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The Logic of Ed-Tech
Three Critical Directions

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See table of contents

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Article abstract

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The Logic of Ed-Tech
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Abstract

This paper provides a theoretical and conceptual analysis of educational technology (Ed-Tech) including its role in the administration and organization of schools, colleges, and universities; teachers' pedagogical practices; and students' learning. During and since the pandemic period, education has relied more heavily than ever on technological tools, products, and services—pedagogical innovations that require novel conceptual, theoretical, and critical perspectives for researchers to engage with. Thus, we employ the term Ed-Tech as a heuristic language to critically interrogate the ways by which the economic logic that underpins commercialized and commodified Ed-Tech continues to shape the sphere of education. This paper focuses on three interrelated concerns surrounding Ed-Tech: sales/privatization; solutions/pedagogy; and surveillance/privacy. A critical examination and discussion of each of these interconnected concepts and concerns reveal overt directions for where Ed-Tech is headed through the conceptualization of inertia, automation, and data. The paper concludes by drawing attention to the need for further empirical research and reflection that address current and future pedagogical practices in relation to the ethical dimensions of educational technologies.

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Introduction

The primary purpose of this paper is to reveal, explicate, and better understand the economic logic that underpins the current use of commercial educational technologies (or "Ed-Tech") in education. More specifically, the analysis aims to provide a framework which synthesizes and consolidates critical perspectives on the burgeoning use of digital technologies among educators and students alike (Mirrlees & Alvi, 2019). Following Macgilchrist (2021), we endeavour to further examine the "transformation, stability and speculation" (p. 246) concerning Ed-Tech, offering an analysis that seeks not to identify "*what works*" in education but rather to provide a critical examination that "moves the conversation forward by raising questions and troubling those previously held assumptions and convictions" in the field (Macgilchrist, 2021, p. 247). Thus, we capitalize the term Ed-Tech to signify a particular socioeconomic commercial activity process, or logic, whose *modus operandi* is defined by the mechanisms of the marketplace. More simply, as Williamson (2022) notes, "EdTech is not just about education, or about technology: much of it is also about business" (p. 157). Hence, in the analysis herein, Ed-Tech is understood as designed, sold, and refined by commercial entities (located primarily in the private sector) for use in all spheres where educational activities occur (including and especially in the public sector). As publicly-funded education systems increasingly rely on commercial Ed-Tech tools, products, and services to promote or enhance teaching and learning at all levels, particular aims, norms, values, and visions novel to Ed-Tech-based education have emerged. In this contemporary context—replete with tensions and contradictions—conflicting ideologies currently co-exist *modus vivendi* and form the basis of this conception of Ed-Tech and subsequent analysis below.

Background

With COVID-19 and subsequent reactions to the pandemic period, education at all levels faced a flurry of activity globally. Educational organizations were required to grapple (or "pivot") with the new reality of more socially distanced educational provision. Central to this was the greater integration of various technological products, tools, and services in providing education and the daily practices of schools and schooling. The current and prospective growth of Ed-Tech indicates that forecasters and apologists alike envision the ongoing digitization of education to occur rapidly (Selwyn, 2020; Williamson et al., 2020; Williamson & Hogan, 2021). Such growth has taken shape in almost limitless forms—including online courses and online schools, digital textbooks and video-conferencing tools, distance learning, massive open online courses, artificial intelligence products, online examinations, and more (Teräs et al., 2020; Williamson & Hogan, 2021; Wyatt-Smith et al., 2021). The pandemic has thus accelerated the already steady growth of Ed-Tech adoption and expansion into various facets of education (Couldry & Meijas, 2019) and has normalized new jargon into the vernacular (e.g., digitization, personalization, optimization, analytics, synchronicity, and interactivity). At minimum, we can conclude that the COVID-19 pandemic has led to the closer coupling of education with Ed-Tech (Horn, 2023).

Although the growth of Ed-Tech appears somewhat inevitable due to the pandemic crisis, there remains a need to ask critical questions regarding its integration and the fundamental ideas, values, and ethics that shadow the broader economic relationship between education and technology. Hence, the focus of this analysis is not an empirical examination of Ed-Tech tools or their relative efficacy in the education endeavour—important as those considerations might be in another context—but rather to ask the questions: *What is the logic of Ed-Tech* and *where is Ed-Tech headed?*

This paper thus critically examines and sheds light on the underlying economic logic of Ed-Tech and, more specifically, explains three central interrelated concerns surrounding the ongoing proliferation, integration, and incorporation of Ed-Tech in all aspects of education, namely: sales/privatization; solutions/pedagogy; and surveillance/privacy.

Organization of the Paper

This paper is organized into five sections. The previous section provided a background and contextualized the examination of Ed-Tech in today's educational landscape. The second section provides a theoretical orientation to the research, positing that Ed-Tech (and more specifically, the economic logic of Ed-Tech) must be understood in relation to emergent perspectives surrounding ideas such as crisis capitalism, digital capitalism, and surveillance capitalism—located within the arena of the critical sociology of educational technologies. These ideas, taken together, critically interrogate the ongoing processes of commodification underlying the fundamental economic relationship between Ed-Tech and Education.

The third section outlines and discusses three interrelated concepts—sales, solutions, and surveillance—that highlight the ongoing growth and development of Ed-Tech as a particular commodity in the educational ecosystem. Such conceptualizations reveal key issues and concerns surrounding educational privatization, pedagogy, and privacy, respectively. The section includes a conceptual framework (outlined in graphical form) that demonstrates the iterative manner by which we may seek to further analyze the flow or direction of concurrent Ed-Tech, in motion. Building on the theoretical and conceptual framework, the fourth section puts forward three logics which provide us with a compass or flow which represents the concurrent trends or trajectories of Ed-Tech expansion and reflects the particular ideas, values, and goals surrounding the nature and purpose of education, as well as the overall direction(s) which Ed-Tech is moving towards.

Finally, the fifth section provides a discussion and conclusion, confirming that the analysis does not summarily reject educational technologies entirely at all points, but rather critically questions Ed-Tech as a particular form of economic logic that seeks to reshape education within a particular vision for the present and future. Further research is required to understand the challenges and the implications of Ed-Tech fully for all levels of education moving forward.

Theoretical Framework

The framework for analysis draws extensively from the sociological study of educational technologies (Cuban, 1986, 2001, 2004; Mertala, 2019; Ramiel, 2021; Selwyn, 2010, 2016; Teräs et al., 2020). More specifically, emergent perspectives in this arena have sought to (re)examine the theoretical and conceptual terrain concerning the intersections of education alongside capitalism and capitalist dynamics (Couldry & Mejias, 2019), neoliberalism (Giroux, 2020; Moore et al., 2021), and technology (Mirrlees & Alvi, 2019) in the contemporary period. Thus, new areas, arenas and discourses surrounding ideas such as digital capitalism (Fuchs, 2021; Pace, 2018; Schiller, 1999) and surveillance capitalism (Bloom, 2019; Zuboff, 2019) have reflected growing concerns and must also be understood as (increasingly) extending and penetrating the realm of education and schooling (Hall, 2012; Moore et al., 2021; Teräs et al., 2020).

Over the last 25 years, Ed-Tech has fundamentally altered the political, social, and personal spheres of education (Selwyn et al., 2020). In this sense, Ed-Tech is to be interpreted as a movement, a force, or a logic that supersedes the constraints of the antecedent information and communications technology (ICT) era. The elemental logic here is that of the free market—

relations of production and reproduction premised on the principles of capital accumulation (Fuchs, 2010; Marx, 1867/1976; Zuboff, 2019). Ed-Tech's ongoing evolution depends on both technological progress alongside the economic rules, laws, and policies that dictate the manner, direction, and flow by which Ed-Tech can or will be allowed to exist in any place, context, or time. Hence, in the contemporary period, the COVID-19 pandemic has allowed Ed-Tech to expand into previously unrealized markets. Consequently, Ed-Tech needs to be understood as a union of education and of technology (Klein, 2020a, 2020b)—an extension of a capitalist framework that continually needs to locate, secure, and exploit newer sources of profit and surplus value (Harvey, 2004, 2005; Marx, 1867/1976).

In her seminal work, Klein (2007) demonstrated how large socio-economic-political-cultural events and crises (*disaster capitalism*) are used to institute policies that persist long after the trigger events end (Klein, 2017). Harvey (2007) further illustrates how each social, economic, or technological disruption in various parts of the world has been the impetus to usher in practices that favour those with invested capital. In short, a crisis becomes a mechanism to permeate into previously unrealized locales. Harvey (2004, 2005) demonstrates that capital spreads and accumulates in times of crisis through the ongoing project of accumulation by dispossession. Klein (2020b) has more recently commented on "coronavirus capitalism" emerging from the recent historical moment in relation to capital accumulation. Finally, Giroux (2020) elaborates on the pandemic and how unfolding events revealed the neoliberal project of free markets, commodification, and accumulation.

In such tumultuous times, Ed-Tech has emerged as a quick and ready-made solution (Teräs et al., 2020) to the problems brought upon education (Moore et al., 2021). Thus, critical educational theorists have similarly provided "*disaster*" or "*crisis*" analyses over the years, providing essential critiques of the damaging impact of disaster capitalism on schools and students (Salazar Perez & Cannella, 2011). Saltman (2007), for instance, documents extensively how such practices have taken place in the United States, where crises have allowed educational profiteers to enter the educational marketplace. In all cases, the ideology of the market underpins the continued trend toward increasing educational commodification, marketization, and profit accumulation. Ed-Tech expansion appears to fit into this larger trend.

The framework articulated below is thus arrived at through a review of the emergent critical literature surrounding Ed-Tech. As Weller (2020) notes, over the past 25 years, the initial innocence and optimism of educational technologies have, in many ways, been replaced by numerous possible (though not inevitable) "undesirable outcomes" (p.180). The critical interrogation of Ed-Tech thus requires not only a view of the past and analysis of the present but also an eye towards the future, as all tools, products and services inevitably are shaped and reshaped by the social world in which they enter and unfold (Selwyn, 2016). To this end, we have attempted to synthesize the critical Ed-Tech literature and scholarship in order to provide a more synthesized and clearer understanding of the Ed-Tech phenomenon in relation to its driving forces and key economic logic. Through this collection, evaluation and fusion, we provide three key conceptual points of analysis which, understood collectively and in concert, provide a foundation and lens for both concurrent and future critical scholarship regarding all manners of Ed-Tech.

Towards New Conceptualizations

Continuing scholarship concerning Ed-Tech has sought to better understand and explain the economic logic's mechanisms and nature underpinning technological modernity (Bloom, 2019;

Zuboff, 2019). Simultaneously, critical scholarship in education has revealed the social and economic ties guiding Ed-Tech expansion (Boyd, 2016; Hall, 2012; Selwyn, 2019; Teräs et al., 2020). Thus, Ed-Tech can be viewed as a specific economic logic within the larger context of education and capitalist relations. Proposing such research goes beyond the utility of technology in education by asking questions, including those driving this analysis: *What is the logic of Ed-Tech, and where is Ed-Tech headed?* New adaptations of educational technologies continue to impact and reconfigure delivery modalities, and technological innovations create new dynamics that alter education's nature, values and purposes. To further understand this logic, three central concerns emerge, which we further explicate in a fluid, dynamic, iterative, and often overlapping and contradictory process.

Sales and Privatization

The ongoing development of Ed-Tech tools, products, and services offered and sold to educational institutions is effectively guided and dictated by the mechanisms of the marketplace (Kuehn, 2017). The central idea remains that the entire enterprise hinges on these sales (Williamson, 2020a, 2020b), reflecting a form of commodification. Ed-Tech is ardently advertised to education/educators as a ready-made, prepared solution, which solves one or more of the numerous "problems" or "crises" facing education. Implied in the sales pitch is that educational organizations need not invent their own solutions to educational problems when technological solutions are already available.

Moreover, investing in the acquisition, purchase, or licensing of Ed-Tech means that limited financial (and human) resources are directed away from other core domains of educational organizations. As commercial entities own many of these technologies, the buy-in of Ed-Tech tools effectively encourages private sector educational involvement in both the short and long term. Overall, such trends point toward the ongoing privatization of education (Williamson, 2021). Educational organizations' purchase of Ed-Tech increasingly leads to what might be understood as a form of accumulation by dispossession (Harvey, 2005), whereby Ed-Tech tools, products, and services readily infiltrate, displace, and reconfigure other possible forms of teaching and learning (Mirrlees & Alvi, 2019).

To better understand this trend, one only needs to examine the expansion of Ed-Tech over the past decade—and more substantively during the current pandemic period. Indeed, according to the World Bank (2020), the COVID-19 pandemic might have provided the ideal conditions that have allowed educational policymakers to "build back better" through the lens of expanding opportunities for Ed-Tech (Williamson & Hogan, 2020). Similarly, global investment bank Credit Suisse (2020) states explicitly that "Education technology, or EdTech, is one of the most exciting sectors in the economy, with the potential to impact billions of lives" (p. 6). In short, Ed-Tech is described and applauded for its potential as a new form of educational privatization (Moore et al., 2021)—the intended or unintended consequences of which are not yet fully developed, theorized, or understood.

Solutions and Pedagogy

As educational organizations acquire a growing store of educational technologies that provide solutions to schools, educators, and students, Ed-Tech offers education numerous means to reshape, redefine, and reconfigure teaching, learning, and pedagogy. In this way, intentionally

or not, teaching and learning are fundamentally altered or transfigured pedagogically as educators incorporate and integrate various forms of Ed-Tech (Williamson & Hogan, 2021). The reconfiguration occurs as Ed-Tech products, tools, and services become a crucial part of teaching and learning—typically under the rhetoric of enablement (even if the technology may instead limit what pedagogues are able to do). This readily occurs with all Ed-Tech solutions while introducing certain limitations—be they owing to technical features, broadband access, security, or other logistical constraints. Consequently, adjustments are made at the pedagogical rather than technological or operational levels (Kumar & Kewley, 2022) primarily to incorporate and accommodate Ed-Tech into the classroom.

This significant shift pushes pedagogy further away from the purview of education professionals to that of technological technicians (Kumar, 2020). Such trends thus point to the ongoing de-professionalization of educators' work (Williamson et al., 2020). In essence, the solutions that Ed-Tech promises or offers may come at the cost of relinquishing control by pedagogical experts (Bauman, 1993). Hence, as an increasing number of Ed-Tech tools, products and services are accepted into the normative structure of teaching and learning, adjustments made in pedagogical practices reflect a shift in professional control, knowledge, and power configurations (Teräs et al., 2020).

As Webb (2002) notes, teachers' professional power equates to what French and Raven (1993) call expert power—the ability of teachers to exercise autonomy. Yet, according to Webb (2002), teacher power is constrained and diminished under reforms that seek to reframe or remake teaching as a more technical rather than professional exercise. As Williamson and Hogan (2021) see it, such concerns might be understood as a new trend toward the de-professionalization of education specialists. Ed-Tech constantly and consistently seeks to infringe on the autonomy and expertise of pedagogical knowledge historically assigned to teachers. Again, Ed-Tech provides a new reflection of earlier concerns—the sale of Ed-Tech leads to further privatization, while the embedding of Ed-Tech into pedagogical practice leads to further de-professionalization. To add to these apprehensions, Ed-Tech expansion now also incorporates novel dimensions of surveillance—leading to unprecedented concerns over educational privacy.

Surveillance and Privacy

Ed-Tech, obtained (through sales) and utilized (as solutions) by educators or educational organizations, is also increasingly an instrument of (and perhaps even subjected to) numerous forms of surveillance that seek to extract ever-larger amounts of behavioural data (Zuboff, 2019). This function, often concealed, aims to track users' interactions with an Ed-Tech tool, product, or service during the duration of the engagement and rudimentary assessment, inter alia. As Zuboff (2019) articulates in her seminal work, the new economic logic of surveillance capitalism now permeates almost all aspects of our daily lives. It must be understood as a novel of production aimed at the realization of new forms of surplus value. The extent to which individuals are now subject to surveillance practices is historically unprecedented and increasingly concerning (Bloom, 2019; Noble, 2018; O'Neil, 2016).

The educational environment is not immune to this phenomenon; on the contrary, it provides fertile ground for data—learning about, profiting from, and developing current and future consumers and customers (Kendell, 2020). Zuboff (2019) further illustrates the extent to which these seemingly benign features divulge end-users behaviours to technological companies.

Although surveillance capitalism is not yet fully understood as an emergent factory of surplus value creation, growing awareness of Ed-Tech surveillance in recent years points to warranted concerns for students, educators, and policymakers (Wan, 2019). As Anand (2020) describes, the educational and social implications of such tracking, recording, and monitoring are at best murky and, as Watters (2020) comments, it reflects new values embedded in Ed-Tech to be inculcated into education, including control, compulsion, and efficiency.

Increased Ed-Tech integration results in more significant amounts of data (both in terms of quantity and quality) potentially extracted about and from all those involved in education—mined, synthesized, and analyzed for various purposes. These purposes range from educational performance to creating new or improved products for subsequent sales and enhanced solutions. Hence, the sales, solutions, and surveillance cycle perpetually moves on and forward over time. These trends, in particular, point to ongoing concerns over privacy, transparency and accountability in education.

Conceptualization of the Motion of Ed-Tech

The conceptual framework presented in Figure 1 illustrates the ideas articulated about sales, solutions, and surveillance with implications for privatization, pedagogy, and privacy. As a circular and iterative relationship, the starting point can begin from various inflection points—be it Ed-Tech solutions, sales, or surveillance—and the relationship among the three components remains intact. Non-directional arrows among sales, solutions, and surveillance depict the ambiguity of the starting point and the direction of movement. The concentric relationship shows the perpetual nature of the dynamic. The subsequent section explains how such concerns relate to the fundamental logic of Ed-Tech with respect to the directions of inertia, automation, and data, respectively.

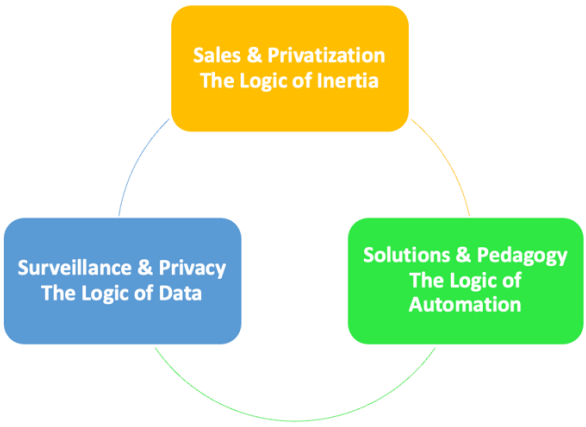

Figure 1. Three Directions: The Iterative "Flow" of Ed-Tech

The Logic of Ed-Tech

The expansion of Ed-Tech continues to permeate all aspects of the educational endeavour (teaching, communication, research, administration, etc.). To better understand both the logic and

flow of Ed-Tech, three fundamental directions are revealed. Such tendencies provide guidance and new scholarship questions concerning Ed-Tech moving forward. Understood broadly, perhaps as Newtonian laws of motion that are obeyed under most conditions (Newton, 1687/2016) or as Marx's laws of motion of capitalist development (Harvey, 2010; Marx, 1867/1976), this heuristic device (Burkett, 2000) is deployed to "to lay bare the economic law of motion" Mandel, 1976, p. 12) towards understanding the "essence" (Heidegger, 1954/1977) of contemporary technology and specifically of Ed-Tech. Thus, the overall direction, movement, trajectory, tendency, flow, or defining characteristics of Ed-Tech are found to be threefold: (1) inertia, (2) automation, and (3) data. A detailed explanation and discussion of each of these directions follows below.

Ed-Tech Logic #1: Inertia

The first direction of Ed-Tech states that: *Ed-Tech will beget more Ed-Tech*. The previous discussion demonstrated how Ed-Tech is often introduced to resolve a problem, issue, or even a crisis, such as the recent pandemic (Klein, 2020a; Klein, 2020b). As Ed-Tech tools, products, and services are increasingly adopted and integrated into the educational ecosystem, they also become increasingly self-sustaining. For instance, Bauman (1993) warned of a similar trend when he suggested that technology improves upon itself through a series of upgrades. That is, as Ed-Tech becomes a normative standard in spaces such as the classroom, the fundamental values underpinning its logic (profit accumulation, efficiency, and convenience, amongst others) become both easier to accept and more difficult to resist.

This results in continued reinvestment by educational organizations (Williamson & Hogan, 2020) and/or by educators themselves (Spiegelman, 2018), as Ed-Tech offers ever-new updates and upgrades to expand upon existing tools, products, and services. As a sort of planned obsolescence (Selwyn, 2021) evident across the broader technology sector (Sarhan, 2017), Ed-Tech consistently and constantly requires education to buy in explicitly and complicitly—a difficult cycle to escape. COVID-19 exacerbated such trends, as educational institutions were compelled to adopt Ed-Tech wholeheartedly during the pandemic period (Williamson, 2021). According to investment banking firm Credit Suisse (2020), the Ed-Tech market was expected to grow to over $400 Billion USB by 2025, however this projection has been further accelerated by the pandemic. As they note, "EdTech offers entrepreneurs and investors opportunities to deliver strong financial returns and delivers technologies that dramatically enhance the learning experience of billions of students at lower cost" (p. 11). As Yelenevych (2022) corroborates, "The value of the global edtech market in 2021 was $106.46 billion, and it's just the beginning. From 2022 to 2030, this market is expected to grow annually by 16.5% and is expected to expand 2.5 times from 2019 to 2025, up to $404 billion in 2025" (para 3). Through a lens of capital investment and expected future earnings, the trend is extremely bullish for Ed-Tech, implying further growth and accumulation.

As another example, proctoring exam software use accelerated during the pandemic to address the issue of monitoring student examinations in the higher education sector. The deficiencies observed, discovered, or reasoned (i.e. newer problems) were proposed to be resolved by adopting newer and upgraded tools, products, and services (Moore et al., 2021), often from the ecosystem of the same Ed-Tech provider. Other approaches to Ed-Tech adoption and retention are

plentiful: models such as freemium[1] or paid subscriptions, which push for Ed-Tech to be accepted and ideally adopted in perpetuity.

In essence, Ed-Tech will always push for more technologies—reasoned through the logic of cost-efficiency, standardization, convenience, and security. Implied within this configuration of Ed-Tech is that it is logically more efficient, more effective, more convenient, and more secure to adopt newer and improved versions of Ed-Tech tools rather than seek out alternatives (or competitors) elsewhere. Like inertia, once deployed, it necessitates continued purchasing, upgrading, (re)configuration and (re)integration—more and newer forms of itself—as it continues to replicate, evolve, and expand.

Ed-Tech Logic #2: Automation

The second direction of Ed-Tech states that: *Ed-Tech moves education towards further automation*. That is, the push for Ed-Tech technological adoption and integration increasingly exposes education to further levels of automation. The logic behind such trends assumes the fallibility of the human subject (such as the educator), who can, ideally, be reshaped, reconfigured, or perhaps reduced, further toward the level of technician (Williamson et al., 2020). The logic of automation propels decision-makers to seek out quickly deployed remedies—especially in moments of emergency and crises. On such occasions, Ed-Tech is presented as an available, automatic, feature-rich, centralized, uniform solution that can be deployed and scaled quickly. As solutions are accepted and deployed, new technological standards are introduced, which (re)define the parameters of what education can or should be.

As an example, consider the growing area of artificial intelligence (AI) in education. New tools, products, and services continue to emerge, positing that education can be done more efficiently and effectively through Ed-Tech (Furness, 2020). Educational solutions such as AI teaching assistants are proposed to reduce educators' workload (Alderton, 2021; Kasepalu et al., 2022) and enhance productivity. Similarly, AI essay writing services are increasingly offered to students to automate writing tasks (Mindzak & Eaton, 2021), while AI paper detection services are simultaneously presented to educators to detect plagiarized writing (Abd-Elaal et al., 2022), and finally, AI grading services are offered to automate assessment and evaluation (Kumar, 2023; Kumar & Boulanger, 2020). On all sides, the fundamental logic is a concerted push towards further automation—highlighting the inherent value systems of mechanization, computerization and efficiency underpinning Ed-Tech.

Furthermore, new tools, products and services emerge in tandem with AI, which promise educators and educational instructions new approaches to automation. The parameters are relatively boundless in this regard—the permeation of AI can and will likely impact students and educators—however this (re)volution will remain centred around the value of automation. As Bergviken et al. (2023) conclude concerning automation and teachers' work:

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[1] "A combination of the words 'free' and 'premium,' freemium is a type of business model that offers basic features of a product or service to users at no cost and charges a premium for supplemental or advanced features. A company using a freemium model provides basic services on a complimentary basis, often in a 'free trial' or limited version for the user, while also offering more advanced services or additional features at a premium." (Segal, 2021, para. 1)

> In their broader sense of digital systems and global platform infrastructures, EdTech arguably also goes hand in hand in the pursuit of AI and automated policy governance (Gulson and Witzenberger 2022), which makes education and teacher work controllable across various spheres. However, it is seldom a linear or a simple process but rather a struggle over who has the power to define the overall purposes of public education. (p. 39)

By revising the means and modes of production of pedagogy, the personal social relations of educational workers with the products of their labour are dramatically and fundamentally altered by the introduction of new modes and modalities that reshape teaching and learning in numerous ways (Moore et al., 2021; Perrotta et al., 2020). The presumptive position is that Ed-Tech offers education the correct path (in this case, a more automated one). Resistance to such developments is often labelled as backward or "Luddism" (Blackwell et al., 2013; Ideland, 2021), implying that those who do not accept further automation might indeed be the ones who will be automated themselves (Sadowski et al., 2021).

In short, a defining characteristic of Ed-Tech is the movement or trend toward further automation. Implied within this logic is that education can and should be offered in a manner that is faster, cheaper, more efficient (Mindzak, 2020), and indoctrinating towards further Ed-Tech use, whenever possible. As solutions are readily adopted, educational values are reframed and relocated—away from teachers' direct control and towards technicians. In practice, these continue to reduce education to a more technical activity, and thus one that is more controllable, less professional, and thus open to further dynamic forms of automation.

Ed-Tech Logic #3: Data

The third direction of Ed-Tech states that: *Ed-Tech will gather as much behavioural data as possible*. Contemporary and concurrent iterations of Ed-Tech rely on vast amounts of data. The unquenchable thirst for more and new(er) sources of data (primarily behavioural data) defines the current nature of intrusive technologies (Zuboff, 2019)—including their move into educational institutions (Fuchs, 2011; Klein, 2020ab; Moore et al., 2021). Concerns regarding educational surveillance are not new and have been drawn extensively from the insights of prominent theorists such as Foucault (1975/1995) and Ball (2003). However, it appears we have entered a new era of surveillance in education (Taylor, 2013). Thus, when parsed together with the expansion of Ed-Tech, we begin to glimpse a new frontier of educational privacy.

In practical terms, interaction with any form of digital products today might record extensive amounts of meta-data, including dates, times, locations, durations, devices, inter alia (Bloom, 2019). This can be valuable—records and transactions for validity, integrity, investigations, transaction reversals, or resolving disputes. However, in a more pervasive kind of recording, other pertinent data, such as aspects of user demographics and personal information, often identified by the nature of the interaction, are also logged and kept for long periods—possibly indefinitely (Kshetri, 2021; Lyon, 2020; Simeu, 2021; Zuboff, 2019). These data sets constitute a wealth of information that is then used by Ed-Tech to further refine, market and target certain segments of the population towards promoting further sales, solutions and surplus-profit accumulation.

On the spectrum of benign to intrusive, the benign end takes the form of logging user interactions; on the intrusive end, it is universal surveillance. Lindh and Nolin (2016) demonstrate

in their analysis of Google Apps for Education, that the business model inherent to this adoption is rooted in surveillance methods, which are rarely scrutinized. Similarly, Regan and Jane (2020) point out that privacy concerns over big data in educational organizations are only just beginning to be understood and evaluated. Indeed, it is difficult, if not impossible, to determine the full scope and scale of data surveillance with respect to Ed-Tech today (Durrani & Alphonso, 2022; Ilci, 2020). Of course, not every Ed-Tech tool operates this way. After all, numerous legal, regulatory, and privacy-focused reforms prevent such surveillance (Kemp, 2019; Ross et al., 2021; Zuboff, 2019). Still, the pre-eminence of the surveillance capitalist mode of production continues to seek inroads in all places to collect data on the entirety of the human experience (Zuboff, 2019). As Rahm (2023) notes, "If data is the new oil and extraction of data from people creates profit for a few, and further marginalizes the many – there is a need to critically scrutinize 'digital inclusion'" (p.18). The rationale behind such actions is the predictive power of data embedded in the modern techno-human experience.

The utility of prediction lies in its ability to plan a trajectory that forecasts future use—leading to further tools, products, and services tailored to the unique individual (Bloom, 2019). In education, such developments are often concealed under the guise of customization and personalization. In the case of Ed-Tech, such intrusions allow a glimpse into the school or the classroom and further into the life of schooling and education. Peering into the black box of the classroom has been historically difficult (Cuban, 2013) and, under surveillance capitalism, is not simply observational, but rather intended for the direct purpose(s) of ensuring that new and improved sales and solutions are to be realized in the educational marketplace (Zuboff, 2019). Students and teachers are reframed or retooled (Ford, 2003), in this case, as users—points of data for further yet unrealized consumption (Lupton & Williamson, 2017; Ramiel, 2019). In this way, surveillance further serves the logic and nature of educational technologies that seek to continue expanding, accumulating, and integrating themselves as fully as possible (Moore et al., 2021; Teräs et al., 2020) in all aspects of formal and informal education.

While technologies are often touted to provide new dimensions of accessibility, freedom, and even democracy (Cuban, 2004; Williamson & Hogan, 2020; Selwyn, 2016), they often conceal other purposes, such as accumulating surplus value and private profit. An education system (or society) shrouded in surveillance is likely not conducive to democratic aims or to individuals developing critical thinking skills or even becoming the best version of themselves (Zuboff, 2019). Surveillance, of course, poses numerous concerns regarding privacy and with Ed-Tech, even more pressing issues surrounding the collection, aggregation, and analysis of behavioural data of students, especially children (Boninger & Molnar, 2016; Kemp, 2019; Kshetri, 2020, 2021; Lyon, 2020; Norris, 2021; Simeu, 2021; Stewart, 2020).

Thus, a defining trait of Ed-Tech remains its insatiable desire for data, particularly the collection of behavioural data to be sold in the behavioural futures market (Zuboff, 2019). As more tools, products, and services are sold to education, and as these solutions are more fully embedded and utilized in teaching and learning, more potential data will be collected, extracted and synthesized. Hence, big data allows Ed-Tech to refine its own particular methodology further and expand into previously unrealized domains through the erosion of pedagogical privacy as well as traditional forms of educational autonomy.

Conclusion

This analysis aimed to highlight and explicate the logic, flow, and direction of Ed-Tech in the contemporary period to determine where it might be headed. The COVID-19 pandemic disrupted the trajectory and accelerated the speed of Ed-Tech adoption in education. As described, Ed-Tech provided solutions that were quickly (if not hastily) adopted at various levels of education. These Ed-Tech solutions, in turn, contain features to surveil and collect data on their users in as many details as possible. Such attributes form a self-sustaining structure that moves through time and space, ever-changing, adapting and evolving in the pursuit of growth and accumulation.

Such a configuration provides us with three logical directions for Ed-Tech—the logic of inertia, the logic of automation, and the logic of data collection—that together provide a model for further theoretical, conceptual, and empirical scholarship moving forward. The potential implications herein raise questions concerning ethics, power, and authority among educational stakeholders and the shift of education closer to other profit-oriented enterprises. In turn, this has led to a growing body of critical scholarship (e.g. Moore et al., 2021) that continues to indicate that technology-aided or enhanced learning holds a limited ability to critically examine itself, as Ed-Tech remains concealed as a means to a (primarily economic) end.

While we have provided a substantive critique of Ed-Tech herein, we recall that our definition and analysis have focused on a particular commercialized form of Ed-Tech—and thus do not adamantly reject the adoption and integration of all educational technologies unequivocally. Education is a vast enterprise, and we do not mean to suggest educational technology is inherently undesirable or ineffective in all cases, nor does this analysis give ample consideration to the numerous broader educational inequities and inequalities exacerbated by technological progress (Selwyn, 2013, 2020; Williamson et al., 2020). Instead, the analysis hopes to invite researchers to consider the implications of the inherent economic logic or directions underpinning Ed-Tech that are outlined in our analysis moving forward. Critical perspectives, continued interrogation, and ongoing vigilance on the subject remain imperative. As Teräs et al. (2020) note:

> In the moment of crisis, educational organizations should think carefully about their choices regarding online learning and education technology. These choices can potentially echo in the future as new relations of power and control, new forms of student inequity and inequality, and other unpredictable effects. (p. 865)

Perhaps, as Selywn (2021) highlights, we need to think of Ed-Tech within limits. Trends, of course, are just that—and any prognostications concerning the future of Ed-Tech and education inevitably are limited in what they can reliably predict. The future is, as always, uncertain and concurrent examples around the globe, such as China's crackdown on foreign Ed-Tech (Bloomberg News, 2021; Zaagman, 2021), emergent legislation concerning student privacy and data collection in the USA (Ross et al., 2021), or school boards in Ontario suing social media platforms for their adverse health effects on students (Diab, 2024), all point to the various scenarios in which Ed-Tech may face new barriers to accumulation and be forced to evolve in divergent directions. These concerns continue to reverberate with the recent proliferation of artificial intelligence in education (Anshari et al., 2023).

Moving forward, educators and administrators can and should exercise precaution, due diligence, and perhaps, defiance in the appropriation and adoption of Ed-Tech, when warranted. There is increasing cause for concern, if not outright alarm, for educators and institutions as Ed-Tech continues to locate new socioeconomic inroads. As outlined herein, the expansion of all

things Ed-Tech demonstrates that educators and educational organizations may become increasingly reliant on such tools, products and services as alternative futures are not readily conceptualized (Veale, 2022). The embedded logic of Ed-Tech demonstrates that it becomes more difficult to escape Ed-Tech the more it becomes integrated into the very fabric of education. Hence, there is a need for resistance to these directions—and perhaps this has already begun to emerge in the larger social imagination (Zuboff, 2019), particularly in the educational arena (Selwyn, 2022).

As we reflect on and scrutinize contemporary educational technology's logic and critical understanding, we only advocate ongoing and frequent re-examinations of propositions lest they mutate or morph. Indeed, exploring Ed-Tech directions implies that it will continue to change and evolve—moving into previously unrealized dimensions, exploring, exploiting and implicating new territories and terrains. Absent such scrutiny, alternative agendas and interests might control the narrative and direction of educational futures. The legacy of the COVID-19 pandemic and the ongoing expansion of Ed-Tech provide a point of reflection that may begin to reveal these contours in our world and educational history.

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