CURRICULUM STUDIES IN THE POSTHUMAN CONDITION/ POSTHUMAN CURRICULUM (STUDIES)

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ABSTRACT

In this article we discuss the difference between curriculum studies (as a field of inquiry) in the posthuman condition and posthuman curriculum (studies). The posthuman condition is characterised by both posthumanism and post-anthropocentrism and relates respectively, to how we now define human given humans' entanglement with new technologies, and the ethical response-ability of humans in intra-action with the more-than-human-world in a context of impending ecological disaster. In this article we shall argue that although Enlightenment humanism has been challenged philosophically/conceptually both in discourses on anti-humanism and posthumanism, humanist approaches to curriculum studies remain with us in the posthuman condition – the ghosts of Dewey, Tyler, Freire, etc., imbue much of curriculum work. However, the posthuman condition also produces posthuman thought that makes it possible to reimagine curriculum studies, that we shall call posthuman curriculum (studies). We shall review different approaches to curriculum studies in the posthuman condition, and then turn our attention to posthuman curriculum (studies). We argue that curriculum (as a vital concept) in posthumanist terms is intelligible and manifests through intra-actions, processes of becoming and experimenting. Set against sedentary states of *being* that mark curriculum studies in the posthuman condition; becoming, intra-acting and experimenting in posthuman curriculum (studies) are *acts*, *doings* in and of this world. The acts and doings in posthuman curriculum (studies) that are mostly written about include: improvisation, theorisation and diffraction. To these we add and specifically discuss quantum tunnelling, tracing, and desiring. Other forms of curriculum experimentation worthy of consideration in posthuman curriculum (studies) but not discussed in the article are queering, imagining, and writing. Towards the end we make the point that although some connections with the past (such as those that haunt curriculum discourses) can be threatening to life, connections of the thick now hold potential and radical openness for newness.

Keywords: curriculum experimentation, curriculum studies, hauntology, post-anthropocentrism, posthumanism

INTRODUCTION

We live in unparalleled times. Human lives have become entangled with advanced technologies to an extent that it is difficult to know what human now is, what it means to be human. These technologies are growing at a rapid rate. Concurrently, environmental problems have reached unprecedented levels, to the extent that planet Earth is on the threshold of ecological catastrophe. The dominant theme of the latter is the threat of ongoing anthropogenic climate change. Braidotti (2019) points out that we are situated between the Fourth Industrial Revolution (4IR) and the Sixth Extinction. The 4IR (Internet 4.0) refers to Schwab's (2015) coinage of a present-day phenomenon, which witnesses the blurring of the margins between the physical, digital, and biological spheres, manifested in technologies such as artificial intelligence (AI), Internet of Things (IoT), drones, 3-D printing, etc. The Sixth Extinction, the title of Elizabeth Kolbert's (2014) book, refers to the geological era which is witnessing the decimation of species due to human activity. Crutzen and Stoermer (2000) went as far as to posit a new geological epoch, the Anthropocene, to depict humans' involvement in altering Earth's systems. Moore (2015) argued that Capitalocene should replace Anthropocene, because the rise of Capitalism in the 15th century was the watershed moment in human's relationship with the more-than-human-world – more significant than the invention of agriculture.

The acceleration of Capitalism (in conjunction with advanced technologies) and ecocide (the decimation of ecosystems) is the backdrop to what has been termed the posthuman condition. This includes how one negotiates the predicament of resisting the dangers of advanced technologies without becoming technophobic and how one ascribes intrinsic value to all of life whilst arresting inequalities among humans. Braidotti (2019) avers that the posthuman condition is the coming together of posthumanism and post-anthropocentrism. For her the former is concerned with critiquing the ideal of "human" produced by Enlightenment Humanism, as "Man" the measure of all things. The latter is concerned with challenging human exceptionalism in the interest of fostering species equity. Furthermore, Braidotti (2019) argues that the posthuman is not only a historical marker for the present condition but a theoretical figuration – a navigational apparatus to canvass the material and discursive expressions of modifications associated with developments of advanced technologies and climate change. We piggyback on Braidotti's "theoretical figuration" and suggest that in the same way poststructuralism was an attempt to work out an academic theory in the postmodern condition, there are now attempts to work out academic "theories"[1] in the posthuman condition and these include: new materialisms, feminist materialism, speculative realism, object-oriented-ontologies, non-representational theory, realist pan-constructivism (for a more detail, see Le

Grange 2018a). These domains of theorising have generated new concepts such as Barad's (2007) agential realism, ethico-onto-epistemology, intra-action, and thick now[2]. And we have seen a shift from deconstructive to diffractive readings of texts (see Murris and Bozalek 2019; Du Preez and Du Toit 2022). The "new"[3] theorising is enabling us[4] to rethink/reimagine, justice, ethics, subjectivity, the divide between the natural sciences and the humanities, and in relation to this article curriculum and curriculum studies. But Braidotti (2019, 2) reminds us that these theorisings are work in progress, that the posthuman is a "working hypothesis about the kind of subjects that we are becoming."

Subjectivity has been central to education and by association curriculum work. The posthuman condition and cognate theorising invites a rethinking of subjectivity and curriculum work. Subjectivity, viewed not as the isolated human, but as embedded, embodied, extended, and enacted. And curriculum and curriculum studies viewed as becoming(s). In this article we wish to think with emerging new "theories" in the posthuman condition to reimagine curriculum and curriculum studies. However, we suggest that we may need to distinguish between curriculum studies in the posthuman condition and posthuman curriculum (~~studies~~)[5]. Kuhn (1996) reminds us that when paradigm shifts occur in science, old (or existing) paradigms do not disappear because the professors who work within those do not die, and they have acolytes. Likewise, when curriculum transformations occur in the field, old ways of thinking and doing curriculum do not disappear – the ghosts of Bobbit, Tyler, Schwab, Freire, etcetera, remain with us in the posthuman condition. In discussing the ghosts of curriculum studies in the next section of the article, we shall draw on the notion of hauntology, first introduced by Derrida (1994) in his book the *Specters of Marx*. By curriculum studies in the posthuman condition we refer to all curriculum work performed in an era of accelerated capitalism and climate change, including possibilities of performing posthuman curriculum work. By posthuman curriculum (~~studies~~) we refer to the latter only, that is, curriculum work that thinks with the range of "theories" (theorisings) of the posthuman, generating new ways of acting and doing curriculum. The rest of the article is divided into the following sections: curriculum studies in the posthuman condition; posthuman curriculum (~~studies~~); some parting thoughts.

CURRICULUM STUDIES IN THE POSTHUMAN CONDITION

As mentioned, we distinguish between curriculum studies in the posthuman condition and posthuman curriculum (~~studies~~). The former concerns all forms of curriculum studies evident in an era following the posthuman turn. The posthuman turn relates to the reconfiguration of the unit of reference of "human" and developments associated with this reconfiguration. The latter concerns posthuman theorising vis-à-vis curriculum studies. In this section of the article,

we shall focus on curriculum studies in the posthuman condition by tracing developments in/of the field, with particular emphasis to the spectres that haunt the field in the posthuman condition. For Derrida (1994) hauntology is a continuing conversation with the ghosts of the past, not to fix the past, but to create a different future. Bozalek et al. (2021, 1) point out that Derrida's "hauntology" is premised on an indeterminate relationship between "'then' and 'now', 'present' and 'absent', 'being' and 'non-being'". Put differently, past, present, and future are inseparable and should not be seen as a linear sequence – the past and future, percolates into the present. Ghosts do not only refer to the past but also to the future, nor do they have reference only to human beings, but also to ideas, paradigms, ideologies, epochs, moments, and so forth. By tracing ghosts of curriculum studies, we highlight the entanglement of past, present, and future, and by association the entanglement of different approaches to and understandings of curriculum studies in the posthuman condition, which itself is an entanglement.

Traditionally understood, curriculum studies is an interdisciplinary field of inquiry, in which curriculum is made the object of inquiry, and comprises approaches informed by a range of different philosophies. As noted, the competing[6] approaches of the field exist because old paradigms do not disappear when paradigm shifts occur. So, in the posthuman condition positivist, interpretivist, critical, pragmatic, poststructuralist and posthuman curriculum (~~studies~~) occurs. Although the field has undergone several transformations over time these have not always made their way into practices that occur in schools and higher education institutions. For example, despite its assumptions being challenged, variants of Tyler's rationale[7] remain with us such as constructive alignment and outcomes-based education (see Gough 2013; Le Grange 2014; Du Preez, Le Grange, and Simmonds 2022).

Hauntology is not new to the field of curriculum studies. For example, much of the contributions to Doll and Gough's (2002) edited collection, *Curriculum Visions*, pivot on the ghosts which haunt the field. In an early chapter to this volume Doll (2002) draws attention to how persons and moments "haunt" the contemporary curriculum, which often is overlooked. About the edited volume, Stables (2003, 544) writes: "... it brushes the dust off some of the skeletons that we did not know we had in our closets ...". Some of the ghosts that the book focuses on are those of Ramus, Tyler, Dewey, Enlightenment humanism and modernism. In presenting a different vision for curriculum, Doll (2002) argues that the "ghosts of control" need to be jettisoned. By "ghosts of control" he refers to the mechanistic and instrumentalist approaches to curriculum such as outcomes-based education, that has its roots in the ideas of curriculum espoused by Ramus in the 16th century and Bobbit, and Tyler in the 20th century. He proceeds to focus on the ghost of Dewey and reframes Dewey's vision of education[8] in terms of "*currere*, complexity, cosmology, conversation, and community" (Doll 2002, 42), to

emphasise connectedness and the emergent nature of educational outcomes rather than outcomes being predetermined. More recently, Baszile (2017) points to the need to confront the ghostly aspects of social life associated with race, gender, and violence in curriculum work. About ghosts she writes: "They are everywhere lingering, meddling, taunting, disrupting, and haunting the present moment" (Baszile 2017, 42).

In the posthuman condition Tyler's ghost lingers, meddles, and disrupts. Curriculum development and design vis-a-vis higher education in many parts of the world are performed in the Tylerian mould. In South Africa, specifically, all higher education programmes must follow an outcomes-based approach and module outcomes need to align with exit level outcomes. Outcomes also need to align with teaching-learning and assessment in what is called constructive alignment[9]. Irrespective of what the curriculum content is, it gets straight jacketed in curriculum development and design processes. Why is the lingering of Tyler's ghost concerning? Tyler's rationale was influenced by the social efficiency idea of Bobbit who was in turn influenced by the ideas of industrial engineer Franklin Winslow Taylor, who proposed that factories of the early industrial revolution in the USA should become more efficient (Gough 2013; Le Grange 2014). Efficiency is a key characteristic of the neoliberal university, in particular the technology of performativity, which Lyotard (1994) connotes the best input/output ratio. Moreover, the COVID-19 pandemic catapulted the pivot to online learning, holding the danger of fast technologies inducing fast (efficient) pedagogies (Du Preez and Le Grange 2020). Moreover, the transition to a fourth industrial revolution could narrow the relationship between higher education and the world of work. These shifts to greater efficiency could make Tyler's rationale appealing and mean that his ghost might continue to haunt the field. Pinar (2014) reminds us that much curriculum work produced internationally focuses on how curricula are shaped by national policies[10] and interests. Critiques of national curriculum policy/frameworks, and its monitoring mechanisms, might in an odd way result in Tyler's ghost continuing to linger, meddle and disrupt. Curriculum in the Tylerian mould is dehumanising, normalising, colonising[11] and homogenising because one way of becoming/being, becomes *the* way becoming/being. Curriculum in this mould has also been associated with the positivist paradigm given its pre-determinism, universalist idea(l)s and focus on measurement (for more detail see Reddy 2014).

In the wake of Joseph Schwab's (1969) declaration that the "curriculum is moribund"[12], we witnessed the development of a curriculum movement in North America that aimed to reconceptualise curriculum in order shift the focus from curriculum development to understanding and deliberation. The reconceptualists[13] argued that the curriculum should be humanised and rescued from the fetters of technical rationality and instrumentalism. The early

reconceptualists were among others Apple, Burton, Mann, MacDonald, Molnar (Pinar 1978) and of course Pinar himself. Evidently, the field in the 1970s was male dominated but women scholars were part of the movement such as Maxine Greene, Janet Millar, and Madeleine Grumet. Some of the early reconceptualists are alive in the present moment and others are no longer with us in the flesh but in our memories of listening to them and through their works that are still read.

Because space will not allow, we shall briefly refer to two broad categories of the reconceptualisation movement, those focusing on humanising the curriculum influenced by phenomenology, and proponents of critical pedagogy. In relation to the former, Pinar (1975, 2011)[14] redefined curriculum by invoking its Latin root word, *currere*, which means "to run". This marked a shift from viewing curriculum as a predetermined pathway (racetrack) to a focus on the human being, and the singularity of their journey because of unique significations from genes to gender, and so forth. Pinar's (1975) *currere* became an autobiographical method of the field used by many over the years, and still quite recently in South Africa (see for example Steyn 2020; Le Grange 2021). Aoki (1999) drew on Heideggerian phenomenology and argued that the lived experience of students and teachers need to be legitimated in what he termed the "curriculum-as-lived", and by so doing effacing the technical rationality and instrumentalism of curriculum in the Tylerian mould. Arguing for humanising the curriculum, exemplified in the many works of Pinar and Aoki, was/is progressive given the dominance of curriculum work which mimicked Tylerian "wisdom". Perhaps, even radical when first produced. However, the ghost of Enlightenment humanism is evident in this work and associated with the ghosts of Heidegger, Freud amongst others. A strong focus on the individual human being in these works means that the human continues to enjoy ontological privilege (Le Grange 2018b). Du Preez, Le Grange, and Simmonds (2022) attempt to rescue *currere*, curriculum-as-lived and complicated conversation from its humanist orientations by experimenting with these concepts through posthuman theorising. What is worth noting here, is that efforts to break away from Tyler, required an engagement with Tyler, demonstrating the entanglement of humanising discourses on curriculum with Tyler. If we are to make any link between humanising approaches to curriculum as a philosophical paradigm, then these approaches would be loosely aligned with an interpretivist paradigm – phenomenological rather than hermeneutical interpretivism.

Critical pedagogy is also a humanising discourse because it challenges social injustices based on class, race, gender, sexual orientation, etc. It engages in ideological critique (of dominant ideologies) and is openly ideological in that critical pedagogues take the side of those who are marginalised and debunk the idea of neutrality. The ghosts of critical pedagogy range

from Karl Marx, members of the Frankfurt School of Critical Theory and of Paulo Freire. Traces of Marx is evident in reproduction/correspondence theory first advanced by Bowles and Gintis (1976) that schools[15] serve to reproduce the class structure in society. The emancipatory ideals of critical pedagogy are spectres of the Frankfurt school of critical theory based on Enlightenment ideals also evident in Paulo Freire's (1972) notion of "conscientisation" and decolonial scholar wa' Thiong'o's (1981) "Decolonising of the mind". Paulo Freire's ghost lingers on in the field of curriculum studies internationally and in relation to South African higher education in several works including, Le Grange (2011a), Rule (2011), Roux and Becker (2016), and Sinwell (2022). Despite its radical nature to transform minds and society, critical pedagogy has received criticisms over the years:

- Deever (1996) argued that it has failed to transform education because of its refusal to engage in the politics of negotiation and translation and therefore remained ensconced in the academe.
- Bowers (1980) averred that critical pedagogy produces binary thinking in rendering socialism as good and capitalism as evil.
- Ellsworth (1989) pointed out the limits of critical pedagogy in classrooms.
- With specific reference to Freire (1972), Tuck and Yang (2012) point out that for him settler colonialism was either an unimportant analytic or a matter already dealt with, a reason why he does not mention it in his works.

Most significant, is the spectre of Enlightenment humanism evident in critical pedagogy given its strong anthropocentric leanings by making the liberation of the human mind central.

There is no space for much elaboration suffice to mention that the spectres of French philosophers such as Foucault, Derrida, Deleuze, Lyotard, etc. are evident in poststructuralist curriculum work, including work done by South African scholars (Du Preez 2008; Le Grange 2011b; Le Grange 2020; Verhoef and Du Preez 2020). The anti-humanism of much poststructuralist work has served to reinforce humanism and the overreach of linguistic poststructuralism has given rise to a privileging of the discursive, not enabling us to respond to the challenge presented by the posthuman predicament. Curriculum studies in the posthuman condition is an entanglement of approaches/understandings of curriculum and figures of the past that seep into the present and haunt the field.

So far, we have traced some of the complex multiplicities that haunt the field of curriculum studies in the posthuman condition. Tracing the hauntology of hegemonic curriculum theories offers a peripheral vision of the past and future. Past and future, as "participants in matter's

iterative becoming" (Barad 2007, 181), opens the possibility to firmly ground oneself in the present to reap from its endless, indeterminate potentiality to create a/new. Next, we shall discuss posthuman curriculum (~~studies~~). The reader would have noticed that we strike through (~~studies~~) after curriculum to downplay the discursive privilege that has given birth to the multiplicities of sedimented theories that mark the field. By striking it through and not omitting it altogether, we acknowledge the eerie traces that carry on haunting the field and which should not escape our peripheral vision/s.

POSTHUMAN CURRICULUM (~~STUDIES~~)

Curriculum is a vital concept which has been widely debated with no single meaning or set of meanings ascribed to it (see for example a detailed discussion of this in Du Preez and Simmonds 2014). Le Grange (2018c, 7) states that "[v]ital concepts are contested, have different meanings in different discourses, and do not have fixity (they are in-becoming)". The indeterminacy of the concept curriculum serves the field well as it allows a space where it could continually be re/invoked and re/configured to attend to ever-changing, complex entanglements. Concepts are dynamic, material re/configurations of the world and are always impartial "[...] there is no endpoint, no totality, no determination or cut that is once and for all. Concepts are material-discursive and cut together-apart" (Barad and Gandorfer 2021, 30). Concepts neither describe or capture the world, nor are they merely ideas (of the mind) detached from the world (Barad and Gandorfer 2021). They are "*specific material doings or enactments of the world*, concepts are *of* the world" (Barad and Gandorfer 2021, 26). As such one could say that curriculum as a vital concept "is an ontological performance of the world in its ongoing articulation" (or at least one manifestation thereof) and has its own (posthuman) intelligibility in which "knowing is a matter of differential responsiveness [...] to what matters". This ontological performance and knowing are deeply entangled and attentive to ethics and do not depend on intellection of a human agent in a traditional humanist sense of intelligibility.

Curriculum intelligibility: Becoming, intra-acting, experimenting

Curriculum intelligibility manifests through intra-actions, processes of becoming and experimenting. Set against sedentary states of *being* that mark curriculum studies in the posthuman condition; becoming, intra-acting and experimenting posthuman curriculum are *acts*, *doings* in and of this world. Du Preez, Le Grange, and Simmonds (2022, 12) argue that in posthumanist terms "the curriculum-as-lived is intelligent, self-organising, experimental, improvisational, and continually becoming. Becoming does not only imply coming into existence [*being*] – it also means becoming many and different in ways that do not establish a

norm for all."

Becoming is not only indeterminate; all intra-actions are indeterminate (for a full discussion on indeterminacy and curriculum, see Bozalek 2022). This means that there is no predetermined set of principles or rules that determine becoming or that governs intra-actions. Intra-actions are indeterminate because relata-within-phenomena emerge through specific intra-actions, which is contra to inter-action that is based on the a priori existence of determinately bounded and propertied entities which encounter one another (Barad 2007). But what does this imply for higher education curriculum (work)? It implies that outcomes as predetermined principles (outcomes-based education) to attain sets of knowledge, skills and values, should be reconsidered. The emphasis should shift from outcomes (which is akin to traditional notions of causality) to relata-within-phenomena, which emerge through (curriculum) intra-actions. It also means that we should not create abstract sets of values and ethics such as broad human rights values to govern curriculum activities, ethics is radically open, immanent and should emerge through intra-actions (Verhoef and Du Preez 2020).

Curriculum intra-actions benefit greatly from different forms of experimentation; or posthuman curriculum (~~studies~~) acts and doings. Le Grange (2016, 34) emphasised the "[...] need to create new concepts that open opportunities for experimentation. It is in experimentation with the real that we expand our powers to enhance life in a context where we are presented with challenges of a post-human condition". One form of curriculum experimentation that he proposes and develops is *improvisation* (see Le Grange 2016; Du Preez, Le Grange, and Simmonds 2022). Curriculum improvisation is akin to improvisational jazz where every musician (teachers and students) are composers, albeit with differing levels of experience and knowledge to contribute to educational intra-actions (Le Grange 2016, 33). Curriculum improvisation, unlike co-designing of curriculum, which is inherently predeterministic and often outcomes driven, calls for a radical re/configuration of curriculum that is not constructed alongside outdated, predetermined outcomes-based approaches. In co-designing of curriculum both teachers and students remain separate entities, whereas in improvisational forms of curriculum work teachers, students and matter become imperceptible. Amongst the many forms of experimentation that Barad generates, they also suggest *"theorizing* as a mode of experimentation that occurs through intra-actions. They explain "[t]he world theorises as well as experiments with itself"; "[t]heorizing is a particular form of intra-acting and as such part of the world" (Barad and Gandorfer 2021, 15); and "[t]heorizing in its radical openness provides not only possibilities for thinking otherwise, but for thinking thinking otherwise" (Barad and Gandorfer 2021, 17). In this understanding of curriculum theorising, hegemonic theories that have haunted curriculum studies are not the focus, but the development

(theorising) of new concepts so that (higher education) curriculum can become radically open spaces of thinking otherwise. *Diffraction* is yet another concept, developed by Barad, that is useful to think with in higher education curriculum spaces. Murris and Bozalek (2019), Hepler et al. (2019), Du Preez and Simmonds (2021), and Du Preez and Du Toit (2022), amongst many scholars have experimented with diffraction and diffractive readings in relation to curriculum in higher education. We shall therefore not elaborate on this well-rehearsed notion here, apart from mentioning that a diffractive reading requires an inquirer to be attuned to or to act sense-ably with texts and/or artefacts that are aways already entangled intra-actions. Texts and/or artefacts emerge when the world is understood from within, "as a critical practice of engagement" and "thinking insights from scientific and social theories through one another" (Barad 2007, 90, 92).

As we have seen from the previous paragraph, improvising, theorising and diffracting have received attention in the body of scholarship. More of these forms of experimenting are becoming in posthuman scholarship that are useful to explore as ways of acting and doing posthuman curriculum (s̶t̶u̶d̶i̶e̶s̶). The curriculum concepts discussed below derive mostly from our intra-actions with selected readings of Karen Barad's work. We collectively call these concepts: forms of curriculum experimentation; or posthuman curriculum (s̶t̶u̶d̶i̶e̶s̶) acts and doings. We focus on the ones that may not have received much attention in literature, namely, quantum tunnelling, tracing, and desiring. We also briefly point to queering, writing, and imagining (wandering/wondering) as acts and doings to pursue further elsewhere. Braidotti and Hlavajova (2018, 1) point out that "new notions and terms are needed to address the constituencies and configurations of the present and to map future directions." What we shall discuss is by no means an exhaustive list of posthuman curriculum (s̶t̶u̶d̶i̶e̶s̶) acts and doings – many more are in becoming – and each seeks further fine-tuning and experimentation in and through curriculum intra-actions. As Braidotti and Hlavajova (2018) remind us: the creation of new concepts is not just a matter of inventing new words, but essentially requires experimentation. Curriculum experimentation as acts and doings are not methods and should not be reduced to a set of rules or transferable procedures to be applied in classroom contexts as this is predeterministic and instrumentalist. It might be useful to think of forms of experimentation as an attunement to, a sense-ability, which develops and could be cultivated in classroom intra-actions. We are therefore careful not to give concrete examples of each act or doing so that it is not reduced to a "how to" guide, keeping it open for interpretation, appropriation, and continuous experimentation. Where we provide examples, they serve the purpose of explication. We now turn to discussion of posthuman curriculum (s̶t̶u̶d̶i̶e̶s̶) acts and doings as forms of curriculum experimentation.

Posthuman curriculum acts and doing

Quantum tunnelling is a concept that could be invoked as an act or doing of posthuman curriculum (~~studies~~). Quantum tunnelling is a physical phenomenon (an *act*) of non-forceful, non-violent penetration of an object (such as an electron or atom) that passes through a potential energy barrier, even though the object (in a classical, Newtonian mechanical terms) does not have sufficient energy to enter or surmount the barrier. Barad explains that quantum tunnelling is "[...] a matter of breaking out of confinement not by making a hole in a barrier but rather by simply winding up on the other side" (Barad and Gandorfer 2021, 57). For them, quantum tunnelling provides an escape from confinement without violence; "*breaking out or breaking through without breaking into bits, without obliterating*" (Barad and Gandorfer 2021, 57 *[itals. in original]*). Quantum tunnelling, when understood as a metaphor, can be seen as a methodological approach (a *doing*) of posthuman curriculum (~~studies~~), or a form of curriculum experimentation. This "doing" requires that complicated curriculum conversations become intra-active spaces where "breaking out" and "breaking through" norms and predetermined sets of ideas about being and knowing, is possible. These conversations are different to ones that involve debate whereby the best argument wins. This is a critical practice of engagement as well as a way of decentering hegemonic knowledge systems (Le Grange 2007). To further illustrate this, one might use the ongoing decolonisation of the curriculum debate as a point of entry. Quantum tunnelling as a doing of posthuman curriculum (~~studies~~) is a breaking through and out of mental and physical colonising, dehumanising, normalising, and homogenising ways of knowing and being. It is about the penetration of sedimented walls of established western thought constructs in a non-violent (albeit not uncreative and resistance free) space/time/matter, so that different ways of thinking, doing and becoming can be unearthed and aerated. Quantum tunnelling thus is an act and doing of decentering and destabilising hegemonic, canonical (western) ways of knowing, doing, and becoming, through and within multiple higher education curriculum intra-actions. Quantum tunneling is not tantamount to decolonisation but could become a decolonial process.

Tracing is a type of agential realist analysis that enables the opening of some of the traces that manifest in an entanglement (Barad and Gandorfer 2021). Entanglements are deeply intertwined, related and contingent phenomena. The aim is not to trace the endless lines between phenomena, but to trace "from and with the middle" of entanglements (Barad and Gandorfer 2021). For Barad and Gandorfer (2021), tracing is never complete because of the complex nature of entanglements as spacetimematter re/configurings. It is not merely discursive engagements but has material expressions and affects. To make it more concrete, let us for a

moment trace one of the entanglements that gave rise to an economic phenomenon, a falling rand[16] in South Africa in the week of 08 May 2023. This act of tracing might well have been a curriculum act or experiment in a university economics classroom. This economic phenomenon, the result of a diplomatic difference between South Africa and the United States of America after the Washington ambassador to South Africa alleged that there was a shipment of armaments on the Lady R ship that was docked in Simon's Town in South Africa in December 2022, and which was bound for Russia to feed its ongoing war against Ukraine. The affects/effects of this diplomatic difference on the economy of South Africa are real in its material manifestation, i.e., its matterrealisation when the South African Rand weakened overnight due to these allegations. A weakened rand has material effects in that unemployment increases and the inflation rate increases, resulting in an increase in the prices of goods and services. The upshot is that poor people are hardest hit, and inequalities are exacerbated. It points to a complex intra-action/s between findings from a US intelligence report, a longstanding geo-political coalition between South Africa and Russia as part of the BRICS nations (Brazil, Russia, India, China, South Africa), and a history of support between these countries dating back more than 30 years ago in the Soviet/Apartheid times when Russia gave support – among other in the form of armaments – to the African National Congress in their fight for freedom in apartheid South Africa. Herewith, arms trade and support are never neutral. Weapons are never neutral and their (monetary) justifications are never innocent as they only lead to gross injustice/s. Weapons are thus highly political, onto-epistemologically charged, and carry enormous ethical weight. From this brief tracing example, one witnesses the possibilities of opening endless lines and complex phenomena (economically, historically, politically, socially, ethically, epistemologically, ontologically, etc.) that intra-act in particular ways to re/configure entanglements of different sorts that affect social justice.

Desiring is another posthuman curriculum (~~studies~~) act and doing; a felt sense of yearning for expression given the limits of language and the reality of inexpressibility (Barad and Gandorfer 2021). Poetics is a manifestation of uncontained, free yearning for expression; it is desiring. Poetics concerns expression through virtual experimentation, according to Barad and Gandorfer (2021), and is a mode of sense-making that exceeds language. Desiring as posthuman curriculum (~~studies~~) act and doing, opens countless channels of/for expression in the ongoing process of unlocking the potential of the present; the thick now. Curriculum intra-actions that awaken the senses through poetics (or the arts and aesthetics in general), attends to the desire and yearning to express in new and different ways through free intra-play and uncontained experimentation. In the classroom all matter that serve as external directing forces, be they teacher/lecturer, classroom architecture, learning materials, books, etc., will colonise desire.

These forms of matter might serve as inspiration and stimulus for becoming but they are never the substance of curriculum. This should be recognised in classroom settings so that students' desires may be expressed through intra-acting with such forms of matter as sources of inspiration for becoming rather than forces that thwart becoming.

In summary, we have identified improvisation, theorising and diffraction as posthuman curriculum acts and doings, or forms of curriculum experimentation. We have added to this and elaborated on quantum tunnelling, tracing, and desiring as further forms of experimentation. Other forms which we consider worthwhile to examine in posthuman curriculum (~~studies~~) are queering, imagining, and wondering. First, queering, is not a state of "being" as has been invoked in gender and identity theories, but a doing; "[a] collection of methodologies to unpick binaries and reread gaps, silences and in-between spaces" (Giffney and Hird 2008, 5). Queering as posthuman critique could be thought of as a form of curriculum experimentation that emphasises an urgency to queer and cultivate posthuman sensibilities such as openness to a variety of ways of knowing and becoming, as well as cultivating genuine respect for difference. Second, "[i]magination", Barad (Barad and Gandorfer 2021, 32) argues, "is a material wandering/wondering that is of the world, neither an individual subjective experience nor a unique capacity of the human mind". Curriculum imagination too, when understood as a form of posthuman curriculum experimentation, holds endless possibilities to re/configure curriculum intra-actions in higher education. Third, following Jasmine Ulmer's article *Writing Slow Ontology* (2017), we argue that writing is yet another form of posthuman curriculum experimentation that is worth pursuing in higher education exactly because of the technology of performativity that is attached to writing and how that has decimated good writing and thinking acts and doings. Ulmer (2017) avers that slow writing does not involve unproductive writing but is about being differently productive through writing in places where writing involves intra-actions with the real (such as outdoors of all kinds) rather than the confines of the office or classroom.

In the introduction to *Arts of Living on a Damaged Planet: Ghosts of the Anthropocene*, Gan et al. (2017, G11) suggest that "to survive, we need to relearn multiple forms of curiosity. Curiosity is an attunement to multispecies entanglement, complexity, and the shimmer all around us". The ways of acting and doing posthuman curriculum, as discussed hitherto, could be seen as possible ways of re/learning multiple forms of curiosity through experimentation to become more attentive to the way curriculum landscapes shimmer[17] in the posthuman condition. The forms of curriculum experimentation suggested in this article are thus not methods to be adhered to, or predetermined ways of attaining outcomes. They are forms of curiosity that we can re/learn in curriculum intra-actions to break out of, and break through,

confined (technocratic, instrumentalist, colonising, normalising, homogenising) and outdated curriculum studies theories that continues to haunt the field.

PARTING THOUGHTS

We live in troubled times, a present that is entangled with past and future, a web of connections that threatens life (both human and more-than-human forms of life), but also holds the potential of giving life and bringing newness to the world. Haraway (2016) encourages us to stay with the trouble, and to make kin rather than babies – to invigorate productive lines of connection with both human and non-human refugees. As we were reminded in this article, some connections with the past (such as those that have shaped dominant discourses in curriculum studies) can be threatening to life – the potential for newness – because it colonises desire, through vicious assaults of normalisation and homogenisation.

In this article, we traced some of the ghosts that haunt the field of curriculum studies, which sever lines of connection among humans, and among humans and non-humans by predetermining the pathways for becoming of pedagogical lives. We also discuss the ghosts who/that invigorated lines of connections among humans but did not (do not) extend it far enough to embrace all of life and its connectedness. We explored the entanglement of past, present, and future vis-a-vis curriculum studies in the posthuman condition and how we have been unable to remove the shackles of technocratic rationality and instrumentalism, despite efforts to humanise curriculum by those referred to as reconceptualists. However, by staying with the trouble, we may recognise the potential that the present offers for newness in the world through invigorating productive, life giving lines of connection. Posthuman curriculum (~~studies~~) may open such possibilities.

Some of the posthuman curriculum (~~studies~~) acts and doings that could proliferate possibilities for newness and life-giving lines of connection that were discussed in this article, included: improvisation, theorisation, diffraction, quantum tunnelling, tracing, desiring, queering, imagining (wondering/wandering), and writing. More could be added as we continue to experiment through staying with the trouble – through intra-acting with the deeply entangled, threatening and the life-giving potential of our times.

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NOTES

1. We place "theories" in scare quotation marks, because along with Barad (2007) we prefer to invoke the verb form, theorising.

2. Thick now relates to the present time and space we inhabit (and that inhabits us) of multiple connections, entanglements of past, present, and future that are threatening, but at the same time hosts seeds of life/newness. See Haraway (2016) for a more detailed discussion on the "thick present".

3. We acknowledge that contemporary theorising builds on what comes before.

4. "Us" refers to an expanded notion of human, not circumscribed to *homo sapiens*.

5. Our act of erasure writing by striking through (studies) after curriculum is performed to downplay the discursive privilege that has given birth to the multiplicities of sedimented theories that mark the field. By striking it through and not omitting it altogether, we acknowledge the eerie traces that carry on haunting the field.

6. Competing might be an oversimplification because new thinking/paradigms also build on what comes before and in the posthuman condition intra-act.

7. Tyler (1949, 1) averred that the curriculum development process comprises the following four elements: the educational aims an institution wishes to attain; the educational engagements planned to achieve the aims; the effective organisation of educational experiences to achieve the aims; and how the aims are achieved.

8. Dewey's vision of education was that schooling, curriculum and community should be integrated and viewed as a continuous whole (Doll 2002).

9. For a detailed discussion on constructive alignment and its Tylerian roots, see Biggs (2014).

10. Although national curriculum frameworks may have elements that are idiosyncratic, policy borrowing does take place as we have seen with outcomes-based education that migrated to South Africa from the USA via Australia and New Zealand.

11. This relates to colonising of desire (in Deleuzo-Guattarian sense) (see Wallin 2010).

12. Schwab (1969) argued that the field had become too theoretical and had little practical effect.

13. Pinar (1978) states that reconceptualists are best distinguished by what they are not. They are not traditionalists (scholars who perform their work in the Tylerian mould) and not conceptual-empiricists (curriculum scholars who behave like mainstream social scientists by stating hypotheses, collecting data and measuring).

14. Pinar (1975) found inspiration from existentialism, psychoanalysis, and phenomenology.

15. We would add higher education too.

16. We acknowledge that there is never a single factor that causes a decline in the value of the rand.

17. Shimmering curriculum landscapes describes the coming in and out of focus of pedagogical, multispecies intra-actions (for a discussion on "shimmering", refer to Gan et al. 2017).

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