

and political-economic dimensions. Moving beyond questions of what to teach about sustainability requires examining education 'as a broad social institution and extended field of practice' shaped by structures of power, capital accumulation, and geopolitical relations. For EdTech specifically, we must attend not just to how digital tools might support ESD curriculum but to how EdTech industries, infrastructures, and imaginaries are themselves implicated in growth-dependent development models.

The implications for an EdTech and environment research program are significant. First, we must distinguish between mainstream ESD's often techno-optimistic embrace of EdTech as a solution to environmental crises, where digital platforms for example promise to 'scale' environmental education globally, AI 'personalises' sustainability learning, and virtual field trips replace physical ones deemed to be overly resource intensive, or where digital tools and devices (laptops) are presumed to have less of an environmental impact than analogue ones (paper and pen/pencil). Critical approaches must interrogate the environmental costs and structural implications of these technological innovations themselves (Miglani, 2026). Second, drawing on critical ESD's emphasis on transformative learning and systemic change, our research must examine how EdTech shapes (and is shaped by) the 'growth subjects' that education systems produce (Schmelzer et al. 2022). Does EdTech reinforce competitive individualism, meritocratic ideologies, and individual consumer-focused approaches to sustainability? Or might alternative technological practices support the collective solidarity, communing, and structural transformation that critical ESD and degrowth perspectives identify as essential?

Third, following Tannock's (2025: 459) insight that 'degrowth offers a framework that directly links discussions about the importance of supporting education with arguments for redirecting resources and funding away from other areas of social and economic production', we can recognise that some forms of EdTech may need to degrow even as education overall should expand. A degrowth framework advocates for scaling back production and consumption in areas such as luxury vehicles, private aviation, large residential properties, disposable fashion trends, weapons manufacturing, factory-farmed meat, cruise tourism, etc., along with curtailing market industries, deliberately shortened product lifespans, economically unproductive employment, and fossil fuel extraction. Simultaneously, it promotes expanding publicly funded essential services, including healthcare, education, transit systems, affordable housing, that support planetary well-being and quality of life (Hickel 2021; Schmelzer et al. 2022; Tannock 2025).

Carbon-intensive, large-scale, venture capital–backed EdTech platforms might represent the kind of 'superfluous' production that degrowth theory calls into question, not because digital technologies have no place in education but because their current trajectories of perpetual expansion, planned obsolescence, and resource extraction run counter to both degrowth principles and critical ESD commitments to educational, environmental and social justice. Meanwhile, resources might be redirected toward educational forms that critical ESD scholars identify as vital: community-based environmental education, land-based pedagogies, and other approaches that strengthen rather than displace local knowledge systems.

When we speak of EdTech degrowth, we must also be explicit about who should 'degrow' and why. As Hickel (2021: 1) argues, degrowth is fundamentally an anti-colonial politics: it is a demand from the Global South directed at wealthy nations in the Global North, whose economic growth 'relies on patterns of colonisation: the appropriation of atmospheric commons, and the appropriation of Southern resources and labour'. High-income countries are responsible for 92% of emissions exceeding planetary boundaries, with the global North appropriating an estimated 10.1 billion tonnes of raw materials and 379 billion hours of labour annually from the South through unequal exchange (Hickel 2021; Dorninger et al. 2021). When we call for EdTech degrowth, we are calling out wealthy nations and global EdTech corporations—Silicon Valley platforms, capital-backed investments in high-income contexts, carbon-intensive AI infrastructures serving Northern education systems—for their extractive, growth-dependent technological practices. Following Hickel's (2021) framework of convergence, we advocate for the Global South to develop appropriate technologies organised around meeting human needs rather than servicing Northern capital accumulation (or need for new markets), while the North degrows its unsustainable technological practices (see Kwet 2019). As Hickel notes, 'green growth' visions often perpetuate colonial arrangements by presuming that renewable energy transitions will continue to rely on extracting materials from the South. An EdTech research program committed to environmental and anti-colonial justice must therefore attend carefully to geopolitics: examining how EdTech supply chains depend on extractivism in the South, how global platforms reproduce digital colonialism, and how alternative technological pathways might emerge that do not replicate the North's unsustainable trajectories.

Finally, critical ESD's emphasis on interdisciplinary, participatory, and action-oriented approaches resonates strongly with the transdisciplinary methodology our research program proposes. As Getzin (2019) and Kaufmann et al. (2019) demonstrate, meaningful engagement with ESD and degrowth requires moving beyond isolated disciplines to foster 'radical transdisciplinarity' (see Stein et al. 2022); collaboration across not just academic fields but with community members, activists, Indigenous knowledge holders, and practitioners working at the intersections of education, technology, and environmental justice (see Duarte and Vigil-Hayes 2021). The research program outlined in this paper's methodology section operationalised these commitments through calls for participatory research, institutional ethnographies, and collaborative knowledge production that centres the voices of those most affected by both EdTech expansion and environmental crisis (Kwet 2019).

While we remain critical of mainstream ESD's accommodation to growth paradigms and techno-solutionism, we recognise critical ESD scholarship as an important ally in developing educational responses to environmental crises that are genuinely transformative rather than reformist. Our EdTech and environment research program thus positions itself in solidarity with critical ESD traditions while drawing on degrowth theory, decolonial critique, critical pedagogy, and ecopedagogical frameworks to develop a multifaceted approach to understanding and transforming the relationships between educational technologies, environmental justice, and socio-ecological futures. Critical ESD perspectives, grounded in transformative

learning and systemic change, connect directly to ecopedagogical frameworks that centre environmental justice.

Ecopedagogy

Ecopedagogical practices and lenses are essential for teaching students to (post)critically unpack how digital technologies are (mis)used in education to form contested terrains of sustaining, intensifying, or countering socio-environmental oppressions, injustices, and violence. The scope of concern here is all of Nature, including and beyond humans, toward planetary sustainability. This argument extends beyond formal education (i.e. non- and informal education) and to research on the uses of technologies in teaching beyond the concerns of educational outcomes to how the technologies affect Earth overall—including and beyond the human world.

Ecopedagogical work is transdisciplinary and conducted through diverse (post) critical theoretical lenses that deepen and widen students' reflexivity to understand the politics of environmental violence from technologies to (re)construct praxis. Within a postdigital society in which 'technologies permeate all aspects of our being' (Jandrić and Hayes 2022: 324), the use of technologies coincides and conflicts with ecopedagogy's overall goal of 'globally all-inclusive socio-environmental justice and planetary sustainability' (Misiaszek 2023a: 1257). It is in reading the uses of (digital) technologies that ecopedagogical literacy provides, in which reading the use and development of technologies, as well as future development of technologies, are continuously problematised through socio-environmental justice and planetary concerns (Misiaszek 2023b).

Such ecopedagogically taught reading is grounded in Freirean pedagogy and literacy to (post)critically unpack the politics of technologies and all of their complex, messy dimensions. Ecopedagogical reading has students critically unpack how humans' acts of environmental violence are falsely justified by continuing sociohistorical othering (e.g. (neo)coloniality, racism, patriarchy, heteronormativity, epistemicide), and ideologies of neoliberalism and anthropocentrism (Misiaszek 2020). Ecopedagogical literacy is innately connected to planetary literacy, as ecopedagogy historically has been connected with planetary citizenship in the very first book with 'ecopedagogy' in its title by Francisco Gutiérrez and Cruz Prado, *Ecopedagogia e cidadania planetária (Ecopedagogy and planetarian citizenship)* (1989).

Disrupting teaching that instils a singular, fatalistic future guided by unjust and unsustainable 'development' is a key ecopedagogical tenet (Misiaszek 2020). However, using and 'developing' digital technologies toward such a future is essential. Avoiding such an oppressive and unsustainable future calls for a radical departure from dominantly held 'commonsense' of what 'modernization' and 'development' is, that, in turn, directs our pathways for how we use and 'advance' digital technologies. Freire's abhorrence of fatalism in education by stressing both humans' *unfinishedness* and the need for utopic pedagogies (Freire 1972, 1992) guides ecopedagogical work as teaching for multiple futures.

Ecopedagogical work to disrupt a future emergent from *D*evelopment rather than *d*evelopment is foundational. The definition of uppercased *D*evelopment, with

lowercased *d*evelopment as the opposite, and its approaches counter all four aspects described as follows:

> [*D*evelopment:] (1) neoliberal economics as the sole factor of development analysis; (2) deprioritizing economic justice concern by ignoring how development processes sustain/increase hegemony; (3) deprioritizing planetary sustainability for Earth's balance; and (4) local framings of development are disregarded for globally constructed ones 'from above' (e.g. Western *D*evelopment models). (Misiaszek 2020: 16)

Differentiating *d*/*D*evelopment aligns with the essence of degrowth movements. The difference is that the term 'development' is (re)defined by the essence of progress guided by ecopedagogy's goal and thus inherently radically counters *D*evelopment in all its forms (Misiaszek 2020).

Parallel with Freire's (1998) arguments that critical pedagogy is meaningless without action (Gadotti 1996), ecopedagogy is not only critically knowing technologies' socio-environmental effects, but teaching must lead to action to often radically transform their uses and how advances of technologies are developed. Thus, both (re)constructing the *d*evelopment of digital technologies and actively disrupting the *D*evelopment of them. In terms of praxis, ecopedagogical teaching and reading is for deepened and widened reflexivity for determining digital technologies' uses and futures that leads toward ecopedgogy's goal, to reemphasise—globally all-inclusive socio-environmental justice and planetary sustainability (Misiaszek 2023a, b, c). Pedagogical uses of digital technologies must also be guided by such readings and research on education, including on EdTech.

EdTech Within Unequal Planetary Conditions

Globally circulating narratives of the Anthropocene frequently frame planetary crisis as a universal human condition, implying that humanity as a whole has collectively produced—and now collectively suffers—the consequences of environmental degradation (Crutzen 2002). Such framings, however, obscure the profound geopolitical, socio-material, and historical inequalities that underpin both the causes and the impacts of planetary change (Chakrabarty 2009). Critical-ecological posthuman scholars and philosophers, including Bruno Latour (2018), Karen Barad (2007), and Rosi Braidotti (2013, 2019), have critiqued this abstraction of a generic Anthropos for collapsing actors with vastly different responsibilities and vulnerabilities into a homogenised category.

This universalised humanity neutralises the political questions of who drives environmental destruction—typically linked to specific industrial regimes and infrastructures, historically advantaged groups, and global capitalist actors—and who disproportionately suffers its effects. Latour (2018) calls for a shift from the Global to the Terrestrial: a perspective grounded in the specific interdependencies and limitations of the Earth's critical zone. Whereas the Global refers to placeless, universalising experiences and imaginaries, the Terrestrial view understands the Earth not

as a passive background but as a dense mesh of human and non-human actors that materially shape, intervene, and constrain sociotechnical possibilities.

Adopting the Terrestrial lens reminds us that educational systems across the world experience climate vulnerability, resource scarcity, infrastructural fragility, and digital divides in markedly different ways (Peters and Besley 2025). This implies a reframing of EdTech not as the universally applicable solution but as one actor within a broader planetary assemblage. Acknowledging that educational environments, technologies, and policies are embedded within these unequal and more-than-human planetary conditions draws attention to the material dependencies of digital technologies (Gourlay 2020) and the uneven ways these dependencies manifest across regions. The Terrestrial perspective is deepened by, and in turn deepens, 'epistemologically diverse planetary understandings of the environment' by foregrounding situated dependencies and unequal conditions. In this sense, the Terrestrial view grounds planetary thinking in the specific, unequal sociotechnical, material, and environmental conditions through which EdTech is enacted.

As we have already collectively witnessed the digital divide at a global scale during the Covid-19 pandemic (Jandrić et al. 2020; Williamson et al. 2020), these entanglements unequally and distinctively shape both the necessity and the feasibility of EdTech adoption, as well as the possibilities and limitations of educational imaginaries in different regional areas (Knox 2025). They continue to (re-)produce inequalities: some communities reap the benefits of digital learning infrastructures while others absorb the environmental burdens of digital production, operation, and disposal (Traxler and Jandrić 2025; Oztok 2025; Paraskeva 2025). Nevertheless, dominant EdTech reform narratives are splendidly wrapped by the educational ideals of democratising educational access, providing personalised learning, and addressing learner attainment gaps (Jandrić et al. 2025). Deeply grounded in technological solutionism and determinism, they rather strategically and cunningly appropriate these inequalities as discursive and rhetorical justifications for technological adoption and innovation.

Even 'green' and 'sustainable' educational futures envisioned in many EdTech policies also prioritise technologically advanced schools, communities, and nations, while marginalising alternative ecological agendas or region-specific priorities (Lee and Lee 2025). Such imaginaries risk reproducing historical inequalities and colonial hierarchies by prescribing universal technological solutions that may exacerbate local vulnerabilities (Jandrić and Hayes 2018; Oztok 2025; Traxler and Jandrić 2025; Paraskeva 2025; Anamika et al. 2026). Such unequal planetary conditions deserve our caring cuts (Mörtsell and Gunnarsson 2023), carefully and ethically acted on with postdigital sensibility (Fawns et al. 2023). Terrestrial perspectives can help postdigital researchers challenge and complicate such dominant global EdTech narratives of 'AI-powered personalized learning' or 'green digital transformation', and instead discern and re-imagine sustainable, desirable, or even feasible EdTech that significantly varies depending on the terrestrial assemblage in which it is enacted (Jandrić et al. 2025).

To advance this agenda, the following questions (among others) help guide postdigital research on EdTech within unequal planetary conditions. How do climate vulnerabilities and digital conditions vary across regions? How do these variations

shape EdTech policy enactments? Who bears the environmental burden of producing, powering, and disposing of EdTech? How are these burdens distributed across planetary assemblages? Who possesses the epistemic and political authority to imagine and define sustainable digital futures? Whose futures are marginalised in the process? To what extent do sustainability discourses within EdTech incorporate decolonial perspectives? How do they challenge or reproduce existing global hierarchies?

Although framed as environmentally responsible, EdTech sustainability narratives overlook the colonial histories underpinning current unequal planetary conditions. Postdigital research (Jandrić et al. 2023a, b) more meaningfully incorporates decolonial perspectives by recognising local ecological priorities, valuing less-dominant knowledges, and confronting the asymmetric power relations embedded in global EdTech assemblages.

Taken together, these questions position environmental concerns as integral to postdigital EdTech research, highlighting how EdTech is embedded in unequal Anthropocene conditions, shaped by differentiated vulnerabilities, uneven environmental burdens, contested future imaginaries, and decolonial challenges. The Terrestrial lens and postdigital sensibility enable careful attention to how educational technologies emerge within broader assemblages of climate, infrastructure, power, and more-than-human relations, and how these assemblages condition what forms of EdTech can, or should, be imagined as sustainable.

A Research Program for EdTech and the Environment

Our research program for EdTech and the environment is based on an understanding of EdTech as a technique; on an understanding of the environment as the whole planet and its surroundings; and on a transdisciplinary postdigital (post)critical assemblage of epistemologies and research methodologies. To avoid excluding any relevant actors, we offer very loose descriptions of EdTech and the EdTech community. Such radical openness arrives with a high price of philosophical and methodological complexity. We understand that more specific studies, such as those estimating carbon emissions of this or that EdTech, will need to be much more specific in outlining the relevant actors. Similarly, we acknowledge that studies are taking place that look more closely at the mechanisms underpinning EdTech interventions for different stakeholders (Haßler et al. 2025). At the level of a general research program, however, only radical openness about who constitutes the EdTech community can provide the necessary completeness. This openness about actors, however, does not prevent specific ethical commitments.

Having outlined the common bases of our EdTech and the environment program, we proceeded to examine our own fields of inquiry. Our author setup, equally based on friendship and complementary expertise, consists of scholars working in the following broad areas: critical EdTech studies, studies of AI and education, postdigital-biodigital approaches, ESD, degrowth, ecopedagogy, and studies of unequal planetary conditions. This author/field setup arrives from our own context, and some other team would perhaps approach the topic very differently. However, we do

believe that these areas cover most concerns about EdTech and the environment that we are currently aware of.

After writing our own sections, we edited and wrote ourselves into all other sections. In this way, we strived to intersect our ideas and produce a mutually agreed research program. Consensus between different authors and disciplines is always difficult, and ours was also not reached without friction. However extensive, we hope that the discussion between the eight authors of this paper is only the beginning of a much wider discussion.

Based on our considerations, we offer an initial list of core commitments for a research program for EdTech and the environment:

- Ontological commitment to understanding EdTech as a postdigital-biodigital technique nested in planet Earth.
- Epistemological commitment to a plurality of knowledges and transdisciplinarity.
- Ethical commitment to working for the benefit of Earth holistically including humans and beyond humans.
- Political commitment to planetary sustainability through democracy that also meaningfully incorporates the more-than-human.
- Pedagogical commitment to autonomy, equality, justice, peace, emancipation, and ecological/multispecies justice.
- Positional commitment that critically understands EdTech and environmental research(ers) as parts of the problem rather than only providing solutions.
- Critical community commitment from educational institutions to their own locations, where their decisions concerning EdTech have implications, including civic responsibilities, growth, fairness of participation and climate and planetary actions.

These commitments share an underlying orientation: questioning the assumption that more technology necessarily serves educational or planetary flourishing, and insisting that decisions about technological sufficiency be made through democratic deliberation rather than market logics.

Methodological Directions and Pathways for Collaboration

While these commitments provide philosophical grounding, realising this research program requires diverse but concrete methodological approaches and structures for collaboration. We envision this as an open, evolving research program that builds on principles of postdigital research (Jandrić et al. 2023a, b; Knox 2024) and invites participation across methodological traditions and disciplines. Empirical research for this program includes, for example, comprehensive environmental impact assessments of EdTech across its full life cycle, from raw material extraction and manufacturing through use, disposal, and waste management; comprehensive studies of carbon footprints, energy consumption, and resource dependencies across different EdTech tools, systems,

and platforms (AI-intensive platforms, cloud-based systems, device-dependent tools, and low/no-tech alternatives); ethnographic investigations of how EdTech decisions are made within educational institutions, examining the actors, interests, and power relations that shape technology adoption; critical policy analyses that trace how EdTech is positioned within national and international climate action frameworks; and participatory action research with communities exploring alternatives to mainstream EdTech, including investigations of local, small-scale, and grassroots educational technological practices.

These empirical directions must attend to questions of scale, examining both big, global EdTech but also a range of local initiatives that never scale, recognising that small scale may itself be a virtue rather than a limitation when considering environmental and social impacts.

Methodologically, this work demands radical transdisciplinarity that moves beyond conventional interdisciplinary collaboration. In order to make these kinds of empirical investigations feasible, we need sustained engagement between critical EdTech scholars, environmental scientists particularly those specialising in sustainable computing and technology life cycle assessments, political economists analysing EdTech industries and markets, Indigenous scholars and communities working on land-based pedagogies and decolonial knowledge systems, degrowth economists and activists, science and technology studies researchers studying sociotechnical and technocapitalist systems, and educators implementing low-tech and minimal computing approaches (see Jandrić 2026a, b). We must also engage with those working in supply chains, from rare Earth mineral extraction to electronic waste management, whose labour and land make EdTech materially possible. This transdisciplinary work requires developing shared conceptual vocabularies while honouring different epistemological traditions, and establishing research infrastructures that can support long-term collaboration across vastly different contexts.

Other perhaps more accessible pathways for participation in this research program include documenting and sharing practices of EdTech minimalism and technological sufficiency within your own educational contexts, conducting institutional audits of EdTech environmental impacts and procurement practices; developing and testing pedagogical approaches that foreground ecological thinking in technology education; building networks between EdTech researchers and scholars in adjacent fields (environmental humanities, sustainable computing, decolonial studies, political ecology); creating public facing resources that translate research findings for educators, policymakers, and communities; and engaging in activist scholarship that challenges EdTech industries and institutional decision makers. We particularly invite research that complicates, challenges, or extends the commitments outlined here. This is a research program that must remain open to critique as we collectively learn from our failures and successes. We warmly welcome critique and discussion!

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Challenge of AI' section. Sarah Hayes drafted the 'Postdigital – Biodigital Approaches' section. Vasilis Kostakis drafted the 'Degrowth' section. Sara Tolbert drafted the 'Education for Sustainable Development' section and the 'Methodological Directions and Pathways for Collaboration' section. Greg William Misiaszek drafted the 'Ecopedagogy' section. Kyungmee Lee drafted the 'EdTech within Unequal Planetary Conditions' section. All authors collaboratively drafted the 'A Research Program for EdTech and the Environment' section. During several iterations, all authors reviewed and revised the whole text.

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