CHAPTER 3

Social Participation in a Postdigital–Biodigital Age

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INTRODUCTION

Social participation, also known under the various names like social engagement, social involvement, social inclusion, and others, is a key aspect of human life. Questions pertaining to social participation appear in various academic and professional fields, including philosophy, sociology, economy, and political science; are permanently present in local, national, and global politics; are at the heart of various grassroots and activist movements; and are central to educational theory and practice.

In general terms, social inclusion is concerned with communities, groups, and individuals—with a primary focus on those that are marginalized—and with access to a level and quality of participation and integration in the rudi-

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mentary and fundamental functions and relations of society. As such, it has personal, institutional, societal, and global dimensions. (Fudge Schormans, 2014, p. 6082)

In our postdigital age, indeed since the beginning of human life, social participation has never been merely about people. Media in the widest sense, technologies, and their socio-material affordances, strongly impact upon who, and in which ways, can participate in certain social activities. For instance, scholarly research cannot be conducted without access to books and articles listed in academic databases; human knowledge is incremental, and all researchers stand on the shoulders of their predecessors. Yet in the current political economy of academic publishing, access to academic databases is prohibitively expensive to anyone outside the narrow circle of rich (usually Western) universities and research centers. In consequence, participation in knowledge-making—which is an activity relevant for all people—is restricted to an elite group who shape research, related ethics, and policy according to its own agendas and interests.

This profoundly influences education, as the knowledge-making and sense-making of the present are intertwined with the knowledge-making and sense-making of the future. Educational inequalities run much deeper than traditional (post)colonial divides between East and West, Global North and Global South, and are intertwined with questions around class, race, and other political and social stratifications.

However, the mainstream political economy of academic publishing is not cast in stone; it is a site of ongoing struggle between hacker-activists who provide free access to copyrighted material and mainstream publishers who use various technical and legal means to protect their copyrights. As "the complex interplay between academics, academic publishers, hacker-activists, producers and users of academic content, actively co-creates the contemporary landscape of academic publishing … [t]raditional relationships between centres and margins of academic publishing have substantially reshifted." (Jandrić & Hayes, 2019) This reshifting profoundly impacts educational opportunities and contributes to new reconfigurations of associated social relationships such as social mobility.

Academic publishing is just one of many examples of deep postdigital entanglement between participation and technology. Some examples are fairly trivial: someone living in a Californian suburb needs a car to get to work, and we would not be able to write this paper without our computers

and Internet connection. Other examples are more complex: during the COVID-19 pandemic lockdowns, we witnessed various reconfigurations of participation in work and education related to access to technology, available workspace at home, family obligations, and so on (Jandrić et al., 2020). It is now commonplace that the relationship between technology and participation cannot be reduced to the availability of technology (e.g., digital haves vs digital have-nots) or technological affordances (e.g., database access). Participation runs much deeper than economy and encompasses a wide spectrum of psychological, social, economic, and other factors (Fudge Schormans, 2014). As witnessed by the collection of testimonies about teaching and learning during the COVID-19 pandemic lockdowns (Jandrić et al., 2020), education is one of the most prominent sites of the postdigital entanglement between participation and technology.

The pandemic has also turned our attention to biopolitics. From the availability of medicines and vaccines, through to the decision on whether to get jabbed, to associated legislation and practice (restriction of movement, COVID passports, etc.), biology has become an increasingly important aspect of social participation. The concept of biopolitics is far from new; it first appeared at the beginning of the twentieth century in the works of Rudolf Kjellén and was championed in the late twentieth century by Michel Foucault and his successors. Foucault's concept of biopower offers much to our postdigital moment; nevertheless, the biopolitics of the late twentieth century significantly differs from that of the 2020s (Peters, 2020). These developments profoundly impact all aspects of human life including but far from limited to education (Williamson, 2019a, 2019b).

Around the turn of the millennium, scholarly fields that had developed independently for the most part of human history—biology and physics—underwent significant convergence. The development of medicines and vaccines, gene editing, and other important breakthroughs in biology would not have been possible without the computer. "Bioinformatics has not arrived from a sudden or artificial blend of the 'soft' or 'moist' *bios* and the 'hard' or 'cold' *technē*; instead, the *technē* is an inherent feature of the *bios*. To various extents, biology is digital information and digital information is biology; one cannot be divorced from the other" (Peters et al., 2021a). This convergence has an important practical consequence, as "[t]he ability to turn biology into digital code, and then to return digital code back into biology, offers much more than new theoretical insights"

and enables "tinkering with and actively transforming living organisms" (Peters et al., 2021a).[1] Consequently, Dyson argues that

> [i]t has become part of the accepted wisdom to say that the twentieth century was the century of physics and the twenty-first century will be the century of biology. Two facts about the coming century are agreed on by almost everyone. Biology is now bigger than physics, as measured by the size of budgets, by the size of the workforce, or by the output of major discoveries; and biology is likely to remain the biggest part of science through the twenty-first century. Biology is also more important than physics, as measured by its economic consequences, by its ethical implications, or by its effects on human welfare. (Dyson, 2007)

During the "information revolutions" of the late twentieth century, studies of technology and social participation followed the technological achievements of their day. During the past decades, and continuing with the arrival of the COVID-19 pandemic, institutions such as the United Nations, World Health Organization, European Union, and national governments, have spent a lot of money and effort in relation to digital participation. Concepts such as digital citizenship, digital literacy, digital inclusion, data poverty and so on are a natural extension of the "information revolution" and "knowledge society" paradigm but are not experienced equally in terms of participation (Hayes et al., 2021). In this context, biopolitics has remained under the shadow of infopolitics. Following recent advances in the biosciences, and in order to respond to challenges brought by the COVID-19 pandemic, we urgently need to expand the current focus on infopolitics towards a more balanced approach which considers its deep entanglement with biopolitics and related inequities in improving possibilities for some groups and individuals and not others (Koopman, 2020). This chapter meets that need and explores reconfigurations of social participation and related policymaking in our postdigital–biodigital age.

BIODIGITAL (IN)EQUALITY AND COMMUNICATION

In *The Genetic Lottery: Why DNA Matters for Social Equality*, geneticist Kathryn Paige Harden (2021) distinguishes between two fundamentally different yet dialectically intertwined "lotteries" that impact every

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[1] This Great Convergence is a complex topic explored in detail in our recent book *Bioinformational Philosophy and Postdigital Knowledge Ecologies* (Peters et al., 2022).

individual. The "natural lottery" consists of every person's inherited genetic makeup, which heavily influences one's (dis)ability in various activities. The "social lottery" depends on conditions such as parental involvement and income. Harden writes: "Your genotype, like the social class of your family, is an accident of birth over which you had no control … a type of luck in your life … together, the natural and social lotteries are powerful predictors of someone's social position in adulthood, particularly their educational attainment" (Harden, 2021, p. 204).

Historically, the concepts of natural and social lottery have been strongly linked to the notion of eugenics. Since Nazi experiments in the Second World War, eugenics has entered the spotlight as an immoral theory and a criminal activity. Yet up until relatively recently, eugenic practices continued in many democratic countries. In the US, for instance, routine involuntary sterilization of Native American people took place as recently as in the mid-1970s (Amy & Rowlands, 2018). Outside of health "care," eugenic practices have been particularly prominent in education, where strong traces of eugenic reasoning have remained up to today (Gershon, 2020). Much has been written about countering eugenics in various contexts, yet Harden captures the essence of these efforts:

> The anti-eugenic project, then, is to (1) understand the role that genetic luck plays in shaping our bodies and brains, (2) document how our current educational systems and labor markets and financial markets reward people with certain types of bodies and brains (but not other types of brains and bodies), and (3) reimagine how those systems could be transformed to the inclusion of everyone, regardless of the outcome of the genetic lottery. (Harden, 2021, p. 20)

In a biodigital reality, Harden's anti-eugenic project is a key aspect of social participation. Another is communication, which has now become fully postdigital.

In "Revisiting digital technologies: envisioning biodigital bodies," Kate O'Riordan argues that traditional communication based on the exchange of information is significantly different from emerging forms of biodigital communication.

> [The] representational media presence is a communicative node, which is overwhelmingly used to communicate with others and one in which people have some control and oversight. Biodigital communication further dislo-

cates some of this control and oversight. To have a biodigital presence is to give something up, to take a substance from the body and put it into the circuit of production. … Giving up a tissue sample and having it returned as genomic data and annotated through a browser as part of an online presence reinserts a form of production that decouples participation. People do not have much control or oversight about what their genome communicates, what it means, or how it is communicated to them. The biodigital quality of this communication means that the online presence as a mode of communication speaks back to the producer in ways that the producer cannot control or oversee. (O'Riordan, 2011, p. 307)

This removal of control can be seen in numerous real-life examples, such as in compulsory COVID-19 tests, where results are automatically known to various institutions (such as health service providers) and private companies (such as airlines) beyond the test-taker's control (see Jandrić et al., 2020); or for students participating in educational neurotechnology projects, where their essentially uncontrollable brain data is used by teachers, schools, and private EdTech companies to enhance learning (see Williamson, 2019a). The loss of control over communication in these examples varies; for instance, those taking a home COVID-19 test may freely choose whom they will share the results with, while those taking a COVID-19 test at the airport automatically subscribe to sharing their results with the airline. In most real-life situations, however, engagement in biodigital communication usually implies at least some, if not significant, loss of the communicators' agency. This is especially prominent in recent educational developments such as attempts at sculpting the plastic learning brain through neurotechnology (see Williamson, 2019a), where the learner becomes a passive (and, more disturbingly, possibly unwilling) participant in their own learning.

Given that communication is a prerequisite for social participation, this loss of agency should be taken seriously. How, and under which circumstances, should we engage in biodigital communication? How should biodigital communication be regulated? Which level of control should the subject of biodigital communication, for example, the COVID-19 testtaker, have over their own biodigital information? Who, and under which circumstances, should have access to personal biodigital data?

Questions like this have become increasingly ubiquitous. Governments, international regulatory boards, and similar bodies usually resolve them on a case-to-case basis. For instance, COVID-19 patients can easily infect

others; to avoid the spread of infection, compulsory tests are enforced by governments and their results are made available to all relevant bodies. This is why most countries in the world readily introduced compulsory COVID-19 testing during times of lockdown despite the strong backlash from the antivaccination movement. However, Williamson's (2019a) study of students participating in educational neurotechnology projects is different. Students who refuse to share their brain data with the teacher, the school, and the EdTech company working for them will not harm anyone; at most themselves, as the only thing they lose from opting out of educational neurotechnology approaches is, probably, support in their teaching and learning—and this support is of questionable value.

There are many shades of gray between the extremes of using biodigital data to protect others (COVID-19 testing) and using them to compromise an individual's bodily integrity. Yet to an extent, the two are always connected, and even the most individual biodigital technologies may have profound consequences for others. For instance, while many people would argue that parents may find it useful to learn their child's gender before birth, the simple procedure of ultrasound, which is harmlessly conducted between weeks 18 and 20 of pregnancy, has in some cultures resulted in the terrible yet widespread practice of female infanticide (Smithey, 2019). In this case, bioinformation, which is convenient to some, is literally deadly to others; to further complicate things, ultrasound is a cheap and omnipresent technology that cannot be easily banned. So how should lawmakers go about addressing this problem?

Biology is indeed digital information and digital information is indeed biology. In the starkest examples, biodigital communication has power over people's lives and health (female infanticide, COVID-19 tests). "Lighter" examples of this relationship, such as the practice of doing genetic tests before purchasing life insurance and determining the price of insurance accordingly, are complex issues in their own right. Even "the lightest" example, such as whether students agree to share their brain data in order to improve their own learning (Williamson, 2019a), opens up a plethora of philosophical, ethical, and legislative questions. The omnipresent loss of control over our own communication can benefit some people (e.g. those with a genetic "clearance" for low insurance rates) and kill others (e.g. foetuses). As biodigital technology (from ultrasound to complex brain scanning techniques) has become cheap and omnipresent, biodigital communication—and its regulation—raises some of the key questions of social participation in a postdigital–biodigital age.

Biopolitics and Social Participation

Recent postdigital–biodigital developments significantly shift power relationships between individuals, individuals and their communities, and individuals, their communities, and (bio)technology. Foucault's biopower, exercised by administrative bodies on individuals and populations as "power over life" (Foucault, 2008, pp. 304–308), now needs to be expanded. Administrative bodies can be (and often are) automated, and individual control over information shared by individuals' own bodies has diminished. New biodigital forms of social participation urgently call for the development of new (theories of) biopolitics that take these developments into account.

The new biodigital vehicles that channel power in postdigital society are manifesting in multiple diverse ways, depending on the complexities of people's individual "postdigital positionalities" (Hayes, 2021). For some people, choices can be made to monitor their own bodies via digital devices. These "onto-platforms" know us and our "hourly fluctuations of the self—better than we can know ourselves" (Peters, 2019). However, in other cases, the verification of bodily activity is required by systems where questions such as: "Do you plan to sell my data?" or "What commercial interests and economic partnerships lie behind this system into which I am entering my most intimate details?" cannot easily be asked. The imperative to verify our human identity effects a shift where the central point of reference is now "the algorithmic culture of computational networks—not the human" (Braidotti, 2019, p. 1).

Human interactions with new forms of biodigital data are a pressing area for (social) scientific research. There is a fundamental shift of focus as biopolitics meets social participation, which has implications for governmentality. Just as Foucault (2008) argued that studying the technologies of power requires an analysis of the underpinning political rationality, we argue for the need to examine how humans are rationally represented as they interact with biodigital data. Extending Foucault's arguments concerning the reciprocal constitution of power techniques and forms of knowledge in our postdigital–biodigital era require a close analysis of two interrelated aspects that impact on social participation: the varying levels of participation that different individuals have and associated political rationalities.

Examining our new human biodigital data interactions and the varying levels of participation that different individuals have can be considered

through *postdigital–biodigital positionality* (Hayes, 2021). If humans are evolving into "biodigital beings" and "new forms of synthetic life" may also be part of humans, then how might this alter different people's positionalities in postdigital society? For example, what needs to change with regard to Equality, Diversity and Inclusivity (EDI) policies and related educational programs? "Reforms to inclusivity policies focused on human-to-human discriminatory practices alone, need to now be more inclusive of all kinds of hybrid reshaped humans and computers" (Hayes, 2021, p. 258). As such, the former political rationalities underpinning arguments concerning human-to-human inequalities, data, and social participation need to be fundamentally reviewed. There are new questions of who, or what exactly, is being represented and how, as matters of social justice arrive at multiple intersections with each of our postdigital–biodigital positionalities. We therefore need to continually question "the point at which numerous disadvantages cluster together to compound existing inequalities for individual citizens" (Hayes, 2021, p, 260).

There are questions too on "how disciplines may converge differently under, or across, new bioinformational and biodigital paradigms" (Peters et al., 2021b, p. 3) to address such challenges. Nikolas Rose (2013, p. 3) pointed out the need to "understand ourselves in radically new ways as the insights of genomics and neuroscience have opened up the workings of our bodies and our minds to new kinds of knowledge and intervention." Questioning the consequences of this for the politics of life today, Rose raised the implications of new relations being formed between the social, cultural, and human life sciences. The political rationality that underpins these interactions and how related policy is communicated impacts on our intellectual processing of these realities. This has implications, too, for how much power individuals believe they do or do not have to participate in a postdigital–biodigital society. Neoliberal forms of infopolitics have maintained inequalities in relation to the participation of so-called digital citizens. As biopolitics becomes ever more closely entangled with the rationalities of infopolitics, human participation continues to be compromised. How current infopolicy and biopolicy might, therefore, be reimagined as postdigital–biodigital policymaking is a key question for social participation.

To unpack some of these arguments, and indeed to invite other researchers to participate in critiquing and extending these, we will now discuss the "human face" of the biodigital "data-driven society" in the example of Human Data Interaction (HDI) (Mortier et al., 2014). In this

field of study, the focus is on the complex ecosystem of personal data that is now collected and generated around individuals and companies. Sitting at the "intersection of various disciplines, including computer science, statistics, sociology, psychology and behavioural economics," HDI refers to the three core themes of *legibility, agency* and *negotiability* in order to further dialogue across "interested parties in the personal and big data ecosystems" (Mortier et al., 2014).

Extending from work in Human Computer Interaction (HCI), HDI deliberately places the *human* at the center of data flows in order to provide mechanisms for citizens to interact more explicitly with their data. Whilst the three themes of HDI were initially concerned with the opacity of data involved in algorithmic exchanges of information and the lack of control people have over what this means and how such online communications take place, extending these issues to emerging forms of biodigital communication is now a pressing matter. There are problems of *legibility, agency,* and *negotiability* whenever "the online presence as a mode of communication speaks back to the producer in ways that the producer cannot control or oversee" (O'Riordan, 2011, p. 307).

In an Engineering and Physical Sciences Research Council (EPSRC)-funded edited book, *Human Data Interaction, Disadvantage and Skills in the Community: Enabling Cross-Sector Environments for Postdigital Inclusion*, new concerns for HDI are explored from many diverse contexts in order to invite widely inclusive cross-sector and interdisciplinary participation, partnership, and collaboration (Hayes et al., 2023). In examining HDI across these different sectors and disciplines, the intention is to surface just how entangled our human bodies are now with digital and biological data and data-driven platforms. In their introduction to the book, Hayes et al. (2023) write that "[t]he commercial and political drivers that structure these human data interactions now also structure and intersect with many aspects of how education is organised." Looking at various aspects of education through the lens of legibility, agency, and negotiability, they explore ways in which "[i]n the UK, local agencies, councils, combined authorities, and educational institutions have sought to address this complex issue [of digital participation and inclusion] through regional coalitions to encourage dialogue and initiatives" (Hayes et al., 2023). While we don't have enough room to explore all these ways in detail, we would like to stress the HDI approach as a valuable way of looking at postdigital participation.

In a recent Human Rights Watch report, "*How Dare They Peep into My Private Life?": Children's Rights Violations by Governments that Endorsed Online Learning during the Covid-19 Pandemic* (2021), breaches of children's rights included EdTech products that targeted children and their data extracted from educational settings with behavioral advertising. This enabled companies to target them with personalized content and advertisements and to follow them across the Internet. As, across the globe, governments and educational institutions have permitted such invasions of child privacy under the guise of "participation" during the pandemic, such practices simply merge with the many shades of gray in the extremes of biodigital data that are also aimed at protecting children.

Postdigital–Biodigital Policymaking

The idea of digital citizenship has been closely linked with forms of participation, effective access to, and use of, the Internet and related public policy (Mossberger et al., 2007). The idea that technology facilitates civic participation and contributes to community engagement and democracy in an "information revolution" and "knowledge society" is at play here. McCosker et al. (2016), on the other hand, examine digital citizenship as highly contested, a negotiation, involving control and culture. They explore the intimacies of digital citizenship as a "fluid interface" where there are tensions between "the promises of new modes of civic participation, inclusion and creativity, and the threat of misuse and misappropriation" (McCosker et al., 2016, p. 1). Carr et al. (2022) link these to eco-global citizenship, democracy, and transformative education. In short, social participation is the deep foundation of our society.

The Problem of Control

However, meaningful social participation should not arise from coercion. This is, for instance, why most of the world's countries do not enforce compulsory voting in elections, and in 21 countries that exercised compulsory voting in December 2021, fines for abstinence were comparable in magnitude to a parking ticket (CIA, 2022). Compulsory or not, voting is effectively treated as a citizen's moral obligation. In a postdigital–biodigital age, however, the citizen often "participates" in various activities whether they like it or not. While compulsory COVID-19 testing can be implemented as a means of protecting co-citizens, other forms of

biodigital participation are less easily justified. For instance, are there really no other, less intrusive, options that could replace biometric passports while maintaining a high level of security?

Where once traditional communication was based on an exchange of information, emerging forms of biodigital communication involve the removal of control over all aspects of our bodies. An analysis of such processes from the point of view of HDI theory would suggest individuals repeatedly lose *legibility*, or the power to read and understand what has been taken. They also lose their *agency* to intervene and are denied any *negotiability* to change this situation. Some of the most prominent examples of this are found in the field of education. We therefore ask: Where do participation and protection end, and where do coercion and injustice begin for postdigital–biodigital citizens and, by extension, postdigital learners?

New Understandings of (Education) Politics

This question reaches beyond individual freedom and reflects deep transformations in our understanding of politics. In *The Politics of Life Itself: Biomedicine, Power, and Subjectivity in the Twenty-First Century,* Rose argues that

> the vital politics of our own century … is neither delimited by the poles of illness and health, nor focused on eliminating pathology to protect the destiny of the nation. Rather, it is concerned with our growing capacities to control, manage, engineer, reshape, and modulate the very vital capacities of human beings as living creatures. It is, I suggest, a politics of "life itself." (Rose, 2007, p. 3)

While we do not wish to overly emphasize the role of education in social participation, we do need to focus our discussion on postdigital–biodigital policymaking. Education science provides a good focal point for our inquiry, offering a small but rapidly growing body of research on the politics of "life itself" (ibid.). According to Ben Williamson,

> [a] new interdisciplinary educational science focused on the quantification of students' affects, bodies and brains, captured in the term "precision education," has emerged as a priority among scientists, foundation funders, philanthropic donors, and commercial entities. Set in the context of inten-

sive scientific advances in the biological sciences, including psychophysiology and biometrics, neuroscience and genomics, precision education raises fresh questions about the intersections of biology with society, politics and governance. (Williamson, 2019b)

This body of research, which can be found under names other than precision education, branches in many important directions. Harden expands her critique of genetic inequality to ways of doing genetics research, saying that "genetics research does not just disproportionately study White people. It also is disproportionately conducted by White people" (Harden, 2021, p. 85). Other researchers reach towards other aspects such as income, gender, and so on. Consequently, "[w]ithout conducting genetic research with the entire global population, there is a danger that genetic knowledge will only benefit people who are already advantaged" (ibid.). Summarizing this body of research, Kalervo N. Gulson and P. Taylor Webb (2018) note that "[t]he introduction of new knowledge in education may lead to a narrowing not only of what type of knowledge counts as policy knowledge, but also what techniques and expertise are legitimate" and identify biohacking and augmentation as "new areas of performance enhancement and possible reconfiguration of equity" (Gulson & Webb, 2018).

The Infopolitics–Biopolitics Continuum

This dichotomy between various forms of new postdigital–biodigital knowledges is reminiscent of the eternal dichotomy between centers and margins of power and brings our discussion to the familiar terrain of political struggle. Writing for the Special Issue of *Learning, Media and Technology* titled *Global Technologies, Local Practices* (Gallagher & Knox, 2019), we examined the shifting relationships between knowledge production and academic publication and concluded that "the current political economy of mainstream academic publishing has resulted from a complex interplay between large academic publishers, academics, and hacker-activists." Our research led us to a larger conclusion that "[i]n the postdigital age, the concept of the margins has not disappeared, but it has become somewhat marginal in its own right" (Jandrić & Hayes, 2019). We thus called for the development of "a new language of describing what we mean by 'marginal voices'" and "new strategies for cohabitation of, and collaboration between, various socio-technological actors."

Developed in the context of infopolitics, these conclusions bear deep resonance with biopolitics. Infopolitics is concerned with whole new classes of actors such as algorithms, whose agency can reach as far as achieving a status of (something comparable to) "humanity." Ray Kurzweil's (2005) dreams of re-creating his own father's mind and Maggi Savin-Baden's (2022) discussions of the digital afterlife are typical cases in point. Biopolitics also has its new classes of actors, such as Savin-Baden's postdigital humans (2021). The new infopolitical and biopolitical actors have a different material base: infopolitics is about entities made of dead silicon-based microchips while biopolitics is about entities made of carbon-based living cells. However, the postdigital–biodigital "Great Convergence" between *bios* and *technē* significantly complicates matters. Infopolitics is (still) driven by biological actors, and biopolitics requires the powers of digital data storage and computing. This is why the biodigital human is neither digital not analog but *postdigital*, and this is why infopolitics and biopolitics are mutually constitutive.

Infopolitics and Biopolitics in Education

Postdigital–biodigital politics consists of traditional education, sociology, genetics research, and other fields of human inquiry that struggle to uphold their dominance on their turfs. It also includes, and quite prominently, emerging infopolitical/biopolitical actors that struggle for their own space, place, and agency. The struggle always begins with naming, and new phrases such as "precision education" and "digital policy sociology" (Williamson, 2019b) compete for power over the recognized concept. This struggle is linked to (but far from exclusively about) money. In the realm of infopolitics, EdTech companies are biting off increasingly large chunks of governmental education expenditure (Teräs et al., 2020). Similarly, in the realm of biopolitics, pharmaceutical companies are consuming increasingly large portions of governmental healthcare budgets. Many of these trends have been going on for years and are well documented. What has remained under the radar, and is now seizing our attention with increasing impact, is the convergence between the two (see Peters et al., 2022).

Some links between infopolitics and biopolitics are well documented. For instance, it is well known that the public resistance to COVID-19 vaccination (biopolitics) due to fake news and the post-truth infoscape

(infopolitics) has resulted in immeasurable numbers of deaths. Consequently, evaluation of our efforts to provide correct information to citizens can be poignantly summed up in a question: "How many deaths make a good outcome?" (Fuller, 2020, p. 552). Thanks to this line of research, we can now trace the money and identify "winners" and "losers" in relation to specific technologies. It is hugely important to know these things: understanding the world is just a first step towards changing it.

We urgently need to understand subtler and longer-term consequences of the marriage between infopolitics and biopolitics. During the pandemic, numerous new data-driven platforms and systems "crept" into our lives under the guise of improving education or work. Some, like Microsoft Viva[2] as an employee experience platform, claim to help people to put knowledge to work and increase their engagement, learning, and wellbeing. However, who is the data being gathered on individual employees really benefiting? Indeed, is it reassuring or stressful to be informed about the hours of screen time that have interrupted sleep? What happens to education in this context? These subtle intrusions at the intersections of infopolitics and biopolitics still intrude on deeply personal and positional aspects of our lives (Hayes, 2021).

As we slowly paint a very clear (and somewhat unfortunate) picture of what is, we need to dare to imagine what kind of educational technology we want to develop and what kind of a world we would like to live in. In order to develop related policies we need to ask: Who are "we"? How shall we do all these things? In order to begin answering these questions, we offer our concluding remarks structured according to the five W's of journalism: who, what, when, where, and why.

Conclusion

Who Participates in Education?

Social participation in a postdigital–biodigital age involves a wide range of human and non-human actors. These actors are based on carbon, silicon, and possibly other materials; depending on different theories, they are granted various levels of rights and duties associated with "humanity."

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[2] See https://www.microsoft.com/en-us/microsoft-viva/employee-experience-platform. Accessed 17 October 2022.

While we do not subscribe to a radical equality between various types of actors (human-nonhuman, carbon-based, silicon based, etc.), we do recognize that they are all important in their own ways. Regardless of their theoretical status, all actors in our postdigital–biodigital reality need to be acknowledged and their agencies need to be understood in relation to other actors and their respective agencies. This requires moving away from monopolies by elite groups who shape research, related ethics, publishing, and policy according to their own agendas and interests. It requires many more studies to be undertaken in which experts from different cultural communities across the globe contribute diverse insights to biodigital dilemmas informed by

> [r]esearch, learners, and those who have practical experience of the context, operations for example, "people from the inside." In addition, there is a need for buy-in of the community. Participatory design requires sociocultural considerations, thorough understanding of the problem, getting rid of assumptions … . there is a risk of neo-colonisation in the implementation of technological solutions as technology is not neutral. (Traxler et al., 2020, p. 9)

What Is to Be Done?

To begin with, we need to analyze transformations that take place in existing actors and to develop our understanding of the new actors. We need to follow the money and see who profits from new biodigital technologies. We need to follow other, less visible power lines and see who benefits in more subtle ways: directly and indirectly, advertently and inadvertently. We need to create new areas of inquiry, such as precision education and digital policy sociology (Williamson, 2019a, 2019b), to find the common ground between such new fields and work already undertaken in HDI, and we need to develop new, inclusive communities of inquiry.

This knowledge should transfer into educational practice and into policy. Above all, we need to develop new visions for the future, new ways of changing these visions, and new ways of implementing these visions in practice. Policies for today and visions of tomorrow can only be developed collectively, so we need to develop new forms of social participation and education suitable for our biodigital–postdigital reality.

When?

EdTech and BioTech companies already have one foot in the door of various social systems including schools (Williamson, 2019a, 2019b) and other public services (Eubanks, 2018). Some struggles, such as the debate around the extraction of public money towards global corporations, are painfully obvious. Others, such as the directions of future technology development, are more obscure and therefore require additional examples of postdigital interdisciplinary dialogues "covering aspects of life that have come to the fore with recent events and concerns" (Traxler et al., 2021).

Scientific research is strongly shaped by political economy; blue-skies research of today translates into the technologies of tomorrow (Peters et al., 2020). The struggle for social participation, and indeed social equality and justice, therefore needs to be historicized. We need to look backwards in order to understand what has contributed to our present condition, and we need to look forward in order to try and predict future consequences of our present actions. This work needs to be critical yet hopeful.

For instance, Shandell Houlden and George Veletsianos (2022) write that, during the COVID-19 pandemic, researchers responded to the rise of insecurity with the "use of speculative education fiction in critical education studies, a method which has the potential for radical imagination." After a careful examination of a large number of sources, they found that the dominant discourse was largely pessimistic. They "demonstrate the limits of these thematic visions by tracing the relationship between the ways in which pessimistic storytelling, related as it is to apocalyptic storytelling, risks reinforcing inequality" and propose more hopeful speculative research methods.

Where?

Predigital struggles over power and meaning have taken place in schools, universities, research institutes, political bodies, streets, and marketplaces. The postdigital age has shifted some of these struggles online, creating new spaces for the making and dissemination of knowledge that are distinct and dialectically interlinked with traditional spaces. The biodigital age has added another spatial layer and some of these struggles have now moved to biological bodies. A proverbial case in point are the struggles over COVID-19 vaccination, which take place in schools, universities,

hospitals, social networks, and human bodies. In a biodigital–postdigital reality, no aspect of human existence has remained untouched, and the biodigital–postdigital inclusion of all individual positionalities (Hayes, 2021) is therefore key to addressing the inequalities of social participation.

While it can be argued (via e.g., Foucault, 2008) that things have always been this way and that, for instance, the three historical waves of the plague in Europe also impacted people on all these levels, today is a little different. Unlike medieval Europeans, who had no choice but to explain the plague in religious terms, we now have the techno-scientific power with which to interfere with, and actively shape, our postdigital–biodigital reality. Today's struggles for power and meaning take place literally everywhere. For practical reasons, our research will always focus on some aspects of these struggles (e.g., genomics research, educational policy, and so on). Yet as we examine the places of our immediate interest, we should always keep an eye on the whole. In terms of research, this implies a move towards transdisciplinarity (MacKenzie, 2022) as well as the connection of cross-sector community voices on matters concerning data, disadvantage, and postdigital–biodigital inclusion (Hayes et al., 2021).

Why? Postscript

It goes without saying that social participation is a prerequisite for social equality, justice, democracy, and so on. It is also generally acknowledged that the technological transformations of the late twentieth century, leading to a postdigital mashup of the analog and the digital, have radically transformed our informational ecologies and created new forms of info-politics. In areas such as post-truth and fake news, policymakers have only just started to get to grips with the informational challenge (MacKenzie et al., 2021). What has remained under the radar, yet hidden in plain sight, are the biological consequences of these trends, the techno-scientific development of biotechnology, and biopolitics.

In the blink of an eye, the COVID-19 pandemic has turned our attention to biopolitics and biopractices. Seemingly disconnected research areas have started to converge from a puzzle into a much larger image. Discoveries and theories as diverse as nanotechnology, ecopedagogy, cloning, genetic engineering, biodigital philosophy, and Human Data Interaction have begun to recombine and complement each other in new ways. While our collective attention has shifted to biopolitics, this need

not imply that we should abandon infopolitics. Probably the key take-away of postdigital theory, repeated and tested in numerous situations, is that "postdigital really useful knowledge lies at the intersections between biology, information, and society" (Jandrić, 2021, p. 264). Biopolitics and infopolitics are therefore dialectically intertwined and one cannot be thought of without the other.

Then there are different interpretations to consider in relation to the tenets or core themes of HDI theory: *legibility, agency,* and *negotiability.* For example, the "postdigital positionality" (Hayes, 2021) of individuals in different cultural groups and communities can mean that these tenets are understood in rather different ways. Taking the concept of *agency* as one example, in Williams and Brant's (2022, p. 211) biodigital discussion of different Indigenous worldviews, they point out that

> [t]he Haudenosaunee worldview does not figure objects or individuals as static. For example, a wooden table is in a constant state of flux or transformation. It is composed of all the interactions it had as a tree in the forest; as wood in the workshop; as a table used for eating or other purposes; and as food for insects, fungi, and other decomposers when it eventually breaks down and returns to the ecosystem. This vibrant dynamism extends to humans, medicine plants, rivers, animals, and the rest of Creation. (Williams & Brant, 2022, p. 211)

The Haudenosaunee perspective is said to be similar to Rose's (2013, p. 14) assertion that "the envelope of the skin does not, by rights, delineate an enclosed, autonomous zone," meaning that the human self is understood as extending beyond the boundaries of our physical bodies. Thus, *agency* is not simply about a human will to act but refers to a more dynamic entanglement or becoming.

In 2023, therefore, social participation once again needs to be re-examined, re-analyzed, and reimagined in, and for, a biodigital age. Postdigital theory offers the theoretical underpinnings and practical tools with which to approach this task. Furthermore, the community of global scholars who are collectively developing postdigital theory is ever-growing and expanding. While it is hard to swim against the prevalent tide of Western domination in knowledge work, we need to ensure that the ethical dimensions of biodigital technologies and human data interactions are not only analyzed from a Global North-dominated standpoint. Human–technology relationships are always changing, always in flux, and today's

theories and practices will inevitably shape humanity's collective future. This future is everyone's concern, and everyone needs to take an active part in its shaping. Postdigital–biodigital social participation, and especially its educational aspects, are a key area of research, policy, and practice that can turn this vision into reality.

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