Connectivism, Chaos and Chaoids:

How Practitioners Might Find Inspiration from Chaos to Find New Spaces for Teaching and Learning

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Abstract
The rapid development of Web 2.0 technologies has created excitement and opportunity alongside fear and confusion. It seems no part of society, culture, economy and human life generally has been untouched as a new sense of chaos emerges. Across all sectors change has been experienced with a mixture of terror and exhilaration as disruption offers opportunity while often creating more oppressive structures than before. Alongside technological development has been the proliferation of a neoliberal takeover of the ways we live, work and educate; A social condition that Mark Fisher (2010) calls capitalist realism. The impact of this growing sense of chaos on education seems significant if uncertain, generating transformative rhetoric if often ambiguous around what has been transformed. This paper looks at adult education as a space being fought over by increasingly corporate institutions and sees one thread of resistance, connectivism – a 'new learning theory for the digital age' - introducing chaos theory as a means of resistance. The paper goes on to argue that connectivism offers practical reflections without clear purpose. We need the philosophical purpose of Deleuze and Guattari's approach to chaoids and chaos to go from identifying patterns to creating new forms of creating order. The paper includes a discussion on where we are now; what the significance of these two approaches to chaos are; provides exemplars of chaoids that respond to the challenge and provide alternative models of education.

1. Introduction

The purpose of this paper is to develop a link between Siemens (2005) and Downes (2012) work on connectivism and ideas around chaoids proposed by Deleuze and Guattari (1994). A

common ground exists in relation to chaos, connectivism's links to chaos theory, and the establishing of new ways of thinking about education. By better understanding how chaos theory opens up what is possible, educators find encouragement to seek alternatives to traditional institutional practice.

Connectivism emerged as a theoretical response to the technology-rich information age and contends that knowledge creation is intrinsically bound in a complex web of machines, people and the networks that connect them. Siemens (2005) and Downes (2007) propose that connectivism was a necessary response to a learning ecology fundamentally altered through the influences of networked, web-based technologies. Introduced as a *learning theory for the digital age* (Siemens, 2005), connectivism has been criticised about the extent to which it constitutes a learning theory at all (Verhagen, 2006). One of the key outputs has been Massive Open Online Courses (MOOCs) that began as manifestations of connectivist thinking and led to 2012 being named 'The Year of the MOOC' by the New York Times (Pappano, 2012). Connectivism was positioned as a third generation of learning theory (Anderson & Dron, 2011) and while challenging the extent to which it provided a feasible learning theory, Bell (2011) saw for some it was, '*an influential phenomenon that inspires teachers and learners to make changes in their practice'* (Bell, 2011) while simultaneously attracting criticism for a perceive lack of theoretical rigour.

What is often left undeveloped and is the primary focus here is connectivism's interest in chaos theory. Siemens described how, *'Chaos…recognizes the connection of everything to everything…the ability to recognize and adjust to pattern shifts is a key learning task.'* (Siemens, 2005, p. 3). This paper argues that connectivism engenders a new approach to learning theory that can be radical and liberating by seeing in chaos theory a meaningful, powerful basis for learning design. A rethinking of who is involved in education, where it takes place and what constitutes knowledge requires a space to create alternative educational approaches. A first hurdle is overcoming prevailing concepts and authoritative voices shaping what next steps should be.

Connectivism occurs alongside technology-enhanced learning discourse largely rooted in tradition, convention and the maintenance of existing hierarchies and institutional models. Laurillard (2007, p. xv) describes a '*transitional phase between [an] ICT free past and an ICT aware future*.' Many thinkers considered networks and Web 2.0 technologies as heralding

significant changes in learning (Prensky, 2001; Laurillard, 2007, 2012; Beetham & Sharpe, 2007). Much of this work is developed around enhancing the ways existing professional educators, and institutions of learning, might enhance what they do. Technology in such models relate back to traditional learning theories and question the *how* of education, but not the *why*, *what* and *who*. In many practical instances, the *ICT aware future* that Laurillard discusses is nothing more developed than using technological approximations of 'old', pre-existing and traditional methods of teaching that may be '*good…but nowhere near being transformati*onal' (Laurillard, 2007, p. xvi).

Siemens (2005, p. 4) suggests chaos holds a *'cryptic form of order'* that lies in wait of discovery. It is a view of chaos based on discovery that is contrasted here with Deleuze and Guattari's consideration that chaos is a site for creation. In their work around chaoids (1994, p. 208). Deleuze & Guattari, propose chaos as a space of creation that makes possible the thinking of new concepts. Deleuzo-Guattarian thinking help provide a reflective depth that supports the practical aspects of connectivism. This depth allows consideration of not only the networked potential of humans and machines at an operational level, but to also respond to the complex issues raised by a technology infrastructure immersed in political, ideological and cultural inequalities. This helps locate technology enhanced learning in a vast matrix of capacities…almost beyond human imagining' (Crawford & Joli, 2018, p. ii)built on interconnectedness involving "a vast planetary network' (Crawford & Joli, 2018, p. ii) of labour, and the mining of resources and data. Chaos, and our responses to it, ask for more than competence and professional standards and instead necessitate creativity and a consciousness based on the impact our choices generate. Educators must balance the ways they might use technology for positive revisions and social equality while also being conscious of the impact our efforts have on these wider planetary networks.

Connectivism and Deleuze and Guattari have proven influential concepts in recent years and through exploring the links with chaos it is possible to find the ways educators might unsettle and invert conventional wisdom. Such conventions include unmasking the hidden structures of technology networks and creating educational opportunity that is both valuable in its immediate context, and reflective of its wider global effects. By insisting we think differently, finding potential to transgress dominant hierarchical and elitist educational models, the aim is to engage with theoretical spaces that are not necessarily fully formed.

The consideration is whether the incompleteness of connectivism generates a space of creative possibility that might continue to inspire educators who are open to fluid, imperfect and nebulous stages of development. The paper is an exploration of chaos, its applications and the way we might use some of these ideas to support new thinking and alternative places to learn and teach.

2. Enhancing the Familiar

This section provides examples of the wider technology enhanced learning discourse and the emphasis on enhancing existing institutions, rather than disrupting them. It is important to recognise that Siemens and the connectivists are not alone in highlighting alternative concepts around where learning occurs.

A growing body of work recognises the potential for redrawing the borders of where education emerges (Edwards, Gallacher & Whittaker, 2007; Facer, 2011; Holland, 2011; Hall & Smyth, 2016). Despite this, a residual *institutional epistemology* (Schön, 1995) resists challenges to centripetal ownership and dominance. Webb (2018, pp. 96-97) characterises a 'corporate-imperial university' firmly entrenched in a 'network of state apparatuses of control, discipline, surveillance, carcerality and violence.' The concern of the university from this perspective is not one of neutral exploration of networked spaces but a more sinister seeking of continued control over learning alongside ownership of knowledge creation (Webb, 2018). The significance is that while transformation might appear in both connectivist thinking and the language of the institution, the underlying ideals are radically different.

Laurillard (2012) illustrates the view that technology provides new tools, often unruly and unsettling, and that professional educators must take control if these are to offer meaningful benefit. Laurillard (2012, p. 226) echoes Siemens (2005) earlier contention that the challenges of the information age mean learning 'cannot be met by our current educational systems.' What is required, Laurillard (2012, p. 226) argues, is to establish teaching as a *design science* rather than an art to reinforce the links between education and government agendas. Through teaching as design-science, Laurillard presents a platform for professionalization in teaching and a renewal of the three roles (teacher, student, knowledge) that accommodate technology along institutional lines but that resist any shift to new spaces. Rather than as passive adaptors, Laurillard (2012, p. 2) argues that educators must, 'now begin to drive its

use of technology.' It is a call for greater technology, increased use of technology, but with power, hierarchy and control remaining in the same hands as before. Laurillard dismisses 'opportunists' that find in networked technologies the opportunity to alter where learning might occur. Instead of welcoming new participants, fresh perspectives and transformative approaches to learning for contemporary society, Laurillard (2012, p. 4) proposes a defensive academy premised on a response in which, 'the educationalist has to attack this kind of nonsense.'

Other emergent, contemporary learning theories, such as Engestrom's (2001, p. 58) expansive learning theory that recognises the rapidity of change means often knowledge is 'learned as it is being created. There is no competent teacher.' The development of social constructivist principles recognises a fluidity in who teachers might be, yet remains clear that the educational institutions will be the place in which this change takes place.

Springer (2016, p. 5) considers anarchic pedagogies as ones that might foster, 'the possibility of building a new world in the shell of the old' that reflect beliefs in pedagogy as the route away from oppressive social control. Parchoma (2011) and Kanuka (2008) suggests that educators need to revisit their *philosophies in practice* to develop renewed awareness of a learning ecology transformed by technology networks. The focus of such philosophies focus on an institutional professionalism rather than spaces beyond the institution. Both Siemens (2005) and Downes (2007) consider connectivism provides alternate ways of viewing how we learn even if these alternatives are not explicitly anti-institutional. There is a commonality here with both connectivism and advocates of teaching-as-profession viewing technology as the basis of a radical rethinking of education.

Much of the discourse from institutions appears rooted in defence of existing power and authority. It is a position reflective of what Braidotti (2006, p. 2) describes as a "magician's trick" as new technologies help promote globalisation that results in:

> …a totally schizophrenic double pull…the potentially innovative, de-territorialising impact of new technologies…hampered and tuned down by the reassertion of the gravitational pull of old and established values.

Understanding that this double-pull exists is a necessary step in recognising that, while the language of transformation is commonplace and widespread, it is a term that reflects widely different realities. Connectivism is a significant part of the discourse, but from a perspective not already committed to the continuation of existing institutional models. The importance of the network also insists on greater recognition of the planetary matrix (Crawford & Joli, 2018) itself being shaped by residual power structures that shape future spaces in the unequal image of the past or the present.

2.1 Connectivism

The foundations of connectivism begin with Siemens' 2005 paper, *Connectivism: A learning theory for the digital age.* Connectivism responds to altered states of learning '*impacted… by technology*' (Siemens, 2005, p. 1) and proposes that traditional theories of learning are incapable of responding to learning in a digital age. Siemens (2005, p. 3) argues that 'the underlying conditions have altered so significantly, an entirely new approach is needed'. It is a position familiar to those ideas around networks emerging within institutional practice, but Siemens (cited in Feldstein, 2014, p. 7) proposed that connectivist MOOCs:

> …were not designed to serve the missions of the elite colleges and universities. They were designed to undermine them and make those missions obsolete.

In such explicit claims, connectivism presents a process for disruption but one dislocated from any clear ideological purpose *for* disruption. For Siemens, the failures of the institutions are based in a failure to recognise the impact of networks that bypass the familiar roles and practices of the institutions. At the core of this argument is that widespread technology use has dramatically increased the 'half-life of knowledge' (Siemens, 2005, p. 1), that is, the time span from when 'knowledge is gained to when it becomes obsolete.' Siemens questions the dominance of traditional models of learning, of objectivism, pragmatism and interpretivism as the theoretical basis for how learning is designed. In the learning models of behaviourism, cognitivism and constructivism, the foci of learning remain embodied in the individual. As the half-life of knowledge diminishes, as organisations expand and leaning occurs through machines and networks, this focus on embodying learning within individual learners becomes diminished. Rather than memorising facts and specific data, Siemens (2005, p. 3) argues that learning must respond to pattern recognition around where learning occurs. A deluge of information means it is impossible for any individual to hold the information they need

meaning new learning skills must recognise the value of connections and the immediacy of technologically mediated knowledge.

Connectivism shifts from models of learning that prioritise the individual as the ultimate receptacle of learning. Instead, the contention is that connections and networks are most significant and that, 'our ability to learn what we need for tomorrow is more important than what we know today' (Siemens, 2005, p. 6). Siemens (2005, p. 5) presents eight principles of connectivism:

i. *Learning & knowledge rests in diversity of opinions*
ii. *Learning is a process of connecting specialised nodes or information sources*
iii. *Learning may reside in non-human appliances*
iv. *Capacity to know more is more critical than what is currently known*
v. *Nurturing and maintaining connections is needed to facilitate continual learning*
vi. *Ability to see connections between fields, ideas and concepts is a core skill*
vii. *Currency (accurate, up to date knowledge) is the intent of all connectivist learning activities*
viii. *Decision making itself is a learning process.*

The epistemological basis of connectivism across these principles contradicts knowledge prioritised in in the institutional-as-centre theories. Siemens (2005) and Downes (2007) argue for 'distributed learning' as a form of knowledge and learning. Connectivist knowledge includes clear distinctions between *public knowledge*, 'embodied as a canon and passed on to successive generations' *(*Downes, 2007, p. 14*), social knowledge*, knowledge not held in any single individual, or node, *'…*rather a property of the society working as a whole*'* (Downes, 2007, p. 8) and *private/personal knowledge* that resides within the individual and unknowable outside that individual, until it becomes shared knowledge, or in other cases, public knowledge.

What characterises *connectivist knowledge* is that it '…requires an interaction. More to the point connective knowledge is knowledge of the interaction' (Downes, 2007, p. 1). The interaction between individuals, societies, organisations and the technology that links them, become the focus for distributed learning. What creates knowledge, or what creates the

existence of concepts that can be 'known', relies on the multiple places across connections and not in any single place (Downes, 2007, p. 7).

Where connectivism has been most visible is in Massive Open Online Courses (MOOCs) that initially challenged the location of learning. MOOCs began with the creation of connectivist MOOCs (cMOOCs) that introduced the concept of online, large cohort networks, without identifiable teachers, subject focus nor institutional affiliation. Connectivist MOOCs were themselves marginalised as the xMOOC, those MOOCs owned and operated by universities as branding exercises, began to dominate.

Daniel (2012, p.2) argues that beyond a shared acronym, xMOOCs and cMOOCs are, '…so distinct in pedagogy that it is confusing to designate them by the same term.' Fidalgo-Blanco (2016, p. 2) defines the separation as xMOOCs being 'instructivist and individualist' while cMOOCs require 'social learning, cooperation and the use of Web 2.0'.

Table 1 defines some of the key differences between the two MOOCs that also serve to distinguish the ways that connectivism offers a direct challenge to institutional thinking.

cMOOC (or Connectivist MOOC)	**xMOOC**
• '*connectivist, social learning approach that focuses on communication amongst participants online'* (Bayne & Ross, 2014. p.4) • *'driven by principles of pedagogic innovation within a richly networked, disaggregated mode of social learning' (Bayne & Ross, 2014,* p.21) • *'based on a philosophy of connectivism and networking'* (Daniel, 2012. p.2) • '*cMOOCs…originally* • *designed to challenge traditional approaches to teaching and learning by experimenting with*	• *'Focus more on content transmission and knowledge acquisition through repetition and testing'* (Bayne & Ross, 2014. p.4) • *'institutionally-focused 'xMOOC', characterised by pedagogy short on social contact …overly reliant on video-lecture content and automated assessment' (*Bayne & Ross, 2014. p.21) • '*developed by elite US institutions …follow a more behaviourist approach'* (Daniel, 2012. p.2) • *'xMOOCs …have taken a traditional pedagogical approach to teaching*

• *new pedagogical approach'* (Mackness & Bell, 2015. p.25)	• *and learning'* (Mackness & Bell, 2015. p.25)

Table 1: *Distinction between cMOOCs and xMOOCs* (Shukie, 2018, p. 84)

Rather than distributed knowledge, the xMOOC centralised expertise through star lecturers and prioritised student numbers as a key measure. Distribution of this kind was more that of a mass market, based on consumption of institutional products and dissemination of *public knowledge*, than spaces for exchange and knowledge creation. Selwyn (2015, p. 191) described MOOCs as 'a conduit for long running struggles over the nature and form of Higher Education' with the potential for distributed knowledge at the heart of this struggle.

Anderson & Dron (2011, p. 80) present connectivism as the third generation of distance learning, following cognitive-behaviourism and social-constructivism with each theory representing the 'worldview of the era in which they developed.' While approximating a form of transformation, Anderson & Dron (2011, p. 92) argue that "new" learning theories remain largely underpinned by older, traditional and conventional models. While chaos theory might describe the potential of the networks the forms of knowledge being connected remain dominated by conventional means of construction. Distributed knowledge opens possibilities for multiple spaces to create what is learned and where this comes from, yet in connectivism appears as a form of de-politicised popular education. The underpinning rationale for connectivism that Siemens (2005) provides is not explicit in establishing a shift in power even while this appears fundamental. There is no corresponding critique of neoliberal education, privatisation or financialisation found elsewhere (Berardi, 2015; Springer, 2016; Webb, 2018). The argument here is that where the potential for such recognition comes, and where new models of education might emerge, is through recognising the importance of connectivism's relationship with chaos theory.

2.2 Chaos Theory

The significance of chaos theory is presented in Siemens' (2005) first description of connectivism and in Downe's (2007; 2012) later work on connectivist knowledge. They argue that chaos theory provides opportunities to shift away from traditional approaches to

education and while Siemens (2005) also considers complexity theory and self-organisation theory, it is the stronger influence of chaos theory that is of most interest here.

Chaos theory initially developed in relation to meteorology in the early 1960s (Lorenz, 1995) and highlighted the significance that tiny changes had on long term weather patterns. The consequences of events are to a large extent unpredictable, leading to the proliferation of the concept of 'butterfly effect' that stems from Lorenz's work. According to this, a butterfly flapping its wings in one continent can create tumultuous weather conditions in another, the impact of the initial conditions having far-reaching and largely unpredictable consequences. Primarily rooted in natural sciences and mathematics, chaos theory is founded on three key principles:

i. There must be a dependence on the sensitivity to initial conditions

ii. The system must be iterative

iii. The system must be linear

(Bird, 1997, p. 144)

The significance of sensitivity to initial conditions resonates with research, practice and theory beyond the natural sciences and into sociology and education (Eve, Horsfall and Lee, 1997). The possibilities of chaos theory opened-up new ways of thinking and renewed support for ideas and theoretical models that challenge established order. Turner highlights approaches to chaos theory that offer:

> …to place within our grasp a set of very powerful intellectual tools – concepts to think with…free of many of the limitations of our traditional armory…we can dissolve oppositions between the ordered and the random – and in the process reinstate useful old ideas such as freedom. New concepts become thinkable. (cited in Eve, Horsfall & Lee, 1997, p. xii)

Gleick (1997) contends that it will, along with relativity and quantum mechanics, be the most significant legacy of the twentieth century. The focus of this claim lies in the contention that chaos theory impacts on all other theories, in all disciplines. Gleick (1997, p. 7) ascertains that, 'The simplest systems are now seen to create extraordinarily difficult problems of

predictability' and from this unpredictability, 'order arises spontaneously …chaos and order together.

Chaos theory is open to varying interpretations, primarily that it creates a theoretical basis for believing that nothing can be predicted, and consequently nothing is certain except uncertainty. Chaos theory is then deterministic even if determined responses are not easily predicted (Bird, 1997, p. 144; Gleick, 1997, pp. 150-151). It is significant because while traditional science bases *'*canons of proof on successful prediction of the results of controlled experimentation' (Turner, 1997, p. xii), the lack of knowledge of where such proof lies evades conventional truth claims. Concepts of teaching as a design science (Laurillard, 2012) are then constrained by such conventional approaches to evidence and unable to respond to the sensitivity to initial conditions and the ripple effect of global networks. Additional concepts from chaos theory, such as *Mandelbrot sets (*Gleick, 1997, p. 236*) strange attractors* (Lorenz*,* 1995 p. 139) and *the Butterfly Effect (*Gleick, 1997, p. 9) identify that although random, there are still clear patterns of order; although ones difficult to predict. Eve, Horsfall and Lee, (1997, pp. 270-271) describe chaotic and random characteristics of chaos as a myth based on a desire for clarity and linear order.

2.3 Chaos Theory and Connectivism

Connectivism recognises unpredictability as a fundamental feature of all networks and scientific (social and natural) exploration. For Siemens (2005, p. 4) the learning impact comes as:

> Computer networks, power grids, and social networks all function on the simple principle that people, groups, systems, nodes, entities can be connected to create an integrated whole. Alterations within the network have ripple effects on the whole.

Siemens suggests that, 'chaos is a new reality for knowledge workers' (ibid.) and links the shrinking half-life of knowledge to a necessary shift in how learning responds. It is important that chaos does not mean random, that for connectivist thinkers 'chaos states that meaning exists" and the task for learners and educators is to "recognise the patterns that appear to be hidden' (Siemens, 2005, p.4). Caught within an ecology of "extraordinarily difficult problems of predictability*"* (Gleick, 1997, p.360) the shift of education is away from neat concepts of

knowing as a fixed concept to one in which, 'the pipe is more important than the content in the pipe' (Siemens, 2005. p.6). Networks and connections become the essential routes to discover knowledge and it is the ability to discover, through networks, that is more important than acquiring any fixed concepts or established knowledge.

Downes (2012, p. 94) argues that educational chaos is an inevitability and the fact that this does not apply well in traditional learning and existing academic institutions is 'so much the worse' for them. An inability to respond to chaotic spaces, he argues, restricts potential responsiveness from education structures that are able only to reproduce an expected, predictable concept of knowledge. What Downes describes is connectivism developing not a fear of chaos but an acceptance of it. It is an acceptance that paces it at odds with institutional conventions that cannot align with connectivist thinking because the response must always be to appropriate it. Downes (2012, p. 92) suggests such arguments are '*circular'* because critics of connectivism that base their measures on existing practices merely "defend the current practice by the current practice."

Anderson & Drons (2011, p.89) criticise that in connectivist spaces 'structure is unevenly distributed and often emergent' with a result that is seldom 'optimally efficient for achieving learning goals' highlights Downes point. Once new models are assessed purely on the ways they replicate existing measures they lose any impact. New models require a radical rethinking of what we mean by education, who it involves and how it is measured. Responding to criticism that educators need to be aware of connectivism as potentially leading to what Kashan described as 'educational chaos' (Downes, 2012, p. 93). Downes says that:

> …the connectivist approach can pretty reliably lead to chaos. But this is because we believe that learning is not structured, controlled or processed

Perhaps similar to the unpredictable order of *strange attractors,* this vision of chaos contends that patterns exist, and learning is about discovering them. Downes (2012, p. 93) suggests that:

> …we expect students to be able to manage complex and rapidly changing environments...to manage through just the sort of chaos we are creating

Downes (2012, p. 453) argues that rather than saying 'knowledge is power' we should see that 'power is knowledge.' The significance Downes (2012, p. 454) gives to this is that knowledge exists only in terms of the connections that provide it; that power is shifting from centralised states such as monarchy and corporatism and toward 'the chaos of individualism' in which 'knowledge is nothing more than pattern recognition.' A further concern might be the ways that connectivist thinking responds to the darker aspects of the web (Crawford & Joli, 2018) and those ripple effects that perpetuate global inequalities while seemingly supporting educational change.

The significance of connectivism and chaos theory is the opening of the door to new theoretical foundations, beyond those of pragmatism, objectivism or interpretivism and recognising power as a feature of all learning. Recognising the significance of chaos insists on looking outward to the 'anatomy' (Crawford & Joli, 2018) of networks and seeing what impact increased technology has on the planet in terms of labour, social equality and diminishing resources. As an escape from narrow furrows of professional educators and institutional control, chaos theory provides a strong if unwieldy theoretical basis to think new thoughts.

2.4 Chaoids and Planes of Immanence: A Deleuzo-Guattarian response to chaos

At this point the paper recognises a fork in the road and takes an alternative path than connectivism as enough in itself to foster change. While connectivism proposes order in chaos and recognition of this order as the goal, another approach exists that posits creation rather than discovery . Deleuze and Guattari's (1994) *chaoids* engage with chaos as more than a space of unpredictability, and instead introduces chaos as a space able to host alternate concepts of reality. Rather than placing us outside, watching what forms in a chaos beyond us, Deleuze and Guattari describe a chaos in which we might create new concepts. The purpose of the inclusion here is to promote knowledge as something we generate rather than recognise. A crucial feature of this approach is *planes of immanence* (Deleuze and Guattari, 1994; Holland, 2011) that represent the way philosophy might cut through chaos (figure 1).

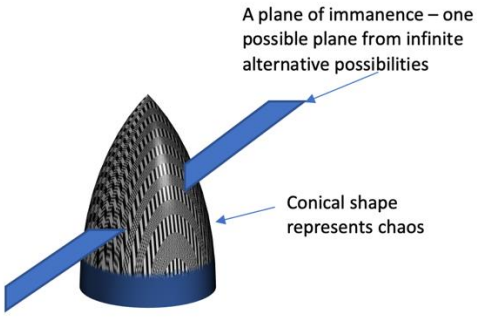

Figure 1: *Image showing the plane of immanence cutting one of infinite possible pathways through chaos.*

Planes of immanence are spaces along which new ways of thinking develop. Along these planes, chaoids are more particular instances of how concepts are generated and represent alternate ways of speaking, seeing, writing and creating new realities. Deleuze and Guattari (1994, p. 208) propose that**,** 'chaos has three daughters, depending on the plane that cuts through it: these are the **Chaoids -** art, science, and philosophy - as forms of thought or creation.' The three 'daughters' offer divergent approaches unified by a shared concern with recognising chaos and responding to it; the chaoids become 'the realities produced on the planes that cut through the chaos in different ways' (Deleuze and Guattari, 1994, p. 208). Planes are infinite and can reflect multiple viewpoints, realities and spaces for philosophies to emerge (Holland, 2011). Parr (2010, p. 48) defines philosophy itself as 'an ethics of chaos, a particular way of living with chaos – and against the sterile clichés of opinion (doxa).' A Deleuzo-Guattarian chaos is defined, 'not by disorder but by its fugacity' (Parr, 2010, p. 48). The speed of thoughts and actions that emerge and disappear almost immediately have some resonance with Siemens (2005) diminishing half-life of knowledge, recognising chaos in continual flux. As a result, Parr (2010, p. 48) defines 'the task of philosophy, through the drawing of planes of immanence [is] to give consistency to chaos while retaining its speed and productivity.'

In *What is Philosophy?* (1994), Delueze and Guattari argue that emerging philosophies must respond to the world as it is lived now, avoiding merely reactive critique and instead proposing affirmative philosophies that provide alternatives (Holland, 2011).

Berardi (2014) reflects on Guattari's work on chaosmos, which is, 'a composed chaos - neither foreseen or pre-conceived' (p.204) as a stage reached when it becomes necessary to

move from one way of thinking to another. This shift from 'one rhythm to another' (p.188) requires chaoids to represent the actuality, the means of capturing and responding to a new way of seeing. Berardi (2014, p. 188) describes chaoids as:

> …a linguistic agent whose purpose and function is to translate the spasmodic rhythm of chaos so that it can become harmonic and understandable. Chaoid is the form (artistic, poetic, political, scientific) that is able to transfer language into another dimension of speed existing outside of the spasmogenic rhythm being dominated by the language of finance.

Chaoids are the beginning of concepts, spaces for imagining that first dispel the emptiness of opinion (Deleuze & Guattari, 1994, p.206) and then help create concepts through thought and action. The importance for contemporary educators is in the generation of, and responsiveness to, chaoids that reflect chaos and offer affirmative solutions and do not become enamoured with only existing structures of power. Guattari argues that the creation of chaoids becomes necessary in the face of 'barbarism, mental implosion, chaosmic spasm' (cited in Berardi, 2014, p.183) and Berardi proposes that such dangers are evident now in the shape of climate change and pervasive neoliberal capitalism. We might find in connectivism a chaoid in educational philosophy that escapes the economic and canonical drivers of what education is, and what it is for. From this chaoid, concepts of new educational engagement might be imagined and enacted.

Connectivism offers no ready-made, complete theory but a space that opens thought, allowing challenge, change, diversion and reflection as it continues to respond to chaosmos. These new spaces are not necessarily emancipatory and Miller (2018, p. 335) considers that technology networks produce 'new powers' that are, 'not only new; they are also wild'. This wildness means new power is as likely to dismantle the positive aspects of law, social and cultural systems on which we rely as they are to remove barriers of elitism and social inequality. The development of new educational philosophies is, then, one of balance, between recognising alternative power and evading replication of existing inequalities. Holland (2011, p. 5) says for Deleuze and Guattari, 'active forces should always take priority over reactive ones' and linking the work of the connectivists with chaoids recognises that future endeavours require more than pedagogical practice and must be supported by affirmative philosophies. Such a praxis of action and affirmative theory is necessary to

establish meaningful challenges to educational structures built on unsustainable models of capitalist growth and exploitation. Webb (2018, p. 97-99) criticises the university as, 'an oligarchy working with government and business to preserve its own privileges' and, while 'utopian classrooms' based around dialogic education might exist, these are 'heavy on bombast' and do not fulfil their promises. While recognising that critical views of the university are a valuable stating point, we also need alternate planes of immanence where educators, of many backgrounds, can develop chaoids and concepts that widen what education looks like. Deleuze and Guattari (1994, p. 108) remind that new practices rely on contexts not yet developed and as such are creations today for a 'people yet to come.' New planes of immanence, and chaoids such as connectivism, offer affirmative responses that may help prepare the ground for this eventuality.

3. Out of Chaos

In this section, the focus is on highlighting some examples that exist now and lay some foundations for the people yet to come. The importance of these spaces is realised by exploring the ways in which alternative educational possibilities are created and shaped by affirmative philosophical positions. The examples here highlight the crucial importance of philosophy and a transformative ethos in generating real alternatives. Each is used to indicate various approaches to educational change, including non-institutional approaches, institutional academics creating new networks, the development of new bodies and projects that work alongside institutions. Webb (2018, p. 102) identifies an 'undercommons' within institutions that resist corporate missions and offer hidden, radical fringes of educators doing things differently. The examples here differ from that in that they begin with an ethos open in its distinctiveness, opposed to the forces that are shaping education based on neoliberalism. These are not hidden, even if unseen, and each proposes a new form of education that challenges institutional dominance.

Returning to the connectivist MOOC highlights this distinction, which operate not as 'utopian classrooms' (Webb, 2018, p.100) in which institutionally-bound 'bolt-holes' offer only minor spaces of transgression. cMOOCs create new spaces to connect that exist beyond the institutional even while populated by many institutionally based creators. Berardi (2014, p. 192) responded to the Bologna Declaration of June 1999, a crucial point in the beginning of a neoliberal takeover of education in Europe, with the creation of the European School for

the Social Imagination (SCEPSI) in 2011. The purposes of SCEPSI relate to creating autonomous knowledge in neutral spaces not automatically defined by economic considerations. SCEPSI defines itself as an, 'experiment in the self-organization of the General Intellect…aiming to create a social space for the autonomous production of knowledge and the recuperation of the social common'. (from SCEPSI website[1]). SCEPSI promotes a developing network, involving academics, but seeking spaces beyond the institutions that no longer permit such work. Similar ventures such as the recently closed Social Science Centre in Lincoln offered education courses for free, based on voluntary expertise and tuition. Developing alternative organisations reveals the willingness of academics within institutions to look outside to continue socially ethical work. The closure of such places highlights the difficulty of survival in such economic environments.

Critical observations such as Mark Fisher's (2009) Capitalist Realism offer both a strong philosophical critique of contemporary culture with a recognition of the value of networks in creating participants through blogs and online communities. Fisher (2009, p. 2) argues that Capitalist Realism conditions, 'not only the production of culture but also the regulation of work and education and acting as a kind of invisible barrier constraining thought and action.' Beyond the powerful philosophical critique, it was the development of Fisher's thinking through K-Punk, a blog, that shifted beyond the restrictions of a dominating and restrictive institutional and cultural landscape. Multiple blogs and online zines (Grace-Ford, 2019) offer a DIY approach that allows diverse, meanderings beyond the institutions. Participation through art, film, psycho-geographic wanderings, writing and activism that embrace unpredictability and produce cultural responses to the flux across ripples of time, space and context.

Projects such as *Community Open Online Courses* (COOCS) (Shukie, 2018) and *Ragged University* (Dunedin, 2018) provide non-institutional spaces that prioritise the community as the site of knowledge exchange. They present realities of educational space that is distinct from the institutions, involve different voices and subjects of study and avoid measures common to institutional education. The organisation and operation of these organisations is participatory and voluntary and evades centralised leadership. As each course/ event/ online

[1] https://scepsi.weebly.com/

posting is developed independently the opportunity to respond to unpredictability and fugacity is increased. They represent separate and community-led initiatives that are explicitly non-institutional and seek knowledge from communities and individuals regardless of academic criteria. Utilising technology networks underpins both and reflect the diversity of connectivism as a chaoid while adding additional philosophical basis in social justice, popular education and critical theory.

Mycroft & Sidebottom (2018) have developed constellations of practice based on rhizomatic concepts of knowledge that shape chaos to create multiple and diverse approaches to learning. Employing posthuman-inspired affirmative ethics (Braidotti, 2013, p. 2) these constellations challenge dominant enlightenment ideals of 'vitruvian man' as well as neoliberal constrictions on what is considered educationally valuable. Responding to traditional systems of education that, 'compound inequality…removing its social purpose in favour of the economic imperative' (Braidotti, 2013, p. 8) the constellations of people/concepts show real and virtual communities scattered across multiple projects. The common characteristic was that the participants were involved in educational organisations, but required an alternative space/ network to explore, create and communicate that generally did not exist in traditional education.

In the example of *Free Spirit Media*, a Chicago-based organisation, the emphasis is on developing programmes of study for youth and young people in broadcast media. The initiative involves a neighbourhood context that allows young people the opportunity to view their own communities' issues and concerns and gives them the tools to articulate and share their stories. The ethos of the project is that 'social transformation is only viable when individuals promote and practice equality, inclusion, and solidarity' (Free Spirit Media, 2018, p.1). The multiple community broadcasts highlight a vibrant landscape in which core values of participation and social purpose replace institutional measures of accreditation. The value of technology is both at a technical skill level but includes networking and collaboration beyond single neighbourhoods.

Across these few examples what emerges is an understanding of the value of chaoids, of people, communities and academics seeking alternatives in how we educate, create knowledge and construct learning networks. Responding to Henry Giroux's utopian imaginary, Webb (2018, p.14) identifies how the institutions offer an almost impossible

terrain for new thinking and activism. The exemplars here challenge this impossibility and highlight how new thinking finds a way. Turner's contention that chaos theory allows 'new concepts to become thinkable' resonates here. These thinkers and creators have generated chaoids almost certainly not defined in relation to chaos theory, chaoids or connectivism. Yet, these disparate approaches to change and rethinking education can be considered examples of the ways that educators might use networked possibilities of technology alongside defined philosophical purpose, to create meaningful, empowered alternatives for education.

4. Conclusion

Two approaches to chaos have been presented here. Connectivism offers a contemporary response to how we might rethink education to recognise patterns within chaos and focus on learning as a networked process. Deleuze and Guattari propose chaoids that allow for new philosophies of education and the necessity of affirmative, active responses that order chaos and create patterns. These are not mutually exclusive, and we combine the ways we think about the development of new approaches to learning. Rooted in the actual practices of networked learning, connectivist ideas provide a link to chaoids and the regeneration of the educational mission. Chaoids insist on a response to chaos that is live and vital, seeing in flux and uncertainty the need for newness in how we educate and create knowledge.

It begins with educators of all kinds, reflective and inventive creators of our present, who accept making changes must begin with us.

The exemplars discussed here recognise interconnectedness and diversity from community-led initiatives also have wider impact and it is through closer networks that we can by-pass the brutality of market-forces and standardising compliance-based models of thinking and learning. Rethinking models of education beyond the institutions can influence change within them. We can reject destructive and marginalising competition for the sake of market ideology, league tables and standardizing measures that create a language of failing institutions and disadvantaged communities based on fiscal concerns, not on concerns of purpose and value. Instead, as COOCs, Ragged Univerity, constellations of practice and Free Spirit Media show, we can rethink communities as powerful spaces of knowledge that can respond to unpredictability and continually changing conditions. Encountering chaos as a tangible space, and one that might be shaped through our own contexts and actions, insists

on plurality rather than standardisation. It is only in a denial of chaos that we become fearful of a lack of order and search instead for stronger, more defined standardising approaches and prescriptive professionalization. Berardi (2014, p. 193) argues that generating chaoids is about, 'the creation of the institutions for self-organisation of the general intellect' rather than restoring former state institutions. Approaches based on autonomy, localised responses to sustainability, challenges to economic or social marginalisation are all possible new formations that developing as planes of immanence, cutting through the chaosmos.

As practitioners, our role is not to seek reductive skill-based guidance notes from a diluted version of connectivism, a how-to guide of technology enhanced learning. Instead, we can approach connectivism as a gateway into the possibilities of education that reflects wide and disparate influences. Through chaos we encounter the infinite possibilities from which we might create solutions to global, national and regional challenges. Through chaoids such as connectivism, we can build new approaches that combine to establish new planes, alternate ways of thinking that can energise and renew our purpose as educators and as people. As Mark Fisher (2009, pp. 80-81 concludes:

> The long, dark night of the end of history has to be grasped as an enormous opportunity. The very oppressive pervasiveness of capitalist realism means that even glimmers of alternative political and economic possibilities can have disproportionately great effect. The tiniest event can tear hole in the grey curtain of a reaction which has marked the horizons of possibility under capitalist realism. From a situation in which nothing can happen, suddenly anything is possible again.

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