Postdigital We-Learn

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Abstract

This paper examines relationships between learning and technological change and argues that we urgently need new ways to approach what it means to learn in the context of a global Fourth Industrial Revolution. It briefly introduces the postdigital perspective, which considers the digital 'revolution' as something that has already happened and focuses to its reconfiguration. It claims that what we access, how we access it, what we do with it, and who then accesses what we have done, are important elements of a postdigital world worthy of closer examination. Focusing to recent debates about postdigital collective intelligence, we develop the concept of postdigital we-learn by showing that it might help us, amongst other things, to counter the idea of a lone human accessing education primarily for future individual, economic profit, as prescribed by the neoliberal learning economy. Building on new schools of thought emerging in response to the expansion of non-human (algorithmic) agency, we refine the concept of postdigital we-learn as a gathering between humans and machines. The consequences of this gathering are uncomfortable, as they imply unlearning elements of both capitalism and critical pedagogy. However, such unlearning is inherent to 'a critical pedagogy of becoming' and positions postdigital we-learn as a suitable framework for understanding and development of emancipatory, critical learning in our postdigital reality.

Keywords: postdigital, we-learn, access, rationality, collective intelligence, critical pedagogy, becoming

Introduction

Learning is associated to some extent with being able to 'get' what an individual believes they 'need'. However, in a neoliberal learning economy, students are told what employability skills they require in university policy, with this logic upheld via multiple supporting institutional narratives (Hayes, 2019a). This setting of economically-focused parameters linked to learning has restrictive implications. What people perceive they can access is linked to what they come to learn, and in turn, how they might act. For example, there is a lot of conceptual space between learning something in order to personally survive, or for wider intellectual, philosophical, or societal interests. Whilst access to education has endless possibilities to advance collective learning for social good (as well as for individual gain), if routes are narrowly framed, alternatives may remain unexplored. Thinking, learning, and acting involve reasoning, but they cannot be approached via logic alone. These actions are inter-dependent on each other, but also on other human and non-human entities in people's lives (Hayes, forthcoming, 2020). Additionally, these perspectives concerning learning cannot be applied to the idea of a human being, or indeed society, as something static. Though humans think and reason in order to make meaning, they do not do so in isolation from the physical, political and technological changes around them (Hayes, forthcoming, 2020). In seeking to understand recent changes in the framing of learning, it is necessary to look briefly at underpinning processes of modernisation in society in connection with technological change. As Jones argues,

> technological changes are sometimes seen as the dominant driver of social change, a kind of technological determinism. However, in the same time period that technology changed, there was a political and economic transformation of the world economy from a competition between capitalism and socialism, with a developing 'third world', to a single global system differentiated into geographical regions and nation states. (Jones, 2019)

Half a century ago, the world was conceived in terms of First, Second and Third World categories of economic and national development. As Wagner points out, the First World was attributed with a certain superiority of institutionalised freedom and differentiation developed in accordance with functional needs (Wagner, 2012). Wagner describes our progression through what have since been labelled as a series of industrial revolutions, with the first of these beginning in the mid-18th century and bringing new manufacturing processes (moving from hand production of textiles and iron to machines in factories) and the introduction of steam engines, trains and boats. In the Second Industrial Revolution the focus was on steel production, the automobile and advances in electricity, with western 'industrial societies' of the 1960s building on these electrical and chemical engineering innovations. As 'post-industrial' society began to be considered, political discussion of 'knowledge societies' accompanied the new information and communication technologies of the Third Industrial Revolution, that have enabled 'global interconnectedness' (Wagner, 2012: viii). Digital technologies in the form of mobile devices demonstrated even furthered the encroachment of such technologies into every aspect of people's daily lives. Taking us into the present, writers now discuss technology in the light of a Fourth Industrial Revolution that is bringing fundamental shifts to how humans learn and work through rapid advancements in Artificial Intelligence (AI) and Machine Learning (Peters, Jandrić and Hayes, 2019).

Considering learning in the light of these technological revolutions, we are keen to avoid a focus where each new technology is seen as simply taking over from the last, or as an isolated instigator of change. Instead, we offer an argument that *all* of these technological changes are still with humans, whether the machines themselves are in use, or not. This is a postdigital perspective, which we expand below, to suggest that all technological change has bearing on what we access, how we access it, what we do with it, and who then accesses what we have done. Based on this argument, if no technology is ever perceived to be gone altogether from our lives, then no former, or future, approaches towards learning, can be obsolete either. Whilst critical learning for teams developing AI would involve different activities than for teams involved in the manufacture of earlier technologies, through the concept of postdigital we-learn, each is a gathering between humans and machines. Taking this as our starting point, unlearning what we know about learning and about our capitalist context are needed.

Recent decades of technological change have happened alongside a spread across the globe of a neoliberal political economy, where free market trade and deregulation of financial markets have been accompanied by a move away from state welfare provision and an increased focus on individual self-help. This has seen education, within institutionalised capitalism, portrayed in policy as a means to an end, where the flexible skills of individuals are developed to meet the needs of the economy (Peters, Jandrić and Hayes, 2018). The Fourth Industrial Revolution however brings a serious challenge to a narrow political construction that claims social issues are solved through more education. A focus on human skills, as if they were somehow separate rather than integrally linked with technological change, alters nothing. Although this structure largely failed to deliver its promise of individual and economic development, new policies for student learning continue to draw from this taken-for-granted vision of neoliberal social development (Peters, Jandrić and Hayes, 2018; Hayes, 2019). We urgently need new ways then to approach what it means to learn in the context of a global Fourth Industrial Revolution and a society that we argue is now 'postdigital'.

There is a shared need to 'unlearn' ongoing and simplistic solutions in terms of educationalisation and technologisation of social and economic issues (Peters, Jandrić and Hayes, 2018) and disrupt the neoliberal learning logic that an individualistic approach towards accessing knowledge will automatically further personal gain in the widest sense. Firstly, social mobility is clearly not improving very rapidly in this model (Jump, 2019). In physical 'post-

industrial' contexts, whilst improvements are taking place for some groups and economic sectors, significant challenges remain for others. These include sustained high unemployment, even prior to predictions of a Fourth Industrial Revolution, child poverty and deprivation, just outside of many educational institutions (Jopling and Johnson, 2019). Such examples exist alongside a varied constellation of who does, or does not, have access to the social and economic currency the digital may bring, before contemplating what a 'postdigital' era could alter.

Secondly, students from disadvantaged backgrounds continue to be 'sold' a reductionist route to learning, where narrow skills and competencies are argued through policy to be the chief prerequisites for success. This may produce subjects who can slot into a pre-existing order of society, but not human agents equipped to adapt to, and invoke, significant change to radically reimagine their roles in a global collective society without work. Even as rational models of learning are enacted, focusing on 'graduate attributes' for employability, there are drives for evaluations of these, to demonstrate student outcomes in the form of 'learning gain'. This suggests lecturers must be motivated by boosting students' future earning power, and it tells students they need to be motivated by their own self-interest – constantly judging what they have gained (Leach, 2018). Finally, but just as importantly, educational policy has persistently separated the performance of humans from machines through the power of words (Hayes, 2019: Jandrić and Hayes, 2019). This failure to discuss important interconnections between the actions of humans with machines and software and with each other, is one area where we believe the concept of postdigital we-learn can offer valuable contributions.

Why postdigital?

We now live in a postdigital world "where digital technology and media is [no longer] separate, virtual, 'other' to a 'natural' human and social life" (Jandrić et al., 2018: 893). The postdigital approach does not seek "technical innovation or improvement but considers digitisation as something that has already happened and thus might be further reconfigured" (Cramer, 2013). "The postdigital is hard to define; messy; unpredictable; digital and analog; technological and non-technological; biological and informational. The postdigital is both a rupture in our existing theories and their continuation" (Jandrić et al., 2018: 893). Somewhat paradoxically, the postdigital era has come upon us, even as we continue to argue about what the digital is, and what it means in education. Describing our current socio-technological reality, postdigital theory opens up new spaces to understand learning across wider perspectives than a simple, instrumental acquisition of skills, based on an assumption of ongoing work.

The postdigital dialectic between human beings and technologies, which rejects the instrumentalization of technology and its underlying philosophical determinisms, provides a significant challenge for (learning) sciences. While we do not (yet) understand the exact nature of relationships between humans and machines, it is easy to see that these relationships are quickly changing. For instance, there is no doubt that our experience of writing this article is very different from, for example, that of Petar's mother, when writing her articles in the 1980s and 1990s. Although there are improvements in 'access' and 'searchability,' it doesn't follow that these make research easier or better.' Rather, they *change* our research process and introduce new problems. Thus, the strategies we use to navigate our access to the vast sources available to us may also lead to a narrowing down of our research areas, as we close ourselves into smaller communities (Jandrić, 2019). This in turn can reinforce existing power relationships (Fuller, 2019) rather than yield new perspectives.

Indeed, the notion of 'access', which we return to later in connection with learning and unlearning within an overall learning economy, is associated with being able to 'get what we need'. Whether this refers to accessing an educational institution in order to learn, or a computational system to download a philosophical article, our routes into learning have both

diversified in this postdigital era and have also narrowed. Alongside seemingly endless possibilities for new postdigital perspectives on education, there is a dominant neoliberal interpretation of learning, as an individualistic and economically driven endeavour. This perspective has treated digital technology as a tool to simply enhance such a model of education, with this concept persistently reinforced through repetitive forms of educational policy discourse (Hayes, 2018, Hayes, 2019a). As Biesta (2006) has argued, recent decades have brought shifts in policies that have transformed the idea of lifelong learning:

> Whereas in the past lifelong learning was seen as a personal good and as an inherent aspect of democratic life, today lifelong learning is increasingly understood in terms of the formation of human capital and as an investment in economic development. This transformation is not only visible at the level of policy; it also has had a strong impact on the learning opportunities made available to adults, partly through a redefinition of what counts as legitimate or 'useful' learning and partly as a result of the reduction of funding for those forms of learning that are considered not to be of any economic value. (Biesta, 2006: 169)

This approach to learning only what is seemingly useful for individual gain simply maintains an existing order that prizes 'employability' skills. This leaves people ill-equipped to adapt more creatively and resiliently to the collective challenges of a Fourth Industrial Revolution. It is like driving students (and those who teach them) down a long and narrow tunnel. The tunnel may be well lit, and clearly following a direction, but like Plato's cave, it fails to reveal the endless possibilities that run alongside the tunnel yet remain out of view.

We are now living in postdigital times with exciting possibilities for collective understandings of more democratic forms of learning. Yet, our educational systems remain structured towards purely rational, individual progression. This fails to acknowledge relationships between human beings and living machines and collective learning opportunities. Instead we find students "are paying the entry fee (essentially a lifetime of debt) for access to a college classroom, a minimum requirement for accessing even the lowest strata of livelihoods, while concurrently working two or three jobs, with no guarantee of attaining future security" (Means, 2019). Furthermore, a global logic of learning framed around skills acquisition for future employment (Peters, Jandrić and Hayes, 2018) is based on the assumption of the availability of work and a set of discrete skills that directly relate to this employment. When Sarah's father trained during the 1940s and 1950s as a vehicle mechanic and went on to work for Aston Martin and Jaguar in the 1960s and 1970s, he acquired skills he could use to renovate his privately-owned vehicles. These days electronic parts are replaced, not repaired, and robotics has been used to execute and automate tasks in the industrial process. The manipulation of tangible manufacturing processes through robotics has brought rapid physical change within industry and the surrounding regions where industries developed. As less visible artificial intelligence (AI) software, in the form of algorithms that learn and self-improve is now rapidly implemented, new realities are already upon us, whether we are prepared for them, or not.

A postdigital perspective presents an opportunity to re-examine the learning economy, which has been marketed by governments, universities and the media in recent decades as something to individually 'access' and progress through on the way to personal employment. Though that employment changes rapidly, institutional web pages still point to the gaining of certain skills by students and the closing of 'the skills gap'. These may be aspects of learning but they are often approached in educational policy from a very narrow viewpoint where higher education is expected to 'fix' societal and economic issues (Peters, Jandrić and Hayes, 2018). However, just as technological change has now provided us with machines that (as humans) we can no longer simply 'fix', we need new understandings of what this means for learning and

for related postdigital educational policy. What we access, how we access it, what we do with it, and who then accesses what we have done, seem to us to be important elements of a postdigital world worthy of closer examination, in relation to learning and unlearning. Currently, human subjects access education in a consumerist process where they fit into the pre-existing order of things, as isolated individuals swiftly passing through. The learning they gain is collected in a transaction in which as students they are told what they need. This tends to overlook the role that humans now enact more widely as postdigital 'prosumers' (Ritzer, Jandrić and Hayes, 2018). Furthermore, it overlooks the very diversity surrounding student lives that many universities claim to support.

Collective intelligence

In a postdigital world, the problem of working together can be systematised into 3 dialectically intertwined issues: (1) the problem of people working together with other people, (2) the problem of people working together with (digital) technologies, and (3) the problem of (digital) technologies working together with each other. The concept of the postdigital cuts across all of these scenarios, providing one way to examine new pathways towards learning that can help build collective intelligence. While we are seeing a lot of wishful thinking about achieving one or another form of collective intelligence through automated systems and artificial intelligences, it is important to ask ourselves what we would like to achieve together. This is the focus of Pierre Lévy's account of collective intelligence as:

> a scientific, technical and political project that aims to make people smarter with computers, instead of trying to make computers smarter than people. So, collective intelligence is neither the opposite of collective stupidity nor the opposite of individual intelligence. It is the opposite of artificial intelligence. It is a way to grow a renewed human/cultural cognitive system by exploiting our increasing computing power and our ubiquitous memory. (in Peters 2015: 261)

Based on Lévy's definition, we will focus this discussion to the first two problems from our classification: the problem of people working together with other people, and the problem of people working together with (digital) technologies. It would seem to us that an important consideration in the growing of a renewed human and cultural cognitive system is an increased collective awareness of how computing power, and indeed power itself, are now configured within late capitalism. "This is not the One-Dimensional Man that Herbert Marcuse (1991) described as the quintessential reified subject of high Fordism. Power is not hiding behind a veil of illusion." (Means, 2019) In introducing 'postdigital we-learn' we are responding to the expansion of non-human (algorithmic) agency to suggest a new way to approach what it means to learn. The concepts of we-think, we-learn, and we-act have always been the basic building blocks of the human condition (Jandrić, 2019), yet they are far from the only ones. Building on Agamben, in *Education out of bounds* Lewis and Kahn (2010: 34) remind us that "[t]he unruly flesh of the multitude folds within itself the nonhuman logic of animal swarms, thus opening up a threshold between nature and culture, *zoë* and *bios*". While this important relationship is an intrinsic part of the we-think, we-learn, and we-act ontology, our focus in this paper is on a new dynamic between these as a gathering of humans and machines that might be reimagined in ways that do not simply reinforce existing power relationships. Admittedly, the prefix we- can be used to support a plethora of ideologies; a typical case in point is the company WeWork[1] which provides shared workspaces for technology enterprises. In this article and elsewhere in our work, however, we take a clear ethical, ideological, and

[1] See https://www.wework.com/.

pragmatic position of understanding we-think, we-learn, and we-act, as building blocks for the non-capitalist (or better said post-capitalist) project of postdigital critical pedagogy.

Taking firstly, 'we-think', there is the challenge to 're-think' how technology is perceived. Whilst we have progressed through a series of 'revolutions', we can no longer afford to be constrained by notions of 'industrial', 'digital' 'robotic' or 'analogue', or to indulge the idea of 'humans' as separate from their 'tools'. We now need to understand the epistemic consequences of our we-think and develop new strategies for we-thinking in and for the future (Jandrić, 2019). The concept of 'we-learn' surrounds re-think as an essential attribute of human beings, not reduced to schooling, which is just a small part of this process. As such there is a need to 'unlearn' the neoliberal framings that constrain how we perceive critical approaches to learning now that our technologies are no longer 'revolutionary', but mainstream.

In a gathering with technologies, humans need to drop the myth that technology has essential properties that determine our futures. This is rather like breaking free from the metaphorical, rational 'cages' described by George Ritzer as limiting for human potential (Ritzer, Jandrić & Hayes, 2018). As we-act then closes the trialectic with we-think and we-learn, a new understanding of this relationship in the concept of 'postdigital praxis' can grow. Postdigital praxis frees us from the existing social order by taking apart the existing building blocks of we-think and we-learn, to re-think and unlearn these, and then to act more collectively. We can then start to enact the 'postdigital we-learn' trialectic to address democratic challenges, but with an awareness that all of our 'human' traits remain collectively intertwined with our tools. Thus any thinking and learning might have been derived from the actions of someone or something else, to provoke new thinking, learning, or action.

The concept of postdigital we-learn helps us, amongst other things, to counter the idea of a lone human accessing education for future profit alone. This is essential now that a new relationship between humans and technologies, in the form of artificial intelligence, has not only been set up, but independently 'learns' and draws its 'own' conclusions. To progress our thinking on the question of learning in this context, we now need to develop a new discourse to describe what it means for a machine to have agency to learn, as distinct from human agency to learn. This is because humans have different forms of 'access' to learning than the 'access' routes taken by machines. This has implications for both the philosophy of learning and for how we teach and write policy.

Postdigital we-learn: is it really (that) different?

Human existence has always been dialectically intertwined with technical innovation. In *Natural Born Cyborgs*, Andy Clark emphasizes that questions related to recent technological developments are as old as humankind:

> The line between biological self and technological world was, in fact, never very firm. Plasticity and multiplicity are our true constants, and new technologies merely dramatize our oldest puzzles (prosthetics and telepresence are just walking sticks and shouting, cyberspace is just one more place to be). Human intellectual history is, in large part, the tale of this fragile and always unstable frontier. (Clark, 2003: 8)

From spears and stone knives, through the printing press and computers, our learning has often resulted in and from development of tools. However, recent development in artificial intelligences has changed the nature of these tools. Traditional tools such as a hammer, automobile, and digital word processor are 'passive' – to get them working, someone needs to grab a hammer, drive a car, and type words. The latest developments in computing have brought about a different type of technology and a new relation between technology and humans. The

development of artificial intelligences, such as self-driving cars, also requires a lot of human work, but once an artificial intelligence has been set up, it independently 'learns' and makes its 'own' conclusions. We may start up an artificial intelligence by pressing the 'on' button but what happens thereafter is far from passive. Through a postdigital we-learn framework we have capacity to question the very philosophy of learning that is built into these machines and ask what it reproduces and reinforces. If it currently amplifies a neoliberal logic, then how might this be unlearned, once it has been set in motion? What new technological developments might be discovered by project teams, if postditial praxis influences their approach?

This expansion of non-human agency has inspired whole new schools of thought such as posthumanism, sociomaterialism, and others; at least since William Gibson's *Neuromancer* (1984), these developments show up equally in the sciences and in the arts. An important element of the postdigital challenge lies in sociomaterial reconfigurations of relationships between human beings and technologies which "conceptualise knowledge and capacities as being *emergent* from the webs of interconnections between heterogeneous entities, both human and nonhuman". In this way, they "integrate the material technologies and media found in networked learning into a framework that encompasses people and machines in a symmetrical way" (Jones, 2018: 47).

Sociomaterial understanding of symmetry between people and machines has been extensively debated in the last few decades. For instance, in 2002 Steve Fuller and Bruno Latour debated the following motion: "A strong distinction between humans and non-humans is no longer required for research purposes" (Barron, 2003: 78). Latour took the position that "all phenomena should be treated equally, whether it comes from something human, natural or artificial", but Fuller claimed that it leads towards the "abdication of responsibility" (Fuller and Jandrić, 2019: 212). The debate "was never intended to offer solutions" (Barron, 2003: 98), yet Fuller and Latour "seemed to agree that treating people and machines in a symmetrical way reaches all the way to questions of values and morality" (Peters and Jandrić, 2019: 203). Almost two decades later, Jones pragmatically concludes "that all actors cannot be treated as completely symmetrical for research purposes because of the particular access that we have to accounts of experience from human actors" (Jones, 2018: 51)[2]. This seems to us to be particularly important, when accounts of 'access' in education as well as 'experience' have been persistently marketized within neoliberal policies aimed at learning. The notions of thinking/learning/acting 'with' machines imply neither subordination, nor reciprocity – the postdigital reality is somewhere in various shades of grey hidden in Jones' notion of symmetry. Elsewhere, Sarah has discussed the problem of attributing agency to non-human linguistic structures such as 'the student experience' (Hayes, 2019a). This distances humans from their own personal experience, replacing this with an artificial construction that can then be attributed in policy with the ability to 'act'.

While this is not the place for a more detailed discussion of sociomaterial symmetry between people and machines, or indeed the intricacies of policy discourse, we argue that the complexities of the language used to describe these relationships cannot be ignored. To address the question of what might be different about postdigital learning we turn initially towards the critical posthumanist approach. Put simply, this suggests that: "we are never prior to, or independent of, the very technologies, companion species and environments that help to constitute us" (Matthewman, 2011: 176). This is a powerful contrasting viewpoint from a deterministic rhetoric about the role of technology in driving forward society, education and work, which has tended to dominate neoliberal educational policy (Hayes, 2019a, Hayes2019b). Moving from policy to practice, Sian Bayne argues that placing a posthumanist perspective

[2] For a more detailed account of the Fuller-Latour debate, see (Fuller and Jandrić, 2019). For a more detailed account of postdigital symmetry between humans and machines, see (Peters and Jandrić, 2019).

within education takes place "where the social and the material worlds come together – where the human teacher's agency comes up against the workings of data to conduct another, and different, kind of teaching which is neither human not machinic but some kind of gathering of the two" (Bayne in Jandrić 2017: 206). In a recent article, Peters and Jandrić show that:

> The critical posthumanist perspective takes into account debates and uncertainties pertaining to relationships between human beings and living machines yet refuses to be restricted by them. It firmly places humans in control of their own destiny yet allows living machines a lot of responsibility and agency in teaching. In this way, the critical posthumanist perspective offers sound guidance for our everyday practice and theoretical background for approaching deep philosophical questions of equality and symmetry between human beings and living machines. (Peters and Jandrić, 2019: 203)

So what kind of teaching, and of course learning, takes place in our postdigital world? What kind of gathering between humans and machines should we organise? It would seem to us that a stronger awareness of what we access, how we access it, what we do with it and who then accesses what we have done, is an important part of unlearning restrictive rationalities about technology and developing postdigital we-learn. Defining the different forms of 'access' to learning afforded to humans and to machines is a pressing project. If we do not address these questions, we risk the agency of machines (programmed through neoliberal values) creating the platforms by which we exist. Today, this risk has arguably (and sadly) in many cases become reality, yet new possibilities await us though by opening these and other questions concerning collective learning arising from a gathering of humans and machines. This could inform educational policy in radical new directions that cause rational statements in policy to crumble (Hayes, 2019a) and also bring new exciting perspectives to the philosophy of learning, through the trialetic of postdigital we-learn.

As we interact with multiple systems, we need a critical postdigital dialogue to share our human experiences of what learning means in these new contexts. In our recent co-authored attempt at a postdigital dialogue, a larger group of authors has collectively concluded:

> A postdigital critical pedagogy hopes to reclaim the digital sphere as a commons, for the production of surplus consciousness and educational superabundance. Postdigital dialogue is crucial for both illuminating the hegemonic myth of technological development and unmasking the promise of capitalist prosperity and for developing emancipated and creative democratic subjectivities and relations. (Jandrić et al. 2019: 189)

The digital may be disappearing into the background to be barely noticeable in the Fourth Industrial Revolution, but here we can look to the postdigital as our means to return as humans by reinvigorating the concept of the commons (Ford, 2016). "The shift towards the postdigital provides possibilities for unlearning in order to relearn, together; this is hope. However, theorising alone will not bring such hope into being, and postdigital dialogue needs to conscientise and concretise its own politics." (Jandrić et al. 2019: 189)

Postdigital we-learn draws a lot from critical pedagogy, which is the obvious starting point for conscientization and concretization of its politics (Freire, 1970). These days, however, critical pedagogy also struggles with the postdigital reality. In words of Derek Ford: "My position is that critical pedagogy is at a dead-end. This is not to say that it offers nothing valuable, but rather that it is been stagnant for some time (I would say at least since the beginning of the 21st century)" (2017: 2). Postdigital we-learn has clearly absorbed critical pedagogy's message that unlearning narrow, economically-based perspectives on learning (and

learning through technology in particular) is a necessary beginning of a pathway to reimagining what we might access in the future through the trialectic. However, this is far from enough! These days, the ethos of critical pedagogy needs to be reinvented and repurposed for this curious postdigital space of technology and biology, theory and practice, action and reaction, humanism and posthumanism, learning and unlearning. Or more radically: we need to unlearn capitalism, but we also need to unlearn many elements of the traditional canon of critical pedagogy

Our elaboration of a form of postdigital praxis frees us from the existing social order by taking apart the existing building blocks of we-think and we-learn, to re-think and unlearn these, and then to act more collectively. While it is always pleasant to expand our theories and beliefs towards pastures new and unknown, unlearning aspects of critical pedagogy implies swallowing some bitter pills. In particular, to face an awareness that all of our 'human' traits including identity politics are now collectively intertwined with our tools and the game has changed. While we duly swallow these pills, we should not despair, because their bitter taste and unpleasant feeling are an integral part of what Malott and Ford (2015) call "a critical pedagogy of becoming" to provoke new thinking, learning and action. Such a radical change cannot arrive from we-learning itself; it will take serious political conflict to make it possible. Reinvented in and for our postdigital context, critical pedagogy can offer a lot of guidance in this ongoing struggle.

Conclusions

Thinking, learning and acting are inter-dependent on each other, but also on other human and non-human entities in people's lives that do not remain static. Unfortunately, recent decades of technological development have been accompanied by the spread of neoliberal policies that discuss learning in terms of the flexible skills of individuals developed to meet the needs of the economy. Where once the notion of lifelong learning was a broader concept within democratic life, the focus on only what is useful economically, has left exciting territory unexplored. Here we argue that a critical posthumanist perspective can help us explore postdigital imaginaries that emerge through dialectically intertwined relationships between people and each other and people and (digital) technologies. We can pause to consider the idea of 'access' to learning, not simply in a narrow means-to-an-end way, but more broadly, in terms of what access to learning in connection with material things and virtual entities has meant to people, as modernisation through different phases has taken place.

What happens to learning if critical pedagogy fails to inform development of artificial intelligences and other automated tools? While we do not possess a crystal ball for predicting the future, we do know that systems currently at hand, from automated college admissions (O'Keefe, 2017) to automated provision of social and health security (Eubanks, 2018) (just to mention a few) have only exacerbated injustice and inequality. And we know, amongst other things, that "as neurotechnology developments are being extended to education, they present potential for businesses and governments to enact new techniques of 'neurogovernance' by 'scanning' the brain, 'scraping' it for data and then 'sculpting' the brain toward particular capacities." (Williamson, 2019: 65). What learning takes place if new critical approaches are introduced amongst teams developing artificial intelligences and how is this different to teams once involved in the manufacture of earlier technologies? We might not have the crystal ball, but we do know that technology is not destiny (Feenberg, 2002) – by taking matters in our own hands, we can at least try to make the world a better place.

Postdigital we-learn offers new perspectives on shared identities which are grown alongside the machines in our lives. Alongside processes, there are connected experiences of the groups of humans involved and their access to learning. If software development is only seen in terms of finished products that humans apply, then existing inequalities in terms of who can build and / or access software will be reinforced virtually, as well as physically. (Software

is a small part of our sociomaterial reality, but its implications reach to diverse strands of our lives). The ways of how machines operate have already seeped quite deeply into educational discourses (Säljö 2002), especially those involved with measurement of quality and 'excellence' (Jandrić, 2020, Hayes, 2019). A postdigital approach must avoid the danger of linking humans and machines so closely in ways which help proliferate machine metaphors in education; on the flip side of the coin, "we might consider becoming more like bots, with their ability to spread, amplify, intervene, and direct" (Ford, 2020).

When reflecting on the 'revolutions' that have brought forth each new form of technology, a postdigital era enables us to notice that each innovation is still with us, even as the new 'revolution' takes place. Postdigital we-learn allows us to draw on all of these technologies as integral to our lives and the lives of others, and to question who and what humans and intelligences really are, in this shared context. Just as our technologies are still with us, so are our philosophical theories of emancipatory learning in all their abundance. We many need to swallow some bitter pills such as unlearning elements of critical pedagogy, but we can also look forward to a new take on the concept of general intellect (Marx, 1857), in a postdigital collective intelligence, where machinery and people could begin to be liberated from oppression under capitalism. In this respect, postdigital we-learn is a rupture, and a continuation, of emancipatory thinking in and for our contemporary reality.

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