Submission of PhD by published work

‘Learners’ experiences in cMOOCs (2008-2016)’

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This supporting statement is my own work and has not been offered previously for any other degree or diploma.

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Publications for consideration for PhD by published work

Peer reviewed journal articles

Guldberg, K., & Mackness, J. (2009). Foundations of communities of practice: enablers and barriers to participation. *Journal of Computer Assisted Learning*. Wiley-Blackwell. http://eprints.bham.ac.uk/260/1/JCAL2June09KG_JM.pdf

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Book chapter

Williams, R., Mackness, J., & Pauschenwein, J. (2015). *Using Visualization to Understand Transformations in Learning and Design in MOOCs*. In A. Mesquita & P. Peres (Eds.), Furthering Higher Education Possibilities through Massive Open Online Courses, 193 – 209. IGI Global book series Advances in Higher Education and Professional Development. doi:10.4018/978-1-4666-8279-5. https://www.researchgate.net/publication/292162782_Using_visualization_to_understand_transformations_in_learning_and_design_in_MOOCs

Abstract

This research began in 2008 (the year of the first MOOC) with the aim of increasing understanding of the diversity and complexity of participants' learning experiences in connectivist, massive, open, online learning environments (cMOOCs). Through their 'massiveness' and openness these MOOCs have the potential to influence traditional conventions of teaching and learning in Higher Education institutions by placing learners in new, uncertain and unpredictable environments.

I have published 21 peer-reviewed works that have been cited by many other researchers in the field. These works contribute to an understanding of the theory and practice of MOOC pedagogy, individual participants' learning experiences in MOOCs and the roles of teachers in facilitating these experiences. This has led to the development of a multi-dimensional framework (known as 'Footprints of Emergence'), which takes a holistic approach to reflecting on and evaluating open learning. This unique framework, has been used in the UK, Europe, the USA and Canada to explore the design of open learning environments and to elicit and make explicit tacit understandings of individual learning experiences, positioning such experiences on a spectrum between prescribed and emergent learning.

My work has been collaborative, open and emergent. The research has drawn on social learning theory and connectivism to conduct empirical research into MOOCs. The research findings highlight the diversity of participants in MOOCs and their vulnerability to imbalances of power relations, which can lead to isolation and exclusion, particularly in the absence of sound ethical teaching and learning practices. This is significant because MOOCs can be experienced as liminal spaces in which participants can have transformational learning experiences. I propose that a new perspective on the balance between structure and agency to support these transformational experiences is required. The Footprints of Emergence framework is suggested as a useful tool for determining what an appropriate balance might be.

This research has implications for the methods used for investigating learning experiences in cMOOCs, the design of these MOOCs and the changing roles of teachers, learners and researchers in these environments. The research suggests that innovative methods and frameworks are needed for cMOOC research, that the design of cMOOCs should take greater account of the complexity of open environments, that new responsibilities are required of teachers and that a fresh perspective is needed on the ethics of teaching and learning in MOOCs.

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1. Introduction

The research selected for this PhD by published work relates to teaching and learning in open learning environments - specifically connectivist, massive, open, online courses (cMOOCs) that have employed innovative, experimental pedagogies (see for example Bell et al., 2016; Mackness et al., 2010; Mackness et al., 2013; Mackness & Bell, 2015; Mackness et al., 2016; Waite et al., 2013).

Whilst the hype around MOOCs has subsided, it is thought by some that MOOCs will remain a significant educational context for the foreseeable future (Watters, 2015) and that MOOCs are about to enter a 'Plateau of Productivity' (Bozkurt et al., 2016). Research into MOOCs is still less than 10 years old and outputs continue to grow in number at a fast pace (Breslow, 2016). Despite this, understanding of participants' learning experiences in MOOCs, the roles of teachers and what is an appropriate design for a massive open online course all remain under-researched and poorly understood (Adams, Vargas Madriz, & Mullen, 2014; Bayne, 2016; Bayne & Ross, 2014; Gamage, Fernando & Perera, 2015; Liyanagunawardena, Adams & Williams, 2013; Ossiannilsson, Altinay & Altinay, 2016; Veletsianos & Shepherdson, 2016; Wintrup, Wakefield, Morris & Davis, 2015). My research addresses these identified gaps in the MOOC literature.

In this introduction, I first describe the context for this work and consider why the MOOC participant – an individual learner 'with his or her own challenges and struggles' (Barnett, 2007) - merits further research. I then outline the background to the research, summarise the research questions which were addressed in each paper, briefly reference theoretical influences on my work and explain how the papers selected for submission are interrelated.

1.1 The context for my research into cMOOCs

At the time of starting this research in 2008, connectivist MOOCs (cMOOCs) were a new phenomenon (Bell, 2011) not previously investigated. Since then the body of research into MOOCs has grown significantly, as is evidenced by my literature review of the field (see Literature Review, p.19). The review also explores the principal characteristics of cMOOCs and how they differ from other MOOCs (see Table 5, p.21).

A key thread running through my research is the recognition that the complexity of these learning environments shapes the changing practices of teachers, learners, designers and researchers (Williams et al., 2011; Williams et al., 2012a). I argue that massive, open, online courses are complex adaptive systems, in which learners have to be self-organising agents, interacting openly with considerable degrees of freedom. In these environments learners and the system co-evolve (Williams et., 2011). This complexity has resulted in research questions about MOOC designs and the expectations we have of learners and teachers in MOOCs.

Downes (2011) has identified 23 possible roles for MOOC teachers, which include learner, facilitator, designer and convener. The term 'teacher' may therefore no longer be adequate for describing this role in complex environments such as cMOOCs, but for ease and consistency it is the term I will use throughout this submission. Similarly, the word 'learner' can be an empty term that depersonalises and objectifies participants. Nevertheless, whilst bearing this in mind, I will use the word 'learner' to highlight my research concern with learning as opposed to participation and to distinguish these learners from more traditional students in formal education.

The central principles of a cMOOC networked learning environment are autonomy, diversity, openness and connectedness/interactivity (Downes, 2005; 2009a). My research into learners' experiences in cMOOCs and the associated teachers' roles shows that these principles cannot be understood solely in terms of open access, open connectivity or open resources (Williams et al., 2011; Williams et al., 2012a); they have psychological dimensions which influence identities, expectations and relationships (Tschofen & Mackness, 2012). I also question the ethics of experimenting on learners (Mackness et al., 2016; Marshall 2014), recognising their vulnerability in these open, often unsupported learning environments (Barnett, 2007; Mackness & Bell, 2015; Prinsloo & Slade, 2016). I show that uncertainty and liminality are significant aspects of cMOOC learners' experiences (Mackness et al., 2013; Waite et al., 2013; Williams et al., 2015) and that a lack of constraints in open learning can have negative consequences for cMOOC learners (Mackness et al., 2010; Mackness et al., 2016; Mackness & Bell, 2015). This suggests that teaching and learning in MOOCs requires a new balance between structure and agency. A

MOOC with too much structure can inhibit learner agency. A MOOC with too little structure and too much free choice for learners can be experienced as chaotic.

1.2 The MOOC learner

The ever-increasing research output in relation to MOOCs has confirmed the diversity of MOOC participants (Breslow, 2016; DeBoer, Stump, Seaton & Breslow, 2013). Much of this research has used data analytics (Gaševic, Kovanovic, Joksimovic & Siemens, 2014) to investigate thousands of MOOC learners en masse, seeking patterns of behaviour to identify them in terms of typologies (see Literature Review, p.24). Similarly, social network analysis is used increasingly to explore learner connectivity and interaction in open online environments, depicting learners as nodes in a network (Haythornthwaite, de Laat & Schreurs, 2016). Both these methods, in the absence of combined qualitative data, can fail to recognise learners as individuals who may be struggling to make sense of these complex, massive, open, online learning environments and whose identities can be affected by their experience. In cMOOCs not only are learners expected to determine their own learning paths across distributed online sites and connect with a huge diversity of learners and resources, but also to do this in the absence of a direct connection to the teacher (Mackness et al, 2010; Mackness & Bell, 2015). Peer-to-peer teaching and learning is the expectation. This can promote a 'survival of the fittest' ethos, resulting in many learners becoming 'lost in social space' (Dron & Anderson, 2009). It is easy to lose sight of the needs of the individual in these environments.

Given the above, my work has focused on the uniqueness of individual cMOOC participants and how their identities can be affected by the massiveness, openness, diversity and connectivity of the MOOC environment (Williams et al., 2015). However, a key difficulty in researching learning experiences in MOOCs is gaining access to a representative sample of learners. Those who respond to calls for participation in research tend to be learners who are enthusiastic about the MOOC experience, resulting in a responder bias not easy to overcome. It is difficult to trace less enthusiastic learners many of whom drop out before the end of the course with estimates by some of more than 90% of learners falling into this category (Jordan, 2014).

From the time of the first MOOC in 2008, I have been interested in the experiences of individual learners in this elusive category which includes learners who have not succeeded in MOOCs and learners who may be vulnerable, whose identity is fragile (Barnett, 2007), and the reasons for this. If learning is a 'journey of the self' (Barnett, 2007; Wenger, 2005) and the 21st century is the century of identity (Wenger, 2005), and learning is increasingly being conducted in online environments, then a new understanding of how individuals experience online learning is needed (Veletsianos, Collier & Schneider, 2015).

1.3 My background

Since 2009 I have published 20 papers, 19 in peer-reviewed journals, and one book chapter (Appendix 1). I have selected 12 papers and the book chapter for this PhD by published work. These are summarised in Appendix 3.

My identity as a researcher has been emergent, serendipitous, unplanned and unpredictable. I 'fell into' research in 2008 following participation in the world's first massive, open, online course, 'Connectivism and Connective Knowledge'. I was so enthused by my experience of open learning, a 'passionate participant' (Lincoln & Guba, 2000), that I joined a previously unknown group of online collaborators to research this learning experience. This resulted directly in the publication of two papers (Mackness et al., 2010; Mak et al., 2010), and indirectly in many more published papers and presentations (Appendix 1).

Prior to this I had collaboratively published two papers about communities of practice. One of these papers related to my work as an independent education consultant with the ELESIG (Evaluation of Learners' Experiences of e-learning Special Interest Group) community (Sharpe & Mackness, 2010), but the other was voluntary and related to an online course about communities of practice (Guldberg & Mackness, 2009).

Most of my research has been voluntary, unfunded, extra-institutional research, which may or may not have used open data, has been conducted and disseminated in the open and is published in open journals. This type of research has recently been described as

'guerrilla research' (Caldwell, Osborne, Mewburn & Nottingham, 2015; Coughlan & Perryman, 2015; Farrow, 2016; Unger & Warfel, 2011; Weller, 2013a).

I have benefited from easy and quick access to open courses and have taken advantage of the affordances of social media for open research, dissemination and publication (Caldwell et al., 2015). Research questions have sprung from a personal desire to know and understand more about teaching and learning in these new open online learning environments. This in turn has raised further questions about the design of MOOCs in terms of their structure and openness and the extent to which learners have agency and experience emergent learning.

1.4 Research questions

The research questions I have investigated are listed in Table 1. The details of how these questions were answered can be found in the published papers and are summarised in Appendix 4.

Research Questions	**Empirical Papers**
What are the factors that influence participation in a virtual community of practice?	Guldberg, K., & Mackness, J. (**2009**). Foundations of communities of practice: enablers and barriers to participation. *Journal of Computer Assisted Learning*. Wiley-Blackwell.
To what extent do participants experience autonomy, diversity, openness and connectedness/interactivity in a connectivist MOOC?	Mackness, J., Mak, S. F. J., & Williams, R. (**2010**). The Ideals and Reality of Participating in a MOOC. In *Networked Learning Conference, Aalborg* (p. 266 -274).
How do cMOOC design principles and activities enable participant learning? What are the implications for learning of these principles? What are the possible implications of small task-oriented cMOOCs for higher education?	Mackness, J., Waite, M., Roberts, G., & Lovegrove, E. **(2013).** Learning in a Small, Task-Oriented, Connectivist MOOC: Pedagogical Issues and Implications for Higher Education. *International Review of Research in Open and Distance Learning*, 14(4), 140–159.
What are the triggers for active participation in short MOOCs? What are the learners' experiences of participation and how do learners interact with content and with each other?	Waite, M., Mackness, J., Roberts, G., & Lovegrove, E. **(2013).** Liminal Participants and Skilled Orienteers: Learner Participation in a MOOC for New Lecturers. *MERLOT Journal of Online Learning and Teaching*, 9(2), 200–215.
What are the ethical implications of experimenting on MOOC learners?	Mackness, J., & Bell, F. (**2015**). Rhizo14: A Rhizomatic Learning cMOOC in Sunlight and in Shade. *Open Praxis*. 7(1), p. 25-38

How do learners experience the use of the rhizome as a conceptual framework for teaching and learning in a MOOC?	Mackness, J., Bell, F., & Funes, M. **(2016).** The Rhizome: a problematic metaphor for teaching and learning in a MOOC. *Australasian Journal of Educational Technology*, 32(1), 78–91. doi:10.14742/ajet.v0i0.2486
What are the MOOC teacher/facilitator/designer's roles in achieving a balance between structure and agency and how can the Footprints of Emergence visualisation tool be used to support this?	Mackness, J., & Pauschenwein, J. (**2016**). Visualising structure and agency in a MOOC using the Footprints of Emergence framework. *Tenth International Conference on Networked Learning. Lancaster*.
How do MOOC participants associate with each other and develop a community? Can the community be the curriculum?	Bell, F., Mackness, J., & Funes, M. **(2016).** Participant association and emergent curriculum in a MOOC: Can the community be the curriculum? *Research in Learning Technology*
Research Questions	**Conceptual Papers**
Can emergent learning be validated and self-correcting and is it possible to link or integrate emergent and prescribed learning?	Williams, R., Karousou, R., & Mackness, J. (2011). Emergent Learning and Learning Ecologies in Web 2.0. *The International Review of Research in Open and Distributed Learning*, 12(3).
How can the meaning of the four key principles of connective environments - autonomy, diversity, openness and connectivity - and the dimensions of individual experience be informed by personality and self-determination theory?	Tschofen, C., & Mackness, J. (**2012**). Connectivism and Dimensions of Individual Experience. *The International Review of Research in Open and Distance Learning*, 13(1).
Can we develop a practical tool to help us describe multi-variate, self-organised, complex, adaptive and unpredictable learning in new open learning landscapes?	Williams, R. T., Mackness, J., & Gumtau, S. (2012). Footprints of Emergence. *The International Review of Research in Open and Distance Learning*, 13(4).
What are some of the issues associated with open research and open learning and how do these impact on the shift from traditionally closed to open research?	Williams, R., & Mackness, J. **(2013).** Open Research and Open Learning. *Scientific Journal of Educational Technology*. Vol. 2, No. 1. Campus Virtuales.
How have MOOCs transformed learning and how can the Footprints of Emergence visualisation tool be used to provide meaningful insights into these transformations?	Williams, R., Mackness, J., & Pauschenwein, J. **(2015).** *Using Visualization to Understand Transformations in Learning and Design in MOOCs*. In A. Mesquita & P. Peres (Eds.), Furthering Higher Education Possibilities through Massive Open Online Courses (pp. 193 – 209). IGI Global book series Advances in Higher Education and Professional Development. doi:10.4018/978-1-4666-8279-5

Table 1: Research questions related to submitted papers

As Table 1 shows the papers are of two types, empirical and conceptual. The empirical papers focus on eliciting the alternative perspectives and experiences of the wide

diversity of learners, acknowledging the difficulties of surfacing these perspectives. The conceptual papers focus on the way in which the complexity resulting from this diversity can lead to emergent and transformational learning for learners, teachers, designers and researchers. The two types of papers inform each other. Empirical research into learners' experiences in MOOCs has informed the development of a conceptual framework (Footprints of Emergence) for eliciting deeper understanding of this experience, which in turn has informed further research into learners' experiences.

In conducting this research my collaborators and I have drawn on our combined understanding of different theoretical approaches to teaching and learning.

1.5 Theoretical underpinnings

My approach to research has been influenced by a long career in teaching and learning. I have taught all age groups and worked extensively as an online educator. The history of these influences is summarised in Table 2.

Sequence of influential events in my prior experience	A science degree with PGCE	Teaching infant children	Teacher training. Primary science	Online teacher training. Distance learning	Communities of practice	Independent online education consultant	CCK08	MOOCs research
Typical associated learning activities	Chalk and talk	Teaching for learning through play and experience	Surfacing and challenging misconceptions through Socratic questioning and discussion	Developing online resources. Encouraging learner independence, social learning and discussion. Collaborative working. Establishing online presence.		Networking. Creating personal learning environment. Online interaction. Establishing online identity. Use of wide range of technologies.		Collaboration, Cooperation. Discussion. Critical reflection and analysis. Writing.
Some influential theories and theorists	Behaviourism (Skinner, Pavlov, Thorndike)	Social constructivism. (Piaget, Dewey, Vygotsky, Montessori, Bruner)			Social learning theory (Wenger) Complex adaptive systems theory (Cilliers)		Connectivism (Downes and Siemens) Complex adaptive systems theory (Cilliers) Rhizomatic learning (Deleuze and Guattari)	

Table 2. History of theoretical influences on my research

A key theoretical principle that has shaped my work is the belief that reality is socially, culturally and historically constructed and that research is influenced by the researcher and the context (Dale Bloomberg & Volpe, 2016, p.42/43; Lincoln & Guba, 2000).

Significant in my own contribution has been my knowledge and understanding of social constructivism, social learning theory and connectivism. Wenger's work (1998) has been particularly influential in stimulating my interest in how learner identity is developed through negotiated meaning-making as a member of a community of practice. Downes' (2009a) principles of networked learning - autonomy, diversity, openness and connectedness/interactivity - raised questions for me about the meaning of autonomy and openness in open learning environments. These are the questions I have pursued throughout my research journey; questions that are an underlying thread through all the papers.

1.6 Interrelationships between the papers

A mapping analysis of all my publications, using Matthias Melcher's Think Tool (Melcher, 2013), reveals that they can be organised into six groups (see Appendix 2 for further details of the mapping process). These groups, numbered one to six, are depicted by the red nodes in Figure 1 and the individual papers (the grey and green nodes) are numbered according to the order they appear in the list of papers (Appendix 1). The green nodes are the papers that have been summarised (see Appendix 3).

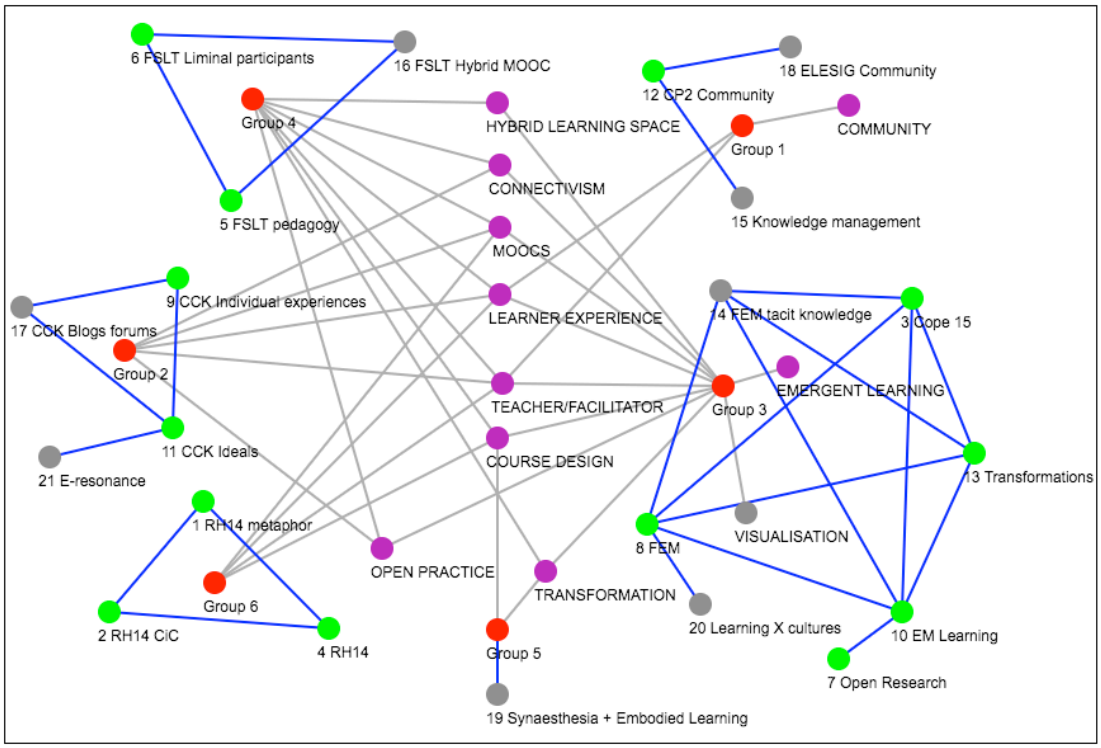

Figure 1: Interrelationships between all publications by group and keyword.

The focus of the research in each group of publications is as in Table 3 below. Papers from groups 1, 2, 3, 4 and 6 have been selected for this PhD by published work.

Group	Publication dates	Focus
1	2008-2013	Implications of community tensions for communities of practice.
2	2010-2011	The affordances, tensions and constraints of open environments, notably MOOCs, for learning experiences and connectivity, with reference to the theory of connectivism and the first MOOC in 2008, Connectivism and Connective Knowledge (CCK08).
3	2011-2016	Design and visualisation of emergent learning experiences within open learning environments, such as MOOCs, where learning is uncertain, unpredictable and relies on self-organisation.
4	2013	One specific MOOC, First Steps into Learning and Teaching in Higher Education (FSLT12); investigation of experiences of the learning community, course design and the implications for teaching and learning in a MOOC.
5	2012-2015	Whether and how learning design can be influenced by an embodied view of perception and action as enactive perception using all the senses.
6	2015-2016	One specific MOOC, Rhizomatic Learning: The community is the curriculum (Rhizo14), with particular reference to learners' experiences of community and curriculum formation and the teacher's role in this.

Table 3: Research focus of each group of papers

The publications' key words (purple nodes in Figure 1) provide further information about how the papers are interrelated (Table 4).

Keyword	Number of related papers
MOOCs	12
Learner experience/participation	10
Course design	10
Open practice	10
Community/Community of Practice (CoP)	7
Connectivity, connectivism	6
Emergent learning	5
Transformation	5
Curriculum	5
Teacher	5

Table 4: Paper interrelationships by keyword

Eight published papers (numbered 14-21 in the list in Appendix 1) have not been included in the selection of published papers. One of these papers (Melcher & Mackness, 2010) has not been peer-reviewed and is therefore inadmissible, although it is an example of what can be achieved through collaboration between two researchers who have never met and it attempts to dig deeper into how people online make connections, another under-researched topic. Three papers (Sharpe & Mackness, 2010; Guldberg, Mackness, Makriyannis & Tait, 2013; Williams, Gumtau & Mackness, 2015) are not included as they are not directly related to learners' experiences in MOOCs, but have influenced my thinking in relation to the social and neural aspects of learning. A further four papers (Mak et al., 2010; Roberts, Mackness, Waite & Lovegrove, 2013; Williams & Mackness, 2014; Williams, Mackness & Gumtau, 2012b) do relate to learners' experiences in MOOCs, but overlap in content with some of the selected papers and have therefore been excluded from the list, even though one of these papers (Mak et al., 2010) has been well cited (146 citations, Google Scholar, 16-05-2017).

1.7 Outline of the following sections

In the following four sections, I first present an in-depth review of the current state of the research literature as it relates to the key threads in my own research. I show that the existing literature confirms teaching and learning in MOOCs to be an emerging research field in which there remain significant gaps related to learners' experiences and teachers' roles. I then discuss some of the methodological challenges facing researchers such as myself, who are committed to learning more about individual learners' experiences in connectivist MOOCs. Significant in this discussion is the question of the adequacy and limitations of traditional qualitative data analysis for this research focus and the importance of an ethical approach to experimental pedagogies. In the penultimate section I discuss the research contribution I have made to an understanding of cMOOCs as complex adaptive systems and the critical importance of collaboration in achieving this contribution. In the final section, I conclude by discussing possible implications of my work for policy, practice and research in this field.

2. Literature Review

Despite the burgeoning amount of research being published (Aparicio, Bacao & Oliveira, 2014; Liyanagunawardena et al., 2013), particularly since 'the year of the MOOC' (Pappano, 2012), open, online education, learners' experiences and teachers' roles in MOOCs all remain insufficiently understood (Bayne & Ross, 2014; Veletsianos, 2013a). I have investigated these areas and have found that:

- There is no consensus around what constitutes a massive open online course. The MOOC landscape has grown increasingly complex with a multiplicity of different courses based on different educational philosophies being offered.
- There is a paucity of research that provides understanding and meaningful insights into how diverse MOOC learners learn in these complex open online environments.
- There has been insufficient recognition by MOOC designers of the complexity of these learning environments and the impact of this complexity on changing teaching and learning practices.
- The impact of ethical issues related to changing teaching practices in MOOCs has not been fully understood.

This review, which includes reference to my own research where appropriate, therefore focuses on what the current literature has to say about these points.

2.1 Massive open online courses: an emerging field of practice and research

Whilst my research focuses on open learning in connectivist MOOCs (cMOOCs), this review draws on research on all types of MOOCs. It is worth noting that open education did not start with MOOCs. The design and development of the first MOOC in 2008 (Fini, 2009; Mackness et al., 2010) was influenced by prior open educational practices such as the open education movement, open educational resources, open courseware, open source software and open content (Baggaley, 2013; Bates, 2013; Daniel, 2012; Rodriguez, 2012; Romiszowski, 2013; Yuan & Powell, 2013), but not, according to some authors, by previous research into distance learning (Baggaley, 2016; Bates, 2013; Brown, 2016; Moe, 2016; Naidu, 2016). This latter point is a criticism often levelled at MOOCs.

Since 2008 many different types of MOOCs have been offered, but the term 'MOOC' remains contentious (Watters, 2015) and continues to be open to numerous different definitions (Baggaley, 2013; Jansen & Schuwer, 2015; McAuley, Stewart, Siemens & Cormier, 2010; Saadatdoost, Sim, Jafarkarimi & Mei Hee, 2015; Yousef, Chatti, Schroeder & Wosnitza, 2014). Each letter in the MOOC acronym can be understood or interpreted differently, leading to two main types of MOOCs, connectivist MOOCs (cMOOCs) and xMOOCs (Bates, 2015; Mackness, 2013a; Rodriguez, 2012) and a whole host of hybrid MOOCs (Anders, 2015; Roberts et al., 2013). The 'x' in xMOOCs was coined by Downes (2013a) to identify a MOOC that is an extension of another course. The key differences between these different types of MOOCs are summarised in Table 5 (which is adapted from Mackness, 2013a).

Since 2012 when the first xMOOC was offered the dichotomy between cMOOCs and xMOOCs has become blurred by the number of hybrid MOOCs that have been delivered (Jacoby 2014; Roberts et al., 2013; Saadatdoost et al., 2015; Yousef et al., 2014). This has increased the confusion around an understanding of teaching and learning in MOOCs (Moe, 2015). Whilst hybrid MOOCs adopt a mix of x and cMOOC teaching and learning principles, cMOOCs and xMOOCs represent very different original aspirations, philosophies and pedagogical approaches to education (Bates, 2015; Mackness, 2013a; Rodriguez, 2012; Saadatdoost et al., 2015).

Table 5: Key differences between xMOOCs, cMOOCs and hybrid MOOCs

Characteristic	cMOOCs (connectivist MOOCs)	xMOOCs (extended MOOCs)	Hybrid MOOCs
Theoretical influences	Connectivism (*Siemens, 2004; 2006)*	Behaviourism /social constructivism *(Daniel, 2012)*	Behaviourism/ Connectivism/ Social constructivism
Massive (Number of participants)	2,200 in the first cMOOC *(Downes, 2013d; Fini 2009; Mackness et al. 2010)*	160,000 in the first xMOOC (*Jacoby, 2014)*	> 150 (Dunbar's number – the number needed to qualify as a MOOC.) *(Downes, 2013c; Dunbar, 1992)*
Open	Free to non-credit participants Open access to course No registration required No pre-requisites other than internet connection Open access to resources Use of open education resources Open copyright Open sharing Openness as a psychological state *(Downes, 2013d; Downes, 2013f; McAuley et al., 2010; Mackness et al., 2010; Tschofen & Mackness, 2012, p.136)*	Free to non-credit participants Open access to course Registration required No pre-requisites other than internet connection Copyrighted content *(Coursera, 2015)*	Hybrid MOOCs interpret each letter of the MOOC acronym idiosyncratically *(Bates, 2015, p.160; Roberts et al., 2013)* They adopt a mix of x and cMOOC teaching principles *(Jacoby 2014; Saadatdoost et al, 2015; Yousef et al., 2014) ..or..* offer the choice of didactic or self-directed paths through the MOOC *(Melcher, 2014; Rosé et al. 2015)*
Online	No physical location required *(Downes, 2013d)*	Online or blended	Many different types of MOOCs have been offered with different 'designs, purposes, topics and teaching styles' *(Anders, 2015; Bang et al., 2015; Bayne & Ross, 2014, p.22; Bonk, 2013; Downes, 2013d; Lane, 2012; Mackness & Pauschenwein, 2016; Meijerink et al., 2016; Röthler & Creelman, 2016; Watolla, 2016; Yousef et al., 2014, 2015)* Examples of hybrid MOOCs include: DOCCs: Distributed Open Collaborative Courses *(Balsamo et al, 2013; Jaschik, 2013)* POOCs: Participatory Open Online Courses *(Daniel, 2013)* SPOCs: Small Private Online Courses *(Hashmi, 2013)* BOOCS: Big (or Boutique) Open Online Courses *(Tattersall, 2013)* COOCs: Community Open Online Courses *(Knox, 2016, p. 218; Shukie, 2015)* DS106 *(Levine, 2014)* FSLT12: First Steps in Learning and Teaching in Higher Education *(Mackness et al., 2013; Roberts et al. 2013; Waite et al., 2013)* OTL12 – Open Translation MOOC *(Beaven et al., 2014)*
Course	Time bounded or open-ended *(Bell et al., 2016; Mackness et al., 2010; Mackness & Bell, 2015)*	Time bounded	
Key principles and activities	Autonomy, diversity, openness, connectedness. Aggregation, reuse, remix, repurpose, feed forward Distributed communication via social media Cooperation Participant-driven content No formal assessment *(Mackness et al., 2010; Mackness et al., 2013; Bates, 2015, p.159 -160)*	Transmission of information Video lectures Computer marked assignments Peer assessment Supporting materials Discussion forums No or light discussion moderation Badges /certificates Learning analytics *(Bates, 2015, p.156 -158)*	
Platform	Multiple and distributed Networked content *(Mackness, 2013a; Mak et al., 2010; Siemens, 2012)*	Centralised *(Atiaja, 2016; Coursera, 2015; Daniel 2012)*	
Purpose	To test connectivism in practice To challenge traditional ways of working in HE To promote diversity, social interaction, self-regulation, co-creation of knowledge *(Downes, 2012; Yuan & Powell, 2013*)	Universal access to education For profit Coursera, EdX, FutureLearn and Open Learning each has its own pedagogic orientation *(Wong, 2015)*	

The design of cMOOCs is influenced by the theory of connectivism (Siemens, 2004) and is based on the belief that in this digital age of uncertainty and information abundance, 'knowledge is distributed across a network of connections and therefore that learning consists in the ability to construct and traverse those networks' (Downes, 2007). These MOOCs are arguably more complex in design and delivery than xMOOCs (Alario-Hoyos, Pérez-Sanagustín, Delgado-Kloos & Munoz-Organero, 2014; de Waard, Abajian, Gallagher, Hogue, Keskin, N., et al., 2011; Kop, Fournier & Mak, 2011). The impact of this complexity on teaching and learning in cMOOCs has been critiqued and researched by Tschofen & Mackness (2012), Williams et al. (2011) and Williams et al. (2012a) and is further discussed in Section 2.4, p.26 and Section 4.2, p.46.

As yet we do not know how MOOCs will influence policy and practice in education in the long term. We are still in the 'early stages of exploring how learning unfolds in large-scale learning environments' (Eynon, Hjoth, Yasseri & Gillani; 2016, pre-print p.2), but MOOCs continue to attract the attention of increasing numbers of researchers (both enthusiasts and sceptics) as evidenced by the growing number of published reviews of the literature relating to MOOCs (Chiappe-Laverde, Hine & Martínez-Silva, 2015; Ebben & Murphy, 2014; Gamage et al., 2015; Haggard, 2013; Hayes, 2015; Jacoby, 2014; Khalil & Ebner, 2014; Liyanagunawardena et al., 2013; Saadatdoost et al., 2015; Veletsianos & Shepherdson, 2016; Yousef et al., 2014).

2.2 Enthusiasts and sceptics

Enthusiasts welcome the disruptive elements of MOOCs, seeing them as taking place in 'a new emergent space' (Bang, Dalsgaard & Donovan, 2015) in 'modern learning environments' (Dillenbourg, Fox, Kirchner, Mitchell & Wirsing, 2014) and bringing distance learning and e-learning back into the mainstream of education (Johnson, Adams Becker, Cummins, Estrada, Freeman et al., 2013). Some enthusiasts claim that 'education is broken' (Deimann, 2015; Barber, Donelly & Rizvi, 2013) and that the opportunities that MOOCs provide for delivering a 'broader, deeper and more exciting education' should be seized by Higher Education. Others point to the possibilities that MOOCs offer for democratizing education (Bang et al., 2015; Deimann, 2015), widening participation and revolutionising pedagogy (Haggard, 2013).

MOOC sceptics have a less positive view of the potential of MOOCs, writing of 'the trough of disillusionment' (Daniel, 2013) and describing MOOCs as 'a passing fad and a branding exercise' (Brabon, 2014, p.1) and 'a naïve and damaging blip in the educational media's long and carefully grounded history' (Baggaley, 2014, p.129). Atiaja (2016) points to problems of credibility, quality, assessment, learning outcomes and high dropout rates. Others have focused on issues of 'lurking' (Milligan, Littlejohn & Margaryan, 2013), retention and completion rates (Bang et al., 2015; Dillenbourg et al., 2104; Hazlett, 2014; Jordan, 2014; Pena, Ruby, Boruch, Wang, Evans et al., 2013; Siemens, Gasevic & Dawson, 2015), although many learners attest to never having the intention to complete the MOOC, but rather to 'window shop' and have fun (Park, Jung & Reeves, 2015; University of Edinburgh, 2013).

Further concerns centre on what are perceived as the pedagogical deficiencies of MOOCs (Baggaley, 2014) and the downgrading of the role of the teacher (Mackness & Bell, 2015). Laurillard (2014) questions a model based on unsupervised learning and peer-to-peer support and assessment, and Bayne and Ross (2014), Biesta (2013a) and Dillenbourg et al. (2014) all consider teachers to be of critical importance. Also of concern is the potential for a focus on 'mass' to result in a factory approach to education. Gillani, Yasseri, Eynon and Hjorth (2014, p.1) highlight the need to know more about 'the degree to which MOOCs in practice allow for deep and meaningful learning'. Knox, Ross, Sinclair, Macleod & Bayne (2014) acknowledge the difficulties of researching learners' experiences in MOOCs with high numbers of participants, but nevertheless maintain that we need to know more about these learners. As Jordan (2014) points out, whilst the wealth of data that can be gathered from MOOC participants is beginning to identify trends and patterns, we currently don't know the reasons behind these trends (Rientes & Toetenel, 2016).

All these authors, together with other researchers (Adams et al., 2014; Bayne, 2016; Gamage et al., 2015; Liyanagunawardena et al., 2013; Ossiannilsson et al., 2016; Wintrup et al., 2015), point to the need for more research which focuses on learners' experiences of MOOCs and the learner voice (Mackness & Bell, 2015; Veletsianos, 2013a). Williams et al. (2011), Williams, et al. (2012a) and Williams & Mackness (2014) have sought to address this gap in the research by identifying characteristics of open learning environments that support emergent learning and by developing a framework (Footprints

of Emergence) which uses these characteristics to elicit learners' tacit knowledge and understanding of their experiences.

2.3 The diversity of MOOC learners

A key principle of connectivist MOOCs is diversity, not only of people, their location, language, culture and learning styles, but also of every aspect of the teaching and learning environment (Downes, 2013d). With this diversity comes complexity. Since 2013 when interest in using data analytics for research increased, large amounts of data have been collected about MOOC learners (Bayne, 2016). From this data, we now know more about who these learners are and it is clear that in terms of age, gender, education, employment and country of origin, they are indeed a diverse group (Ebben & Murphy, 2014; Kop, Fournier & Mak, 2011; Ossiannilsson et al., 2016, p.2; Terras & Ramsay, 2015).

In the face of this diversity and the massive numbers of MOOC participants, many researchers have tried to understand learners' experiences in MOOCs by investigating patterns of learners' behaviours and activities. The outcomes of these investigations have been several published MOOC learner typologies, with researchers suggesting that learners fall into specific groups. For example, one early typology put forward by Hill (2013) grouped MOOC learners into active participants, passive participants, drop-ins, observers and no-shows. Most of these typologies have focused on MOOC completion and levels of learners' engagement (Alario-Hoyos et al., 2014; Eynon, Hjorth, Gillani & Yasseri, 2014; Ferguson & Clow, 2015; Hill, 2013; Kizilcec, Piech & Schneider, 2013; Koller, Ng, Do & Chen, 2013; Milligan et al., 2013).

More recent research has suggested that these types of classifications 'shed limited light on the experiential lifeworld dimensions of learning in a MOOC' (Adams et al., 2014, p.204). Littlejohn, Hood, Milligan & Mustain (2016) recommend that rather than investigate completion and non-completion, research should focus on drivers and motivations and that diversity and massiveness mean that learners must be able to self-regulate. Others have made similar observations (Kop, 2011; Ossiannilsson et al., 2016) pointing to the need for MOOC learners to develop critical digital literacies, intrinsic motivation, competence, confidence and the ability to establish an online presence (Kop et al., 2011). In addition, MOOC learners should be autonomous (Downes, 2009a;

Mackness et al., 2010), resilient (Folke, 2010), able to navigate distributed learning environments, establish reciprocal relationships (Milligan et al., 2013; Waite et al., 2013) and be 'emotionally engaged enthusiasts' (Ferguson and Whitelock, 2014, p.563; Koutropoulos, Gallagher, Abajian, Waard de, Hogue, R. et al., 2012; Rientes & Rivers, 2014). Most of these suggested motivations and drivers are not unique to MOOCs and have been identified in pre-MOOC research into online learning (Garrison, Anderson & Archer, 1999; Salmon, 2012, 2013). However, some differences result from the more verbal and public nature of learning in a MOOC (Cheng, 2014, p.53). Veletsianos (2013a, p.3) believes MOOCs and online education are 'similar, but unique concepts', which should not be conflated. He claims that '… very few researchers have sought to gain a deep, qualitative, and multi-dimensional understanding of learner experiences with open forms of learning' (Veletsianos, 2013a, p.2) and that we need to 'dig deeper' to understand the learner experience and elicit the learner voice (Veletsianos et al., 2015).

Tschofen & Mackness (2012) sought to address this by exploring the psychological aspects of learning in MOOCs. This research was not empirical and did not report on the 'learner voice', but it did consider dimensions of individual experience in MOOCs, viewed through the lenses of personality and self-determination theories. Through this the authors expanded on definitions of autonomy, diversity, openness and connectivity, the four principles of connectivist learning in MOOCs (Downes, 2009a). They posited that a strength of MOOCs is in their ability to accommodate psychological diversity, but that for learning to take place, it is necessary to recognise the 'complexity of social, conceptual, and biological connections along with the complexity of human needs and the diverse circumstances' (Tschofen & Mackness, 2012, p.138). They also noted Wenger's (2005) description of learning as a 'journey of the self' and suggested that learning experiences might be less influential for learning in MOOCs than personality traits. The argument's focus on exploring how learners engage and motivate the self, reinforces Veletsianos' view (2013a) that MOOC research should heed the 'learner voice'. Despite this, even attempts at eliciting the learner voice may fall short of analysing the depth of the learner experience if the intention is 'to confirm rather than challenge the conceptual perspective underpinning the research' (Ashwin, 2012, p.138).

Learners' experiences of MOOCs are complex, diverse and not always positive. (Mackness et al., 2010; Mackness et al., 2013; Mackness & Bell, 2015; Waite et al., 2013; Williams et al., 2015). Misunderstanding, or not acknowledging, the complexity of these open online learning environments by MOOC conveners is both a technical error and an ethical one (Cilliers, 2005; Morrison, 2008). A review of the research suggests that the ethics of teaching and learning in complex adaptive systems, a recognition of participants' unique subjectivity (Biesta, 2013b), the psychological dimensions of their learning, the fragility of their identity development (Barnett, 2007; Wenger, 1998) and the potential for deep transformative learning experiences (Wenger, 1998), have been neglected by all but a few researchers into MOOCs. Osberg and Biesta (2008) point out that the 'planned enculturation' of more traditional learning environments is not achievable in complex systems where meaning emerges as something new and unpredictable. In these systems, educators cannot control what emerges and there is always a risk associated with this uncertainty (Fenwick, 2009).

Open learning environments therefore require a 'pedagogy for human beings' (Barnett, 2002, cited in Kop et al., 2011), which can enable transformational learning experiences (Williams et al., 2015) but may also involve a pedagogy of risk (Barnett, 2007). A pedagogy for an age of uncertainty should aim to 'affirm the humanity of each individual student' (Barnett, 2007, p.137). This suggests that a more holistic and critical view is needed and learners' experiences need to be explored in the context of the design of the MOOC, and the pedagogical approach adopted by the teachers.

2.4 Connectivism and the complexity of the cMOOC learning environment

A distinguishing feature of cMOOCs is that they are designed for learning to take place across distributed platforms (Bates 2015; Mackness, 2013a) and social media sites (Fini, 2009), using distributed resources. This design is intended to be disruptive and to mirror the complexity of learning in a digital age of overwhelming distributed information abundance (Downes, 2007; Siemens, 2006). It is based on the theory of connectivism, which integrates principles of chaos, network, complexity and self-organisation theories.

Connectivism is an emerging theory yet to be fully validated. My research has been informed by connectivism and has contributed to a growing body of empirical work and a

deeper understanding of the principles of connectivism (Mackness et al., 2010; Mak et al., 2010; Tschofen & Mackness, 2012; Williams et al., 2011, 2012a).

The underpinning idea behind connectivism is that knowledge is a set of connections and that learning is the formation of a network of connections in the mind or in society. Connectivism emphasises the primacy of making connections at social, conceptual and neural levels (Downes, 2005; Mackness et al., 2010; AlDahdouh, Osório & Caires, 2015). These connections are constantly changing and adapting (Downes, 2013b). Therefore, as mentioned previously (see p.22), to learn, learners must develop the ability to construct and traverse networks.

Connectivism's value as a new and emerging theory lies in its acknowledgement that knowledge is distributed in the network of the world-wide web, and information is constantly changing and quickly going out of date (Siemens, 2004). This distinguishes connectivism from other learning theories.

There are four major conditions for the application of connectivism in practice. These are autonomy, diversity, openness and interactivity. These are the design dimensions for learning in networks that my colleagues and I have explored. We have not critiqued connectivism as a theory. This has been done by several authors (e.g. Verhagen, 2006; Kerr, 2007; Kop & Hill, 2008; Bell, 2011; Clarà & Barberà, 2013a; Dron, 2014; AlDahdouh et al., 2014; Knox, 2016), who have been responded to by Downes and Siemens, the proponents of connectivism (Siemens, 2006; Downes, 2013e 2014a, 2015a). These critiques have questioned whether connectivism offers anything new as to how learning takes place (Verhagen, 2006; Kerr, 2007), whether it is a learning theory (Kop & Hill, 2008), a theory of how to learn (Dron, 2014) or simply a phenomenon (Bell, 2011), whether it can offer a solution to the learning paradox, conceptualize interaction and explain concept development (Clarà & Barberà, 2013a) and whether it privileges the human subject without telling us enough about the human subject's place in the theory (Knox, 2016). These critics suggest that connectivism lacks coherence as a theory.

AlDahdouh et al. (2014), whose critique is the only one that has been favourably received by Downes (2015a), point out that what is striking about these criticisms of connectivism is the inconsistency between them and the contradicting interpretations and misunderstandings embedded in some of them. However, this is to be expected for a developing theory.

Whilst most of the critiques of connectivism have focused on comparisons between connectivism and existing well-established learning theories, my work has explored the

principles of connectivism as criteria for successful learning in networks. Rather than theory I have been interested in the four elements of the 'semantic condition' of connectivism (Downes, 2013b) and the implications of these for teaching and learning in open learning environments and their design.

A key finding from an early paper (Mackness et al., 2010) was that whilst all four principles are achievable in learning networks, when applied to a course they can be compromised. 'Sometimes what makes for good networks, can make for bad courses' (Downes, 2013b). The principles of connectivism are principles for networks rather than for courses, communities (Bell et al., 2016) or groups (Downes, 2009b). It is unfortunate that the word 'course' was ever used to describe the original pedagogical experiment of massive open online learning, as it has limited an understanding of the principles of connectivism to its relationship with educational courses, rather than to networks in general.

Within a network all four principles (autonomy, diversity, openness and interactivity) are interdependent and work across multiple dimensions, influencing each other and leading to emergent learning (Downes, 2013b). They should be considered together. The potential of learning environments designed according to these interdependent principles of connectivism for emergent learning was recognised early in my research and resulted in the development of the Footprints of Emergence framework for exploring learners' experiences in open learning environments (Williams et al., 2011; 2012a). We took a holistic view of learning in open online learning environments, acknowledging the principles of connectivism as fundamental to successful learning networks, but as explained in our papers, difficult to realise in the practice of a course. In a course, meaningful connectedness is difficult to achieve (Mackness et al., 2010). In researching the impact of the principles of connectivism on dimensions of individual learner experience in MOOCs, Carmen Tschofen and I concluded that:

> Connectivism may offer a framework in which the focus on the primarily external structures, processes, and demands of learning (which even in contemporary execution could be regarded as vestiges of behaviorism) is reduced, and factors which address and accept how learners engage and motivate the self in the development of personal potential come to the fore. It is in the context and recognition of this engagement of the self that we find connectivism is a prescient and viable framework for learning, offering great potential …but also offering paradoxes and uncertainty during transitional times in the understanding, acceptance, and incorporation of these ideas (Tschofen & Mackness, 2012, p.139).

The response to an approach to designing open learning environments based on the principles of connectivism has been on two levels. The first has been, as noted above, to question or refute that connectivism is a theory that provides an adequate conception of learning in psychological or epistemological terms (Clarà & Barberà, 2013a; 2013b) or even a theory at all (Bell, 2011; Dron, 2014; Knox, 2016; Kop & Hill, 2008; Verhagen, 2006). Downes rejects these criticisms writing that:

> 'connectivism says that learning is something very different from what is described in other theories [….] the vocabulary of learning it employs is in some ways importantly incommensurate with that of other theories' (Downes, 2014b).

The second has been to try and reduce the complexity of the MOOC learning environment through:

- the design of xMOOCs, which rejected original cMOOC intentions (Chiappe-Laverde et al., 2015) and is regarded by some as a pedagogical step backward (Stacey, 2013)
- the design of an ever-increasing number of hybrid MOOCs, i.e. those that mix cMOOC and xMOOC design principles (Anders, 2015; Balsamo et al., 2013; Beaven, Hauck, Comas-Quinn, Lewis & de los Arcos, 2014; Lane, 2012; Levine, 2014; Mackness & Pauschenwein, 2016; Meijerink, Kiers & Marquis, 2016; Roberts et al., 2013; Röthler & Creelman, 2016; Watolla, 2016; Yousef, 2015)
- a quest for effective MOOC design (Alario-Hoyos et al., 2014; Conole, 2015; Grover, Franz, Schneider & Pea, 2013; Kop & Fournier, 2015; Salmon, Gregory, Dona & Ross, 2015; Warburton & Mor, 2015).

Ironically, trying to impose order on cMOOCs, to bring institutions into line with each other, to see consistency, to agree on standards and so on, risks losing their potential for creativity, innovation and experimentation (Mackness, 2013b cited in Fournier & Kop, 2015).

Rather than try and order the cMOOC environment, Williams et al. (2012a) and Williams & Mackness (2014) have tried to unpick and work with its complexity by designing the Footprints of Emergence framework. In creating this framework, they concur with Veletsianos (2013a) that MOOC research needs to focus more on eliciting the learner voice. Their research also echoes Bayne and Ross's (2014) view that pedagogy is not just a matter of the MOOC platform, or MOOC design, but a

> 'complex negotiation between platform, the teaching approaches of the academic team developing the course, disciplinary and institutional norms and expectations, and the pattern of learner interactions as the course is played out' (Bayne & Ross, 2014, p.54).

2.5 Challenges facing cMOOC teachers

Two defining features of the MOOC environment that impact on and challenge the roles of teachers are massiveness and openness (Bayne & Ross, 2014; Farrow, 2015; Ferguson & Whitelock, 2014; Miller, 2015; Weller, 2013b).

Massiveness

Massive numbers of participants mean that the teacher can no longer expect to 'know' or interact with each and every student. The need for self-efficacy (Hodges, 2016; Wang & Baker, 2015; Willis, Spiers & Gettings, 2013) and self-determined (Tschofen & Mackness, 2012), self-regulated (Hood, Littlejohn & Milligan, 2015) and self-organised learning (Saadatmand & Kumpulainen, 2014) is increased by the open, massiveness of MOOCs.

Kop et al. (2011) have written that the uncertainty associated with complex MOOC environments requires a shift from a pedagogy based on 'a web-based environment of abundance', which they call a pedagogy of abundance, to a pedagogy of support, 'where the social connections people make on the network provide their learning support' (p.75). Others have also highlighted MOOCs as liminal spaces where learners encounter threshold concepts and practices (Meyer, Land & Baillee, 2010; Waite et al., 2013) and can experience epistemic and ontological transformational shifts that impact on their identities (Williams et al., 2015). This suggests that in these uncertain environments learning needs scaffolding and support (Miller, 2015; Waite et al., 2013) and the presence

of a teacher as a moderator and co-learner (Buhl & Andreasen, 2015; Mackness & Pauschenwein, 2016). Anderson (2003, p.4) believes that 'Deep and meaningful formal learning is supported as long as one of the three forms of interaction (student-teacher; student-student; student-content) is at a high level'. In order to cope with large numbers of participants, MOOC teachers necessarily advocate peer-to-peer support rather than student-teacher support. For the conveners of the first cMOOC this was more than a pragmatic solution. It aligned with their philosophical beliefs that in a digital age learning happens in the multiple connections that are made across a distributed network rather than primarily between student and teacher.

Some have suggested that heutagogy, the study of self-determined learning (Hase & Kenyon, 2001) in which the learner is 'the major agent in their own learning' (Hase & Kenyon, 2007, p.112) is a more appropriate term than pedagogy when discussing teaching and learning in MOOCs (Terras and Ramsay, 2015). Beaven et al. (2014, p.36) drawing on the work of Blaschke (2012) suggest that the demands on learner maturity, autonomy, self-determination and participatory skills in a MOOC increase as they move from a pedagogical model of engagement, to an andragogical model of cultivation and then to a heutagogical model of realization. At the same time the level of instructor control and course structuring decreases. This is evident in cMOOCs which intentionally downplay the role of the teacher (Mackness et al. 2010; Mackness & Bell, 2015) and rely on MOOC participants to be self-directed learners (Bentley, Crump, Cuffe, Jamieson, Macneill et al., 2014; Kop & Fournier, 2011). In 2008, following experience of the massiveness of the first MOOC, Kop and Hill even went so far as to suggest that 'The role of the tutor will not only change, but may disappear altogether' (Kop & Hill, 2008, p.9).

Openness

Openness in the early MOOCs related to altruistic intentions, notably the creation and sharing of open educational resources (reuse, remixing, repurposing and feeding forward) and transparent ways of working. These original intentions are not reflected in xMOOCs, where openness has become conflated with 'free' (Chiappe-Laverde, et al., 2015). In cMOOCs openness in teaching is more a philosophy of education and a way of 'being a teacher', a state of mind (Weller, 2011, p.7) and an inner state rather than an external expression (Tschofen & Mackness, 2012). Openness is thus not only technological, but

also a social, cultural and economic phenomenon (Peter & Deimann, 2013, p.11). However, for teachers and learners, the practice and pedagogy of openness has proved difficult to achieve. It is more than the use of open educational resources (Chiappe-Laverde et al., 2015, p.14; Weller, 2013b). Knox (2013a) has suggested that openness is under-theorised and Edwards (2015, p.3) asks what forms of openness are justifiable. The University of Edinburgh in their Manifesto for Teaching Online (2016) state that: 'Openness is neither neutral nor natural: it creates and depends on closures'. The fact that openness could be more complex than originally thought might explain why a pedagogy of openness is difficult to realise.

Both massiveness and openness come with risks that can impact on teachers' identities (Mackness et al., 2013; Ross, Sinclair, Knox, Bayne & Macleod, 2014; Veletsianos, 2013b) and it is within this context that MOOC teachers try to position themselves. Recently, Biesta (2013a) has decried the shift from teaching to learning that we see in cMOOCs, where learners are expected to 'teach' each other. He has called this 'learnification', which he associates with the downgrading of teaching into facilitation. Both Biesta (2013a, p.42) and Barnett (2007, p.36) write of the fragility and vulnerability of learners, and the importance of the relationship between teacher and learner. The teacher's role is to support the student in hauling 'himself out of himself to come into a new space that he himself creates' (Barnett, 2007, p.36). Views such as these, when applied to MOOCs, make teaching more complex (Ross et al., 2014) and MOOC teachers, particularly in cMOOCs, are still at an early stage of adopting experimental pedagogies.

2.6 MOOCs as environments for testing experimental pedagogies

Bayne & Ross (2014) feel that MOOCs are justifiably a promising space for experiments and some researchers are investigating what aspects of teaching can be automated (Bayne, 2015; Vu, Fredrickson & Meyer, 2016). Bayne is experimenting with the use of 'bots', which she claims would enable us to explore new ways of valuing teacher presence in massive, open, online environments (p.460). Vu et al. (2016) suggest that the use of 'chatbots' for teaching would help to provide 24/7 support for online students.

Some MOOC facilitators embrace the possibility of experimentation, thinking of MOOCs not as a course but as an event (Adams et al. 2014), which is not time-bounded and may

continue after the official end of the course (Bell et al., 2016; Fournier & Kop, 2015 p.239; Mackness & Bell, 2015). Mackness & Bell (2015) and Mackness et al. (2016) have questioned the ethics of experimenting on learners. They concur with Marshall (2014, p.250) that significant ethical concerns 'include the academic duties of care and integrity'. This resonates with the early work of Noddings (1984) who wrote that 'The primary aim of all education must be the nurturance of the ethical ideal' (p.6). Williams et al. (2015) have also suggested that complex adaptive systems such as open learning environments, which allow for emergent learning, 'are defined by negative constraints, i.e. by specifying what may not happen, while leaving as much room as possible for what actually may happen, with the learning event' (p.199). Part of a MOOC teacher's role is to ensure that learners know what they should not do and what should not happen in the learning environment, i.e. the boundaries of openness (Mackness et al., 2010, p.272).

Some MOOC educators have been slow to recognise the associated issues of power, ethics and responsibility (Fenwick, 2009; Mackness et al., 2010; Mackness & Bell, 2015; Morrison, 2008; Prinsloo & Slade, 2016). Experimenting with open learning involves creating spaces in which learners are called into presence (Osberg & Biesta, 2008), but this brings with it increased responsibility for educators.

> '… to eschew the insertion of responsibility in education processes for fear of controlling or colonising others is, Biesta (2006) argues, to be irresponsible.' (Fenwick, 2009, p.12)

This does not negate the possibility of experimentation, which is necessary for a critical perspective on teaching practices in these open learning environments. Rather it highlights that experimentation carries with it ethical responsibilities that might involve rethinking a pedagogy of support not as a single approach, but as on a spectrum between more support for less independent learners and less support for more independent self-directed and self-determined learners.

Despite research into automating teaching in MOOCs and the decentring of the role of the teacher (Mackness & Bell, 2015), teaching in MOOCs remains 'a non-trivial task' (Margaryan, Bianco & Littlejohn, 2015, p.82) and high risk (Bayne & Ross, 2014). Some

researchers have found the instructional quality in MOOCs to be poor (Margaryan et al., 2015) and a failed MOOC can be embarrassingly visible (Morrison, 2013; Kolowich, 2014).

2.7 Summary

Early research focused on trying to define MOOCs. This has proved to be an unrealistic aspiration. MOOCs have not developed as expected. The original democratic, altruistic intentions behind connectivist MOOCs, intentions which would exploit and develop the work of the open education resources movement, have not yet been realised. Within four years of the first MOOC, institutions and individual lecturers saw the potential for celebrity status and a global reach, and xMOOCs, which some have seen as a retrograde step (Stacey, 2013), were born.

Since 2012 understanding of the philosophy behind MOOCs has become increasingly confused. This is evident in the research output. The massiveness of MOOCs rather than their openness has been the focus, which has led to an upsurge of interest in the use of data analytics and quantitative data analysis. There are now many published papers on MOOC learners' completion rates and learners' behaviour patterns (see pages 23 and 24). Low completion rates have been seen as a failure of MOOCs, even though 'open' in its originally intended sense means that learners can come and go as they please in a MOOC. Some have thought that the answer to this must lie in creating an effective design framework for MOOCs, resulting in an increasing interest in learning design (Dalziel, Conole, Wills, Walker & Bennett et al., 2016) and a variety of suggested frameworks. Most of these frameworks tend to try and order these open learning environments rather than embrace the complexity of the learning experience in a holistic way.

The realisation that the individual learner and MOOC teacher have featured very little in the increasingly large body of research has been slow (Veletsianos, 2013a; Bayne & Ross, 2014). These are now recognised as gaps in the existing research. MOOCs present real challenges in reaching individual learners (Mackness & Pauschenwein, 2016), particularly since many of the learners whose experiences would be of most value to explore are those who 'drop out' or are 'lurking' (Kop & Carroll, 2011). Similarly, MOOC teachers are difficult to research because each MOOC is unique, making it difficult to compare one experience or teaching approach with another (Haywood, 2016). Nevertheless, research is

now beginning to turn its attention to the 'learner voice' in MOOCs and the roles of teachers. This is much needed. These are the issues that my collaborators and I have sought to address, both through empirical research and through close attention to the design of these complex, open, online learning environments.

3. Methodology and Choice of Methods

In this section I discuss the methodological approaches that I have adopted with particular reference to subjectivity and insider research. I then consider the challenges that researchers investigating learners' experiences in MOOCs face when selecting the participant sample and the research methods to be employed. This is followed by a discussion of the ethical implications of this new field of research, both for myself and for the wider research community. Predominantly I have taken a qualitative approach to data collection and analysis. The ethical dilemmas and ambiguities associated with research that takes this approach are well documented (e.g. Dench, Iphofen & Huws, 2004). I will complete this section with a discussion of these challenges and the limitations of the research.

3.1 My overall approach

All my empirical research has sought to discover and understand meaning from a large range of voices and variation in real world situations (Merriam, 2002). It is inductive, interpretive (Veletsianos et al., 2015), emergent, evolving and based on experience. It is also open-ended, flexible, process-oriented and has used a variety of approaches. The research has explored specific open online courses and environments, analysing qualitative data collected from course participants via multiple methods (see for example Waite et al., 2013) to identify themes, patterns and issues.

This emergent, practice-led approach to researching an emerging phenomenon, cMOOCs, which in turn are based on a newly proposed, not yet established, emerging theory (connectivism) does not align well with existing established methodologies. Several researchers have called for new methods for researching learners' experiences in MOOCs, (Bates, 2014; Downes, 2014c; Eynon et al., 2014; Raffaghelli et al., 2015; Ross, 2015; Ross, 2016; Veletsianos & Shepherdson, 2016) and there is increasing interest in speculative research approaches, which recognise the potential impact of uncertain futures on education and the need for alternative approaches to research (Ross, 2015; Ross, 2016; Wilkie, Savransky & Rosengarten, 2017). Qualitative approaches such as ethnography, phenomenology, grounded theory, field research, narrative research and case study research, pre-suppose a prior strategy or plan for action, based on a specific approach.

My research has not only arisen serendipitously from immersive experience as a cMOOC participant, but has also focused on the study of emergent phenomena (Williams et al., 2011; 2012a). In addition, whilst the research has used established methods for collecting qualitative data (see Section 3.4 below) it has mixed different methods and has also made use of emerging technologies to conduct this collaborative research (Bell et al., 2016). As such the research has been exploratory in design and conducted in the spirit of Feyerabend's 'Against Method', acknowledging the methods-theory gap which has arisen from the introduction of connectivism as a proposed new theory. Feyerabend (1975) advocated an 'anything goes' approach to try and free science from methodological restrictions, but this should not be equated with lack of rigor. In this research rigor has been achieved through stringent peer-review and peer- debriefing between collaborators, triangulation from multiple data sources and a consistent effort to elicit and report on alternative perspectives. Flexibility, agility and retrospective coherence have thus been key characteristics of my research methodology.

My research has primarily been conducted as a participant observer from an insider perspective. In doing this I have attempted to understand the culture of the participant group and how participants behave, interact and communicate (Bell et al., 2016; Mackness & Bell, 2015) and have acknowledged MOOCs as environments in which there are many different perspectives and realities (Williams et al., 2011; Williams et al., 2012a).

3.2 Subjectivity and insider research

In conducting insider research not only do we seek to discover more about the participants' subjective experience, but our own subjective experience is also part of the mix and contributes to the research (Fenwick & Edwards, 2010; Mackness & Bell, 2015). Both the participants and the researcher interpret the complexity of the social and cultural environments being studied through subjective lenses (Grbich, 2013, p.53; cited in Dale Bloomberg & Volpe, 2016). Insider research means being directly involved or having direct connection with the research setting and raises questions about validity (Rooney, 2005). Interpersonal relationships with research participants, tacit insider knowledge, political and cultural standpoints and personal loyalties can all lead to researcher bias and misinterpretation. On the other hand, insider research can elicit more

authentic, richer information, so potentially increasing the validity of the research findings (Rooney, 2005).

My experience suggests, in agreement with other authors (e.g. Deutsch, 1981; Griffith, 1998; Merton, 1972; Narayan, 1993; Surra & Ridley, 1991), that insider/outsider perspectives are best viewed as a continuum with many dimensions affected by time, location and participants (Mercer, 2007) rather than a dichotomy (Dwyer & Buckle, 2009). As Mercer writes (2007, p.6),

> '…. we are all "multiple insiders and outsiders" (Deutsch, 1981, p. 174), moving "back and forth across different boundaries" (Griffith, 1998, p. 368), "as situations involving different values arise, different statuses are activated and the lines of separation shift" (Merton, 1972, p. 28). '

Like many other researchers, who take a subjective, insider approach, I question whether complete objectivity is possible or desirable (Adler & Adler, 2012; Heshusius, 1994; Merton, 1972) and I have not attempted to achieve this. Rather I have fully engaged with the research settings as a participant, using my blog to reflect on and share my thinking and to maintain an on-going dialogue with research participants (Esposito, 2012). Critical reflection, meticulous collaborative record keeping in bespoke wikis, data triangulation, on-going open communication and sharing of progress with research participants and a focus on non-numerical information, have all been used to try and minimise subjectivity in the search for meaningful and in-depth interpretation of the data.

3.3 The participant sample studied

For the empirical research the participant samples were self-selected. A survey or a call for participants was distributed to all enrolled on the course/MOOC being studied (or as many as it was possible to reach) and the research conducted on data collected from respondents. This approach can be problematic when researching MOOCs; it is well known that many participants either drop out of the MOOC before completion (e.g. Jordan, 2014) or 'lurk' (e.g. Adams et al., 2014). Respondents are more likely to be those who have been successful learners in the MOOC and it is difficult to reach those with an alternative perspective. I have attempted to overcome this (Bell et al., 2016; Mackness et

al., 2010; Mackness & Bell, 2015; Mak et al., 2010) by making every effort to reach and inform all MOOC participants and enabling anonymous responses to survey questions.

An additional problem associated with research into MOOC learners' experiences is that the number of respondents is usually a very small percentage of the total number of MOOC participants. Raffaghelli, Cucchiara and Persico (2015) have written that this makes it difficult to generalise from the research findings. However, interpretive research does not aim to generalise from findings to the general population (Denzin, 1983). Rather it seeks to 'produce a coherent and illuminating description of and perspective on a situation that is based on and consistent with a detailed study of that situation' (Schofield, 2002, p.203). In this way, the research 'can arrive at insightful inductive generalizations' (Polit & Beck, 2010) that can inform future research, policy and practice in teaching and learning in MOOCs. Polit & Beck (2010) cite Cronbach (1975, p.125) and Guba (1978, p.70) as saying that any generalization, be it from statistical, analytic or transferability models of generalization, is a working hypothesis which needs to be repeatedly tested. This must be relevant to MOOC research which is still an emerging field. Perhaps the best that MOOC researchers who analyse qualitative data can hope for is 'reasonable extrapolation' (Patton, 2001, p.489, cited in Polit & Beck, 2010), although Downes questions whether even this is a desirable outcome and has written

> If e.g. the nature and properties of the diverse learners are emergent, then they won't be related to each other in any generalizable way; the only usable generalizations would be drawn at the level of micro phenomena from which they emerge (personal communication, Jan 15, 2017).

3.4 The choice of research methods

The use of qualitative surveys, email interviews and Skype interviews to elicit the learners' voices, which Veletsianos and Shepherdson (2016) have found are largely absent from the literature, are, with participant observation, the primary forms of data collection for my work.

Raffaghelli et al. (2015, p.502) consider these methods to be time-consuming and 'of little use' for researching large cohorts of learners, but possibly of use to MOOC designers or

facilitators. This comment would seem to misunderstand the purpose of this type of research, which does not seek consensus, nor to quantify results, but rather to dig deeper and understand the meaning of experience (Veletsianos et al., 2015). Despite this a mixed methods approach that triangulates data collection and analysis can help to guard against bias, which is a possible pitfall in insider research (Fournier, Kop & Durand, 2014). My more recent research (Bell et al., 2016) has explored this approach through the addition of social network analysis to the analysis of qualitative data gained from more traditional approaches. This evolution in my use of research methods reflects a move from an enthusiastic and experimental approach to a more critical, objective and strategic approach to MOOC research (Ebben & Murphy, 2014).

3.5 Ethical dilemmas in MOOC research

Ethical concerns have been a significant element in my empirical research since 2008. As an independent researcher, I have had to determine a personal ethical approach to research and have always been conscious of the need to follow ethical research principles such as respect for persons, informed consent, honesty, integrity, carefulness, openness, and 'do no harm'. Principles such as these form the basis of many recognised guidelines, e.g. AoIR (2012), BERA (2011), BPS (2010), ESRC (2015). In addition, research findings (including my own) have indicated a need for greater attention to ethical teaching and learning practices in open online learning environments, particularly MOOCs (Farrow, 2016; Mackness et al., 2010; Mackness & Bell, 2015; Marshall, 2014; Rolfe, 2015). To investigate learner experiences in MOOCs I have engaged with ethics on two levels, the ethics of researching and participating in MOOCs and the ethics of teaching in MOOCs.

The ethics of researching and participating in MOOCs

Research into the ethics of online teaching and learning, particularly MOOCs, is limited and presents unfamiliar challenges (Eynon, Schroeder & Fry, 2009; Jones, 2011; Rolfe, 2015). Openness, a key principle of MOOCs, changes the way we teach and interact and creates new responsibilities for researchers, particularly those, like myself, who take advantage of this openness to work outside an institution and with open data (Farrow, 2016). This has led some authors (Farrow, 2016; James & Busher, 2015; Rolfe, 2015; Siemens, 2015) to call for new ethical approaches and frameworks for researching education in the open which should build on existing guidelines but also account for the

fast-changing, online, diverse and unpredictable landscape. A flexible, adaptable, negotiated ethical approach is needed (Convery & Cox, 2012). Farrow (2016), James & Busher (2015) and Convery & Cox (2012) all suggest 'ethical pluralism' as the appropriate teleological view, which they believe to be more suited to the online environment. This aligns with a view of MOOCs as complex adaptive systems in which there is a diversity of learners with many alternative perspectives (see Section 4.2, p.46, for further discussion on this point).

Over time, I have drawn on both deontological and teleological approaches to ethics, initially being guided according to the specifics of the projects by institutional ethical approval (Mackness et al., 2013; Roberts, Mackness, Waite & Lovegrove, 2013; Sharpe & Mackness, 2010; Waite et al., 2013) and published guidelines (Guldberg & Mackness, 2009; Mackness et al., 2010; Mak et al., 2010), but latterly negotiating the ethical framework with research participants (Bell et al., 2016; Mackness et al., 2016; Mackness & Bell, 2015). In taking the latter approach, we faced two challenges. First, it was impossible to know whether every participant who ultimately participated in the research had the opportunity to engage with the negotiation process. Second, despite our precautions, it was difficult to ensure privacy and anonymity for research participants whose identity and 'learner voice' could be recognised across distributed sites, a problem also noted by Dawson (2014). This ambiguity and blurring of boundaries between public and private spaces on the Internet has been highlighted in the Association of Internet Researchers (AoIR) guidelines.

Applying rigorous ethical principles to MOOC research remains a challenge for researchers. Whilst this empirical research is exciting, it raises challenging questions related to working with 'human subjects', the collection and dissemination of online data and consideration of diverse cultural, legal and social contexts (Eynon et al., 2009, p.197). Some researchers have argued that the 'human subject model' is no longer appropriate for online research (Basset & O'Riordon, 2002; Knox, 2016) and recently researchers have questioned whether an 'avatar' or a 'bot' should be considered a 'human subject' when determining an ethical approach to research (Eynon et al., 2009). Perhaps the ethical concern here relates more to the human responses that the avatar or bot might elicit rather than whether these devices are 'human'.

A key point to come out of these ethical considerations is that ethics is a personal responsibility, and researchers must be vigilant in monitoring their own ethical behaviours. As Pat Thomson (2015) writes on her well-known blog 'patter':

> 'Because questions of power, rights and moral principles underpin research, 'ethics' is never a matter of simply meeting institutional requirements. […] Ethics seems to me to be about a sensibility, a way of being in the world as a researcher…'

The ethics of teaching MOOCs

In 2012 I collaboratively designed, taught and researched a MOOC (Mackness et al., 2013; Roberts et al., 2013; Waite et al., 2013). Ethical clearance for this MOOC research was received from the associated institution, an institution recognised for its teaching excellence. Whilst the MOOC was an experiment in opening an existing face-to-face course to the world, the pedagogy was informed by well-researched principles of best practice in online learning, such as those expounded by Garrison et al.'s community of inquiry framework (1999) and Salmon's model for learning online (2012, 2013). Integral to this course, which was about teaching and learning in Higher Education, was an understanding of the meaning of teaching professionalism (Fenwick, 2016) and the knowledge that teaching involves not only modelling ethical teaching practices and behaviours, but also an ethics of care (Gilligan, 2001; Noddings, 1984).

An ethics of care approach has not been evident in all MOOCs (Mackness & Bell, 2015; Willis & Strunk, 2015). In the first MOOC, CCK08, the approach to care of course participants was 'let them sink or swim' believing that this models the nature of learning in an age of uncertainty and information abundance (Mackness et al., 2010). Whilst an understanding of pedagogy in open online spaces cannot progress without experimentation, treating MOOC participants as guinea pigs (Grimes, Fleischman & Jaeger, 2009) or lab rats (Mackness & Bell, 2015) without due consideration of the potential associated ethical issues is problematic (Marshall, 2014).

Teaching in open online courses, particularly courses which take a radical experimental approach to course design and delivery, makes considerable demands on a teacher's personal professionalism and ethics. As Fenwick (2016) states 'received notions of professionalism [….] do not account for the complex ethical encounters and multiple ecologies of contemporary practice in professional work' (p.674). However, if we accept that modelling is a key principle of teaching (Downes, 2010), then the teacher can potentially model both ethical and unethical practice and that practice will influence learners (Marshall, 2014, p.254). With modelling comes responsibility and a duty of care to learners (Gilligan, 2001; Gourlay, 2011; James & Busher, 2015; Noddings, cited in Smith, 2014, 2016). Teachers in MOOCs need to reconcile the tensions between experimentation, ethics and professionalism and determine at what point a duty of care is breached (Rolfe, 2015).

My ethical approach has therefore been one that views a deontological ethical approach as necessary but not sufficient (Esposito, 2012). The meaning of what is public/private data, anonymity, informed consent and insider participation all take on new perspectives in open environments, where unpredictable and unexpected ethical challenges can emerge as the research progresses. As such an iterative, negotiated, teleological, consequential ethical approach is needed.

3.6 Limitations of the research

My empirical research has employed traditional methods for collecting qualitative data, such as participant observation and interviews. Raffaghelli et al. (2015) have pointed out that these methods provide rich data but do not 'scale' making it difficult to generalise from the findings. Raffaghelli et al. (2015) view this as a limitation. If this is so it is one that has, to date, dogged all attempts at researching learning in MOOCs using qualitative data alone. However, a contrary perspective might be that quantitative data that does 'scale' have not provided deeper insights into the learner experience of MOOCs (Adams et al., 2014).

Downes (2015b) has criticised MOOC research for 'clinging to antiquated models and approaches ….'. In relation to my own research this is a fair criticism, although increasing access to easy-to-use open source social network analysis and qualitative coding tools will

help to address this criticism, especially for independent researchers, like myself, who are self-funded. Downes (2015c) has also written that MOOC research is 'hopelessly biased in favour of the traditional model of education as practised in the classrooms' and sees what it expects to see. I have had a long career in the classroom, but have sought to understand and critique new experimental pedagogies in open learning environments and to avoid seeing what I expect to see with some surprising results (see Bell et al., 2016; Mackness et al., 2010; Williams et al., 2012a).

Other researchers have similar concerns to Downes which has resulted in calls for more open, collaborative, multi-disciplinary and inter-disciplinary research, that uses mixed methods to gain a deeper understanding of learning in MOOCs (Breslow, 2016; Eynon et al., 2014; Eynon, et al., 2016; Gaševic et al., 2015; Reich, 2015; Veletsianos & Kimmons, 2012; Veletsianos & Shepherdson, 2015). Eynon et al. (2016) have suggested that discourse analysis of discussion forum posts, combined with quantitative analysis might be an appropriate approach, but I would question how accurately discussion forum posts can represent the 'learner voice' that Veletsianos (2013a) says is missing from the MOOC research. The emotional subtext of communication can be lost in forum posts. Furthermore, research by Mak et al. (2010) on participant use of forums in the first MOOC in 2008 found that they were associated with open sharing of ideas and fast-paced challenging interactions. They reported that this caused quieter participants who sought more personal relationships to retreat to their blogs, from where continued participation was enabled through aggregation of the blogs into the course site. It is therefore difficult to judge how representative of the learner voice discussion forum posts can be.

I suggest that, in addition to researching learners' experiences and the roles of teachers, what is needed is a greater recognition of the complexity of MOOCs (Williams et al., 2011). I discuss this further in the penultimate section of this supporting statement (see Section 4.2: Contribution to understanding complexity in cMOOCs, p.46).

3.7 Summary

MOOC research is still nascent and emergent and whilst there has been a surge in the use of quantitative data analytics for researching learning in MOOCs, there has been little interpretive research (Veletsianos & Shepherdson, 2016). Current research also lacks

debate around methodological issues and is fragmentary in terms of focus and methodologies (Raffaghelli et al., 2015). As noted above, several researchers have pointed to the need for new research methods for investigating learning in new open online environments (Bates, 2014; Downes, 2014c; Eynon et al., 2014; Raffaghelli et al., 2015; Ross, 2015; Ross, 2016; Veletsianos & Shepherdson, 2016).

I have predominantly collected qualitative data using well established traditional methods such as participant observation and interviewing and have followed universally recognised and personal ethical principles to explore learner perceptions and experiences. Where possible I have tried to guard against insider bias and generalising from small samples by open dissemination of the research process, triangulating findings and through collaborative exchange of alternative perspectives.

Downes (2014c) has said that open online learning, particularly in MOOCs, is complex and messy necessitating a discovery approach to research that is open to emergent possibilities. My own research has taken this approach to methodology and process, evolving over time to adapt to changing contexts and situations and being open to emergent practices and new ways of thinking.

4. My Contribution to Understanding cMOOC Learning Experiences

The purpose of this section is to make explicit the contribution that my research as a whole has made to understanding cMOOC learning experiences. I will do this by first positioning my work in the field and then show how it has contributed to understanding the complexity of cMOOC learning environments by recognising them as complex adaptive systems. Finally, I will discuss how collaboration has been essential to my work, to my intellectual contribution and to changing research processes.

4.1 Contribution to the literature on learners' experiences in MOOCs

Between 2008 and 2013 fewer than 20 papers on MOOC research were published (Breslow, 2016). By 2015, the number of published papers had grown to 1500 (Breslow, 2016). Despite this, my review of the current state of the literature has revealed that many of the issues related to teaching and learning in connectivist MOOCs that we raised in our early papers (nine papers between 2008 and 2013) remain unresolved today. MOOCs are still an emerging concept (Loecke, 2016; Moe 2016) and it has been difficult to address the deeper learning and teaching challenges that MOOCs pose (Downes, 2015b; Selwyn, Bulfin & Pangrazio, 2015).

My research has not been concerned with completion rates, learner demographics or typologies. It has not been concerned with the broader institutional issues surrounding MOOCs such as policy, politics, economics, marketing and global reach. Instead it has maintained a sustained focus on trying to 'dig deep' (Veletsianos et al., 2015) into the experience of individual learners and determine how their learning is affected and influenced by the changing, open, unpredictable environments that are characteristics of connectivist MOOCs. Each of the 13 papers submitted for this PhD by published work has made an individual contribution to this field of research (as explained in the paper summaries in Appendix 3) and the position of my research in the field is evident in the review of current literature (Section 2, Literature Review, p.19).

4.2 Contribution to understanding complexity in cMOOCs

Teaching and learning have long been recognised as complex phenomena (Davis & Sumara, 1997) and recent research makes increasing reference to complexity in teaching

and learning (Bayne, 2014; Brown, 2016; Haythornthwaite, 2015; Knox, 2013b; Ross et al., 2014; Steffens, 2015; Straumshein, 2016; Veletsianos, 2016b). This complexity is greatly increased by connectivist MOOC environments, which demonstrate many of the characteristics of complex adaptive systems (Cilliers, 2004; Snowden & Boone, 2007). These systems require learners to be self-organised, to dynamically and frequently interact with people and resources and to embrace openness, uncertainty and unpredictability (Morrison, 2008). These are the expectations we have of cMOOC learners.

As a result of our participation in the first MOOC (CCK08) Roy Williams and I recognised the MOOC environment as one in which emergent learning naturally occurs (Sullivan, 2009; Williams et al., 2011). Through our participation and ensuing research, we became aware of the 'creative tension between openness and structure [that] lies at the heart of [….] complex adaptive systems' such as MOOCs (Williams et al., 2015) and began to explore this in terms of the learner agency afforded by these interactive environments. We questioned whether many of the existing analytic methods were appropriate 'for making sense of such dispersed, rapidly changing, intricately entangled sets of phenomena' (Davis & Sumara, 2008, p.37) and thought a holistic view of the system and the ecology of its interacting elements was needed. From this thinking we developed our multi-dimensional Footprints of Emergence framework (Williams et al., 2012a). This practical framework, which makes a unique contribution to research in this field, is used to elicit tacit understanding of the learner experience by considering this as being on a spectrum between prescribed and emergent learning (Williams et al., 2011). The drawing tool associated with the framework enables a visualisation of emergent learning and supports deep reflection on how this occurs and is valued by learners (Williams et al., 2012a). Learners, teachers, designers and researchers have used the framework to gain new insights into the complexity of open learning environments (see Footprints of Emergence open wiki).

I argue that whilst learning in complex adaptive systems should be radically open, unpredictable and involve risk, this does not equate to a 'sink or swim' approach (Mackness et al., 2010). The diversity of learners attracted to open courses, means that there will also be a diversity of needs in terms of the levels of support required to self-

organise and learn in these open environments. As such, rather than a 'hands off' approach (Mackness & Bell, 2015), light-touch intervention and negative constraints (Mackness et al., 2010; Mackness & Pauschenwein, 2016) are needed if education is to be not just about qualification and socialisation, but also about subjectification, which Biesta defines as 'bringing being into life' (Biesta, 2013b). Teachers play a vital role in this (Bayne & Ross, 2014; Morrison, 2008; Sullivan, 2009) and need to be able 'to make wise situated judgments about what is educationally desirable' (Biesta, 2013b, p.140). The Footprints of Emergence framework (Williams et al., 2011; Williams et al., 2012a) emerged from our research to help make these judgements and consider the characteristics of the space required for 'each student to forge his or her own becoming' (Barnett, 2007, p.137).

4.3 Contribution to changing research processes

All the papers submitted for this PhD by published work have been co-authored. Collaboration has been central and essential to my contribution. Of the 13 published works submitted I was the lead author on five papers and made a significant contribution to eight others. This contribution involved mutual exchange of ideas, information and knowledge, and joint authoring on bespoke private wikis over many weeks and months. Collaboration also involved shared responsibility for data gathering and analysis, literature reviews, editing, formatting, proof-reading drafts and responding to reviewers. On only one of the papers submitted for this PhD has my role been more minor (Waite et al., 2013) and confined to peer feedback on and editing the lead author's script.

I believe that our collaborative research is distinctive for the way in which it has influenced the development of our own learning (Williams & Mackness, 2013). Furthermore, this research process has mirrored the principles of openness, connectivity and emergence that have been the subject of study. It has been unconventional in that, for the most part, my collaborators and I have not conducted our research in affiliation with an institution. There has been commitment to publishing in open journals wherever possible and openly disseminating the research through on and offline presentations, blogs and open wikis (Williams & Mackness, 2013). Veletsianos (2016a) has said that emergent scholarly practices and the use of emerging technologies in education are not yet fully understood or fully researched. This has led Ross (2016) to describe these new ways of working as risky and uncertain, requiring new speculative methods which

recognise the complexity of emerging technologies used for research purposes. We believe that the lack of hierarchy and the sense of mutual accountability and responsibility in our collaborative teamwork are essential ingredients to make this type of 'guerrilla research' (Farrow, 2016; Weller, 2013a) effective.

The submission of co-authored papers for the award of a PhD raises the question of what has been my individual intellectual contribution. Claiming an individual intellectual contribution for work that has depended on collaboration is, for me, problematic. This problem has been well articulated by my long-term research colleague, Roy Williams, with whom I have collaborated on many publications (see Appendix 1), who has written:

> It does need to be stressed that our research has always been collective, in the sense that identifying the boundaries between one person's contributions and another's has not only not been an issue, it has rightly been considered rather counterproductive to furthering good and useful research methodology, theory, data, and analysis. (Appendix 5).

Two other collaborators, Mariana Funes and Carmen Tschofen, have also written statements attesting to my intellectual contribution (Appendix 5).

Reflecting on these generous statements, I am reminded that my intellectual contribution is a product of my long career in teaching and associated ongoing interest in how people learn (see Table 2, p.15). Early in my career, teaching small children gave me valuable experience in unpicking complex ideas to make them more accessible to learners. Combined with experience of editing a medical journal, this has given me an eye for detail and how this relates to the whole picture. Experience of science teaching heightened my awareness of misconceptions and alternative perspectives and helped to develop my questioning skills, which has enabled me to bring a critical approach to our collaborative endeavours. Later in my career, researching and working with online communities of practice (Guldberg & Mackness, 2009; Sharpe & Mackness, 2010), designing and delivering online courses, participation in the first MOOC (Mackness et al., 2010; Mak et al., 2010), and contribution to the design of the UK's first MOOC (Mackness et al., 2013; Waite et al., 2013), all provided me with the opportunity to share knowledge and

understanding of these practices and associated theories, and take advantage of appropriate open software and digital technologies.

To sum up, my intellectual contribution has included raising research questions and putting the research issues in context, theoretically and practically; specific theoretical and practical expertise gleaned from extensive teaching and learning experience both on and offline; collecting, analysing, interrogating and synthesising relevant data; extracting key lessons and insights; and documenting and authoring findings and conclusions in bespoke, personally created wikis. In addition, through my research, I have contributed to further knowledge and understanding of emergent phenomena in open learning environments (through the development of the Footprints of Emergence framework), the principles of connectivism, the rhizome as a metaphor for teaching and learning in a MOOC and learners' experiences in cMOOCs. However, all this has been within the context of close collaboration with my research colleagues.

4.4 Summary

Since 2008, I have maintained a sustained research focus on learning in cMOOCs. This work has raised pedagogical issues which relate to the structure, openness and complexity of cMOOC learning environments, the agency of learners in these environments and the ethical responsibilities of teachers. The development of a conceptual framework (Footprints of Emergence) and associated practical visualisation tool for eliciting learners' experiences in MOOCs is a further contribution to understanding the complexity of open learning environments. All this research has been collaborative, working in multi-disciplinary teams and committed to open practices. In this way, the research has also contributed to changing research practices.

In the final concluding section of this submission I will consider the possible implications of this work for policy, practice and future research.

5. Conclusion

In the preceding sections I have introduced my research, reviewed the current body of research literature related to my field, outlined my methodological approach and discussed my overall contribution.

In a recent editorial for the journal Distance Education, Naidu (2016) has written of research into MOOCs that if we start a new conversation then we should explain the need for this conversation and identify who is likely to be interested; if we join a conversation then we should consider what it is that we are contributing, whether we have something new and unique to say and if so why it is worthy of attention. I have both started and joined conversations about learners' experiences in cMOOCs and published associated research, but as Naidu (2016) says the question must now be 'so what?'

In answer to Naidu's 'so what?' questions, I will conclude this PhD submission by considering the possible implications of my findings for policy, practice and research in this emerging field of educational research.

In 1986 Shulman wrote of the difficulties of using research findings to inform policy and practice.

> What policymakers fail to understand is that there is an unavoidable constraint on any piece of research in any discipline (Shulman, 1981). To conduct a piece of research, scholars must necessarily narrow their scope, focus their view, and formulate a question far less complex than the form in which the world presents itself in practice. This holds for any piece of research; there are no exceptions (Shulman, 1986).

Conscious of and agreeing with Shulman's words of warning, I am hesitant to claim any implications of my work for policy, practice and future research. However, Shulman writes of 'a piece of research'. This supporting statement draws on 13 peer-reviewed publications and experience of a further eight published papers. As such the implications that I will now tentatively suggest are the result of a body of work (rather than an

individual piece of research), which has drawn on an extensive review of the literature over the past eight years.

Scrutiny of all my research, with particular reference to the peer-reviewed publications (see Appendix 1 and Appendix 3), suggests that my findings have potential implications for four areas of policy, practice and research - approaches to MOOC research; MOOC pedagogy; the design of MOOCs; and ethics and individual leaners' experiences.

Approaches to MOOC research are currently inadequate. Innovative learning environments necessitate innovative new research methods.

MOOC research is a rapidly growing field involving fast changing practice (Haywood, 2016). This made early research into MOOCs difficult, but whilst the body of research continues to grow at a fast pace there are signs that the development of MOOCs in terms of new innovative practices is beginning to slow. If this proves to be the case it will give researchers the opportunity to take stock and consider how they might 're-think their frame of reference' and approaches to MOOC research (Haywood, 2016, p.2). There is a recognised need for more rigorous authentic research, use of a wider range of methodologies, e.g. longitudinal studies (Jacoby, 2014; Lawless, 2016) and new methods and tools for gathering qualitative data to research and evaluate learners' experiences in MOOCs (Downes, 2014c; Ross, 2016; Veletsianos, 2016a; Veletsianos, Reich & Pasquini, 2016); tools such as the Footprints of Emergence framework which can be used to explore the relationship between learning spaces, agency and identity (Williams et al., 2011; Williams et al., 2012a; Williams et al., 2015). My research has also shown the value of cross-disciplinary open, online research, scholarship and collaboration (Veletsianos & Kimmons, 2012; Williams & Mackness, 2013; Williams, Mackness & Gumtau, 2012b).). In an increasingly networked and connected world it will be essential for researchers to be agile, adaptive practitioners who have the ability and skills to work collaboratively in international, multi-disciplinary teams, pooling a wide range of expertise to more effectively address the complexity and diversity of the new open online environments (Haywood, 2016). 'Collaboration is the new standard of excellence…. for all educators' (Bonk, 2016) and open scholarship may be increasingly necessary to form the networks

needed to enable multi-disciplinary collaboration between researchers from across the globe (Eynon et al., 2016; Williams & Mackness, 2013).

MOOC pedagogy is poorly understood. Research should focus on the new responsibilities of teachers and how participants change as a result of their MOOC learning experiences.

Daniel (1996) wrote that to meet the demand of the growing population a major new university would need to be created each week. Laurillard (2016) has suggested that MOOCs might be one answer to the problem of how to provide an education for all. Learning online could become a key graduate skill of the future (Haywood, 2016). A review of the literature has shown a pressing need for a better understanding of learning and teaching in MOOCs (Bayne & Ross, 2014). My work has shown the potential transformative effects that learning in MOOCs can have for participants. It has recognised the uniqueness and diversity of learners, goes beyond seeing learners as nodes in a network and seeks to understand their individual experiences and the implications of learning in an age of uncertainty (Guldberg & Mackness, 2009; Mackness et al., 2013; Mackness et al, 2016; Mackness & Bell, 2015; Mackness & Pauschenwein, 2016; Tschofen & Mackness, 2012; Waite et al., 2013; Williams et al., 2015). Research into xMOOCs since 2012 has provided limited insights into what learners learn in MOOCs. Lawless (2016, p.4) suggests that 'The pervasiveness of this MOOC approach [the instructional model underlying the xMOOC approach] may explain their consistent failure to inspire deep learning and transfer'. We know very little about the transformational shifts that MOOC participants undergo, or how their MOOC experience changes them. We need answers to questions such as 'Who do they 'become' as a result of this experience?' and 'What effect does this learning have on their identities?'

I have also shown that MOOC teachers' actions, both in their presence and absence, can have a significant effect on learners' experiences. In xMOOCs, which are primarily based on behaviourist pedagogy the teacher takes a traditional central 'sage on the stage' lecturing role. However, the intention of the original cMOOCs was to decentralise the teacher (Stewart, 2013) leaving participants to support and teach each other. My research suggests that both approaches can be unsatisfactory and that in complex learning environments constraints are necessary if learning is to be effective (Mackness et al.,

2010). The teacher needs to provide these constraints and manage the learning environment. Further research, which attends to the lessons learned from a long history of distance and online education research (Baggaley, 2016) is needed for a better understanding of teachers' roles in MOOCs and how these impact on learners. Research into MOOC pedagogy should be a priority for practitioners, policy makers and researchers and should involve 'student-centred, theory-driven conceptualization and methodological approaches [which] allow us to move beyond descriptive statistics and into a deeper understanding of MOOC learners' (Wiebe, Thompson & Behrend, 2015).

The design of MOOCs should take greater account of the complexity of open environments.

Learners are changing, learning is changing and teachers are changing (Bonk, 2016). This is an inevitable consequence of open online learning environments and MOOCs which attract huge numbers of participants are possibly the most complex environments in which learners now engage. cMOOCs are more innovative and experimental than xMOOCs in their attempt to prepare learners for life-long learning on the open web. They are also more complex, since learners are encouraged to work across distributed open online environments. My review of the literature (see Section 2, p.29) has shown that one response to this complexity has been to try and contain the MOOC environment as xMOOC designers have done, but in doing this xMOOCs lose sight of the aspirations for openness of the originally conceived connectivist MOOCs. On the other hand, connectivist MOOCs can be experienced as chaotic leading to a less than satisfactory learning experience for inexperienced online learners and learners retreating into homogeneous groups with a corresponding loss of diversity, which is a key principle of cMOOCs (Bell et al., 2016). There is a need for greater recognition of MOOCs as complex adaptive systems and for MOOC designers to take a holistic approach to considering the most appropriate balance between openness, structure and agency needed for effective learning.

New ethical frameworks are needed for teaching and learning in MOOCs.

In 2008, I published a paper which reported findings on learners' experiences in the first cMOOC (Mackness et al., 2010) and raised questions about the ethics of experimenting on

learners through employing innovative course design. Five years later further research into a different cMOOC has raised similar ethical concerns (Mackness & Bell; 2015). There are implications in these findings for policy, practice and research. Several researchers have now called for clearer ethical guidelines on how to conduct research into MOOCs (Farrow, 2016; Mackness et al., 2010; Mackness & Bell, 2015; Marshall, 2014; Rolfe, 2015). The relationship between ethics and teaching in MOOCs remains unclear since the roles of MOOC teachers are ambiguous. Marshall (2014) has made the important points that for MOOCs to be ethical, researchers should not harm their subjects. Participants should not be exploited for research purposes nor harmed through poor teaching practices and academics should act with integrity, avoiding the introduction of personal bias or the perpetuation of disparities in power and recognising their academic duty of care. These concerns which mirror those of my own research have recently attracted more attention in the wider research community. MOOCs continue to be thought of as 'natural experiment sites' and 'an excellent context for research' (Riel & Lawless, 2017, in press). Whilst innovation and experimentation are necessary components of MOOC delivery, there is increasing recognition of associated ethical issues. My research has contributed to this conversation by focussing on learners' experiences and teachers' responsibilities.

To conclude, 'The study of MOOCs is not trivial work ….. as it provides an unprecedented opportunity to engage in critical debate over the future of HE [Higher Education] in the context of serious challenges facing humanity' (Brown, 2016, p.39). Through my work I have engaged in this critical debate for the past eight years, but MOOC research remains in its infancy (Haywood, 2016). More systematic research is needed, particularly into learning in innovative cMOOC environments that espouse the principles of networked learning - autonomy, diversity, openness and connectedness/interactivity. Research into MOOCs of all types will continue to have implications for educational policy, practice and research, but research into cMOOCs has greater potential to effect pedagogical change.

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Appendix 1: List of Published Papers

I have published 20 papers, 19 in peer-reviewed journals, and one book chapter. These publications are listed below and indicate the direction and progression of my research trajectory since 2009.

Conference presentations, including a keynote presentation have been published on my blog (Jenny Connected: https://jennymackness.wordpress.com/presentations/). The highlighted papers at the beginning of the Table 1 have been summarised. These summaries together with associated citations and journal information can be found in Appendix 3.

	Authors	Year	Title	Paper URL
	Papers selected for summary			
1	Mackness, J., Bell, F., & Funes, M.	2016	The Rhizome: a problematic metaphor for teaching and learning in a MOOC.	http://ajet.org.au/index.php/AJET/article/view/2486/1342
2	Bell, F., Mackness, J., & Funes, M.	2016	Participant association and emergent curriculum in a cMOOC: Can the community be the curriculum?	http://www.researchinlearningtechnology.net/index.php/rlt#
3	Mackness, J., & Pauschenwein, J.	2016	Visualising structure and agency in a MOOC using the Footprints of Emergence framework.	http://www.networkedlearningconference.org.uk/abstracts/mackness.htm
4	Mackness, J., & Bell, F.	2015	Rhizo14: A Rhizomatic Learning cMOOC in Sunlight and in Shade.	http://openpraxis.org/index.php/OpenPraxis/article/view/173
5	Mackness, J., Waite, M., Roberts, G., & Lovegrove, E.	2013	Learning in a small, task-oriented, connectivist MOOC: Pedagogical Issues and Implications for Higher Education.	http://www.irrodl.org/index.php/irrodl/article/view/1548
6	Waite, M., Mackness, J., Roberts, G., & Lovegrove, E.	2013	Liminal participants & skilled orienteers: A case study of learner participation in a MOOC for new lecturers.	http://jolt.merlot.org/vol9no2/waite_0613.htm
7	Williams, R., & Mackness, J.	2013	Open Research and Open Learning.	https://jennymackness.files.wordpress.com/2010/10/open-research-and-open-learning-100513.pdf
8	Williams, R., Mackness, J., & Gumtau, S.	2012a	Footprints of Emergence.	http://www.irrodl.org/index.php/irrodl/article/view/1267
9	Tschofen, C., & Mackness, J.	2012	Connectivism and Dimensions of Individual Experience.	http://www.irrodl.org/index.php/irrodl/article/view/1143
10	Williams, R., Karousou, R., & Mackness, J.	2011	Emergent Learning and Learning Ecologies in Web 2.0.	http://www.irrodl.org/index.php/irrodl/article/view/883
11	Mackness, J., Mak, S. F. J., & Williams, R.	2010	The Ideals and Reality of Participating in a MOOC.	http://www.lancaster.ac.uk/fss/organisations/netlc/past/nlc2010/abstracts/Mackness.html
12	Guldberg, K., & Mackness, J.	2009	Foundations of communities of practice: enablers and barriers to participation.	http://eprints.bham.ac.uk/260/1/JCAL2June09KG_JM.pdf

	Book chapter			
13	Williams, R., Mackness, J., & Pauschenwein, J.	2015	Using visualization to understand transformations in learning and design in MOOCs.	https://www.researchgate.net/publication/292162782_Using_visualization_to_understand_transformations_in_learning_and_design_in_MOOCs
	Other Papers			
14	Williams, R., & Mackness, J.	2014	Surfacing, sharing and valuing tacit knowledge in open learning.	https://docs.google.com/viewer?a=v&pid=sites&srcid=ZGVmYXVsdGRvbWFpbnxlbGVhcm5pbmd0YWcyMDE0fGd4OjUyNGIwOTJiZTMzZjhlNjM
15	Guldberg, K., Mackness, J., Makriyannis, E., & Tait, C.	2013	Knowledge Management and value creation in a third sector organisation.	http://onlinelibrary.wiley.com/doi/10.1002/kpm.1410/abstract
16	Roberts, G., Mackness, J., Waite, M., & Lovegrove, E.	2013	x v c: Hybrid learning in, through and about MOOCs.	http://openbrookes.net/firststeps12/files/2012/08/OER13ExtendedAbstract-HybridLearningGR-JM-040213.pdf
17	Mak, S. F. J., Williams, R., & Mackness, J.	2010	Blogs and Forums as Communication and Learning Tools in a MOOC.	http://www.lancaster.ac.uk/fss/organisations/netlc/past/nlc2010/abstracts/Mak.html
18	Sharpe, R., & Mackness, J.	2010	Evaluating the development of a community of e-learning researchers: from short-term funding to sustainability.	https://radar.brookes.ac.uk/radar/file/cc59ef86-b37d-2975-d2fa-3a44a10807ea/1/sharpe2010evaluating.pdf
	Papers 'on the edge'			
19	Williams, R., Gumtau, S., & Mackness, J.	2015	Synesthesia: from cross-modal to modality-free learning and knowledge.	https://www.researchgate.net/publication/271518811_Synesthesia_From_Cross-Modal_to_Modality-Free_Learning_and_Knowledge
20	Williams, R., Mackness, J., & Gumtau, S.	2012b	Learning Across Cultures.	https://seadnetwork.wordpress.com/white-paper-abstracts/final-white-papers/learning-across-cultures/
	Published on blog			
21	Melcher, M., & Mackness, J.	2010	The Riddle of Online Resonance.	https://jennymackness.wordpress.com/2010/09/10/the-riddle-of-online-resonance/
	Peer-reviewed Conference Papers/Presentations (see https://jennymackness.wordpress.com/publications/ for full references and links)			
	Williams, R., Gumtau, S., & Mackness, J.	2012	Synaesthesia and Embodied Learning.	
	Williams, R., Mackness, J., & Gumtau, S.	2012	Footprints of Emergence: applying complexity theory to education.	
	Williams, R., Mackness, J., & Gumtau, S.	2012	Designing and Managing Open Learning	
	Guldberg, K., & Mackness, J.	2008	Learner Experiences in an on-line Community of Practice	

Appendix 2: Mapping the Interrelationships between the Papers

As a first step in this process of retrospective coherence I searched for key themes across all the published papers. To do this I used Matthias Melcher's freely available Connectivist Think Tool (Melcher, 2013), accessible from https://x28newblog.wordpress.com/2013/05/17/connectivist-think-tool/

This involved entering the text of all the paper Abstracts into the tool and completing a series of maps to identify links between the papers. This tool is unique in that it allows the user to create interactive maps whilst maintaining ready access to large amounts of text within the mapping screen.

I provide detailed information about how to use the tool and how I mapped the interrelationships between my papers in a video that can be accessed at https://youtu.be/vPmBDsXP68w (Mackness, 2016).

Appendix 3: Paper Summaries[1]

Summary 1. Topic – Learning in communities of practice

Paper Title	Abstract	Citations[2]	Journal/Conference Status	Dissemination
Guldberg, K., & Mackness, J. (**2009**). Foundations of communities of practice: enablers and barriers to participation. *Journal of Computer Assisted Learning*. Wiley-Blackwell. http://eprints.bham.ac.uk/260/1/JCAL2June09KG_JM.pdf	This research draws upon community of practice theory to explore the factors that enabled or hindered participation in an online 'Foundations of Communities of Practice' workshop – a course that is designed to align with Wenger's communities of practice perspective. The research used a mixed methods approach, drawing upon log-on and posting data, questionnaires and semi-structured interviews to explore participant experiences. The findings show that five dimensions either enabled or constrained participation. These were emotion, technology, connectivity, understanding norms and learning tensions. As enablers these dimensions led to successful participation within an online community of practice, but as constraints, they led to peripheral participation. The findings highlight implications for tutors of such courses. These include the need to (1) assess the technical expertise of participants, particularly when a number of different technological tools is used; (2) find ways to identify and evaluate emotional responses so learners can be supported in managing these; (3) ensure that participants understand the norms of a community; and (4) develop clear induction materials and processes.	79	In 2014, the Journal of Computer Assisted Learning was ranked 23rd in the list of Education Journals (http://www.scimagojr.com/journalrank.php?category=3304).	The research findings were shared with the CPsquare community through two teleconferences and a discussion forum, and disseminated via the E-learning@Greenwich conference (2008).
Contribution	This paper contributes to an understanding of the role of communities of practice in education settings. The research explored learners' experiences of a closed online course about communities of practice. The course design aimed to model the principles of communities of practice as expounded by Wenger (1998). The enablers and barriers relating to virtual communities of practice raised by this paper continue to be of relevance (Cleveland Innes & Campbell, 2012; Koutropoulos et al., 2012), particularly in situations where there is an attempt to establish a community of practice within a time-limited course (Mackness and Bell, 2015; Bell, Mackness & Funes, 2016).			

1 Papers ordered by date of publication from 2009 to 2016

2 Google scholar citations: 16-05-17

Summary 2. Topic – Learning experiences in a connectivist MOOC

Paper Title	Abstract	Citations	Journal/Conference Status	Dissemination
Mackness, J., Mak, S. F. J., & Williams, R. (**2010**). The Ideals and Reality of Participating in a MOOC. In *Networked Learning Conference, Aalborg* (p. 266 -274). http://www.lancaster.ac.uk/fss/organisations/netlc/past/nlc2010/abstracts/Mackness.html	'CCK08' was a unique event on Connectivism and Connective Knowledge within a MOOC (Massive Open Online Course) in 2008. It was a course and a network about the emergent practices and the theory of Connectivism, proposed by George Siemens as a new learning theory for a digital age. It was convened and led by Stephen Downes and George Siemens through the University of Manitoba, Canada. Although the event was not formally advertised, more than 2000 participants from all over the world registered for the course, with 24 of these enrolled for credit. The course presented a unique opportunity to discover more about how people learn in large open networks, which offer extensive diversity, connectivity and opportunities for sharing knowledge. Learners are increasingly exercising autonomy regarding where, when, how, what and with whom to learn. To do this, they often select technologies independent of those offered by traditional courses. In CCK08 this autonomy was encouraged and learning on the course was distributed across a variety of platforms. This paper explores the perspectives of some of the participants on their learning experiences in the course, in relation to the characteristics of connectivism outlined by Downes, i.e. autonomy, diversity, openness and connectedness/interactivity. The findings are based on an online survey which was emailed to all active participants and email interview data from self-selected interviewees. The research found that autonomy, diversity, openness and connectedness/interactivity are indeed characteristics of a MOOC, but that they present paradoxes which are difficult to resolve in an online course. The more autonomous, diverse and open the course, and the more connected the learners, the more the potential for their learning to be limited by the	433	This is a well-established and respected biennial conference which has been running for 20 years. It is a research-based conference on networked learning in Higher Education, life-long learning and professional development, organised by Lancaster University, UK, Aalborg University, Denmark, Open Universiteit, Netherlands and Open education Europa. 'Conference proceedings are peer-reviewed by international researchers and published in electronic proceedings and online.' (http://www.networkedlearningconference.org.uk/call/themes.htm)	The research was disseminated at the Networked Learning Conference, which publishes peer-reviewed proceedings online. A Prezi presentation was delivered at the conference and shared openly online. This presentation has been viewed 1989 times (as of 07-11-16). (http://prezi.com/owiih87ovrhc/?utm_campaign=share&utm_medium=copy&rc=ex0share)

	lack of structure, support and moderation normally associated with an online course, and the more they seek to engage in traditional groups as opposed to an open network. These responses constrain the possibility of having the positive experiences of autonomy, diversity, openness and connectedness/interactivity normally expected of an online network. The research suggests that the question of whether a large open online network can be fused with a course has yet to be resolved. Further research studies with larger samples are needed, as is an investigation into the ethical considerations which may need to be taken into account when testing new theory and practice on course participants.			
Contribution	This paper contributes to an understanding of learners' experiences of autonomy, diversity, openness and connectedness in connectivist MOOCs. The research findings suggest that constraints are needed for learners to have a positive experience of learning in open cMOOCs and raises questions about the ethics of experimenting on learners through employing innovative course design.			

Summary 3. Topic – Emergent learning in online learning networks

Paper Title	Abstract	Citations	Journal/Conference Status	Dissemination
Williams, R., Karousou, R., & Mackness, J. (**2011**). Emergent Learning and Learning Ecologies in Web 2.0. *The International Review of Research in Open and Distributed Learning*, 12(3). http://www.irrodl.org/index.php/irrodl/article/view/883	This paper describes the nature of emergence and emergent learning and the conditions that enable emergent, self-organised learning to occur and to flourish. Specifically, it explores whether emergent learning can be validated and whether it is possible to link or integrate emergent with prescribed learning. It draws on complexity theory, communities of practice, and the notion of connectivism to develop some of the foundations for an analytic framework to enable and manage emergent learning and networks in which agents and systems co-evolve. It then examines specific cases of learning to test and further develop the analytic framework. The paper argues that although social networking media might increase the potential range and scope for emergent learning exponentially, considerable effort is required to ensure an effective balance between	195	The paper was published in 2011 in The International Review of Open and Distance Learning (now known as The International Review of Open and Distributed Learning) in a Special Issue on Connectivism: Design and Delivery of Social Networked Learning - http://www.irrodl.org/index.php/irrodl/issue/view/44 On its website, the journal has announced that *As of December 31, 2015, according to Google Scholar,*	The authors were invited to present their research, via a webinar, to the Canadian Institute of Distance Education Research. For a recording of the session and the slides see the Athabasca University Landing website

	prescriptive and emergent learning, both of which need to be part of an integrated learning framework.		*IRRODL was ranked as the top open access educational journal in educational technology and sixth overall. It is ranked 13th of all educational journals (h5 index = 36; h5-median = 65) and is the only open access journal in the top 20.* (IRRODL Announcement January 9th, 2016).	
Contribution	This paper contributes the foundations of an analytic framework for enabling and managing emergent learning in flexible, open learning environments in which agents and systems co-evolve. The authors suggest that in a rapidly changing and increasingly complex, digital world, which itself is increasingly unpredictable, it is important to explore the environments and social behaviours that promote unpredictable emergent learning. The interactive potential of Web 2.0 provides unprecedented opportunities for emergent learning, but emergent social behaviour does not necessarily equate to emergent knowledge or learning.			

Summary 4. Topic – Connectivism and individual learning in MOOCs

Paper Title	Abstract	Citations	Journal/Conference Status	Dissemination
Tschofen, C., & Mackness, J. (**2012**). Connectivism and Dimensions of Individual Experience. *The International Review of Research in Open and Distance Learning*, 13(1). http://www.irrodl.org/index.php/irrodl/article/view/1143	Connectivism has been offered as a new learning theory for a digital age, with four key principles for learning: autonomy, connectedness, diversity, and openness. The testing ground for this theory has been massive open online courses (MOOCs). As the number of MOOC offerings increases, interest in how people interact and develop as individual learners in these complex, diverse, and distributed environments is growing. In their work in these environments the authors observed a growing tension between the elements of connectivity believed to be necessary for effective learning and the variety of individual perspectives both revealed and concealed during interactions with these elements. In this paper, we drew on personality and self-determination theories to gain insight into the dimensions of individual experience in connective environments and to further explore the meaning of autonomy, connectedness,	140	This paper was published in 2012 in the International Review of Open and Distance Learning, which is now, as of Jan 1st 2015, the International Review of Open and Distributed Learning. The name was changed '*to reflect the journal's increased emphasis on openness in education and the blurring of boundaries in online learning to include blended and other forms of technology-enhanced learning*' (IRRODL Announcement January 9th, 2016). The announcement also states that:	The research was published in an open journal. It received a commentary in his online newsletter OLDaily, from Stephen Downes, one of the convenors of the first MOOC, Connectivism and Connective Knowledge (CCK08), which both authors attended. Downes is also the author of the principles of connectivism (Downes, 2012, Feb 01 - http://www.downes.ca/post/57186)

	diversity, and openness. The authors suggest that definitions of all four principles can be expanded to recognize individual and psychological diversity within connective environments. They also suggest that such expanded definitions have implications for learners' experiences of MOOCs, recognizing that learners may vary greatly in their desire for and interpretation of connectivity, autonomy, openness, and diversity.		*As of December 31, 2015, according to Google Scholar, IRRODL was ranked as the top open access educational journal in educational technology and sixth overall. It is ranked 13th of all educational journals (h5 index = 36; h5-median = 65) and is the only open access journal in the top 20.*	
Contribution	This paper draws on personality and self-determination theories to contribute a unique perspective on individual dimensions of learner experiences in cMOOCs. The research uses these theories to explore meanings of autonomy, diversity, interactivity and openness, the key characteristics of learning in cMOOCs. The paper suggests that the notion of personality traits, rather than academic and personal experiences might be major determinants of self-directed learning and this has implications for how learning in MOOCs should be envisioned and developed.			

Summary 5. Topic – Emergent learning

Paper Title	Abstract	Citations	Journal/Conference Status	Dissemination
Williams, R. T., Mackness, J., & Gumtau, S. (**2012**). Footprints of Emergence. *The International Review of Research in Open and Distance Learning*, 13(4). http://www.irrodl.org/index.php/irrodl/article/view/1267	It is ironic that the management of education has become more closed while learning has become more open, particularly over the past 10-20 years. The curriculum has become more instrumental, predictive, standardized, and micro-managed in the belief that this supports employability as well as the management of educational processes, resources, and value. Meanwhile, people have embraced interactive, participatory, collaborative and innovative networks for living and learning. To respond to these challenges, we need to develop practical tools to help us describe these new forms of learning which are multivariate, self-organised, complex, adaptive, and unpredictable. We draw on complexity theory and our experience as researchers, designers, and participants in open and	17	The paper was published in 2011 in The International Review of Open and Distance Learning (now known as The International Review of Open and Distributed Learning) in a Special Issue on Connectivism: Design and Delivery of Social Networked Learning - http://www.irrodl.org/index.php/irrodl/issue/view/44 On its website, the journal has announced that *As of December 31, 2015,*	This research has been disseminated both on and offline in a variety of venues, as follows: - ELearning Conference, FH JOANNEUM in Graz, Austria, 2014 - *keynote* - ALT Conference, 2013, University of Nottingham - *Online seminar* for SCoPE international online community, British Columbia, 2013 - Evaluation of Learners'

	interactive learning to go beyond conventional approaches. We develop a 3D model of landscapes of learning for exploring the relationship between prescribed and emergent learning in any given curriculum. We do this by repeatedly testing our descriptive landscapes (or footprints) against theory, research, and practice across a range of case studies. By doing this, we have not only come up with a practical tool which can be used by curriculum designers, but also realised that the curriculum itself can usefully be treated as emergent, depending on the dynamics between prescribed and emergent learning and how the learning landscape is curated.		*according to Google Scholar, IRRODL was ranked as the top open access educational journal in educational technology and sixth overall. It is ranked 13th of all educational journals (h5 index = 36; h5-median = 65) and is the only open access journal in the top 20.* (IRRODL Announcement January 9th, 2016).	Experiences of e-Learning Special Interest Group' in London, 2013, *workshop* - Lancaster University, 2013, *presentation and workshop* - *Theory clinic.* Theorising Education 2012: The Future of Theory in Education Conference. University of Stirling, 2012 - A bespoke open wiki - https://footprints-of-emergence.wikispaces.com/ - and on our blogs.
Contribution	This research contributes a practical 3D visualisation tool that provides a visual metaphor for exploring learning in complex, distributed, unpredictable open learning environments. It draws on complexity theory, complex adaptive systems, emergence and personal experience to explore the dynamic relationship between prescribed and emergent learning (Wenger, White & Smith, 2009; Siemens, 2004; Downes, 2007; Snowden & Boone, 2007). It allows for a critical analysis of the balance between prescription and emergence and a deeper understanding of the relationship between the learning space and individual agency and identity.			

Summary 6. Topic – Open Research and Open Learning

Paper Title	Abstract	Citations	Journal/Conference Status	Dissemination
Williams, R., & Mackness, J. **(2013).** Open Research and Open Learning. *Scientific Journal of Educational Technology*. Vol. 2, No. 1. Campus Virtuales. http://www.uajournals.com	This paper describes the authors' journeys from traditionally closed to open research. Using a narrative approach, the authors draw on their recent research experience to explore the influences on this shift and how it aligns with their increasing work in emergent learning. The shift has itself been an emergent process. Changes in both open research and open learning are based on 'social software', which changes the relationship between public and private space,	1	'Campus Virtuales (ISSN: 2255-1514) is a scientific biannual publication of multidisciplinary research with respect to the use of Information Technologies and Communications (ICT) in Education, in order to collect studies and experiences of	

/campusvirtuales/index.php/en/	and formal and informal forms of speech and writing. This creates a new hybrid, or 'mashup' between open research and open learning, which goes beyond 'open scholarship'.		researchers in their personal capacity in this field ….. …. The journal has a scientific advisory board comprised of some of the leading international scholars on this field. And the manuscript processing is performed through the OJS platform in a professional way that ensures review by peer and anonymous.' http://www.uajournals.com/campusvirtuales/en/	
Contribution	This paper contributes to an understanding of open learning, open research and open scholarship. The authors explore the tensions between open structures and constraints when learning and researching in the open. They suggest that "Agency, self-organization, confidence, trust and a cooperative environment all depend on some constraints…" (p.9) and that a balance is needed between structure and agency in open learning environments.			

Summary 7. Topic – Learner participation in a cMOOC

Paper Title	Abstract	Citations	Journal/Conference Status	Dissemination
Waite, M., Mackness, J., Roberts, G., & Lovegrove, E. **(2013).** Liminal Participants and Skilled Orienteers: Learner Participation in a MOOC for New Lecturers. *MERLOT Journal of Online Learning and Teaching*, 9(2), 200–215. http://jolt.merlot.org/vol9no2/waite_0613.htm	This case study explored learner participation in First Steps in Learning and Teaching in Higher Education (FSLT12), a short massive open online course (MOOC) aimed at introducing learning and teaching in higher education that was offered by Oxford Brookes University in June 2012. Both novice and experienced MOOC learners joined the course. The aim of the case study was to explore triggers for active participation. A mixed-methods approach was utilized in order to collect and analyze data from focus groups, individual interviews, participant blog posts, and a survey. The lenses of social constructivism, connectivism, and community of practice theories were used to enhance understanding of	55	The paper was published in the MERLOT Journal of Online Learning and Teaching. 'JOLT is a peer-reviewed, open-access, online publication that aims to promote scholarship in the use of the Internet and web-based multimedia resources in higher education. The first issue appeared online in July 2005 and included a number of invited papers from various disciplines.	Related dissemination outputs from: http://openbrookes.net/firststeps12/research/dissemination/ Roberts, G et al. (2013). x v c: Hybridity in through and about MOOCs. In Proceedings of OER13: Creating a Virtuous Circle. Nottingham, England (PDF x

	participation in FSLT12. Three main themes emerged: (1) Navigation: New participants felt overwhelmed by technical issues, multiple channels, and a perceived need to multitask, while experienced learners were judicious about planning their route; (2) Transformative learning: Ultimately, learners experienced a transformative shift, but it required reflection on practice, community support, and self-organization; (3) Reciprocal Relationships: New learners needed time to determine their audience and core community, as well as to realize mutual relationships within that community. Learners in a MOOC inhabit a liminal space. Active MOOC participants are skilled orienteers. Engaging local expertise of experienced MOOC learners and developing participatory skills in new learners is a key strategy for those who organize and facilitate MOOCs.		The journal is now published quarterly.' 'JOLT is indexed with and included in a number of prominent international databases.' http://jolt.merlot.org/index.html In 2015 MERLOT Journal of Online Learning and Teaching was ranked by Google Scholar metrics as follows: h5 index = 20; h5 median = 29 Oxford Brookes University's research ethics committee ethically approved the research.	v c: Hybrid learning in MOOCs) Roberts, G. et al. (2012a). "Open Line: Not Just Moocin' About." In ALT-C 2012: A Confrontation with Reality. Manchester: Association for Learning Technology. http://www.slideshare.net/georgeroberts/not-just-moocin-about Roberts, G. et al. (2012b). "What Is Necessary and What Is Contingent in Design for a Massive Open Online Course?" In Open Horizons: Sharing the Future. Aston University, Birmingham: Higher Education Academy. http://www.slideshare.net/georgeroberts/what-is-necessary-and-what-is-contingent-in-mooc-design
Contribution	This research investigated learner experience of participation in a hybrid MOOC and how learners interacted with content and with each other. It was conducted as a case study which aimed to provide evidence for guiding the implementation of MOOCs and to increase understanding of the educational benefits. A significant finding of this research was the extent to which participants experienced the MOOC as a liminal space (Meyer & Land, 2003) and transformational shifts from pre-liminal to liminal spaces. The authors suggested that a MOOC can be a threshold concept in and of itself. This research contributes to developing but still under-researched MOOC pedagogy (Bayne & Ross, 2014).			

Summary 8. Topic – Learning in a hybrid MOOC

Paper Title	Abstract	Citations	Journal/Conference Status	Dissemination
Mackness, J., Waite, M., Roberts, G., & Lovegrove, E. **(2013).** Learning in a Small, Task-Oriented, Connectivist MOOC: Pedagogical Issues and Implications for Higher Education. *International Review of Research in Open and Distance Learning*, 14(4), 140–159. http://www.irrodl.org/index.php/irrodl/article/view/1548	Despite the increase in massive open online courses (MOOCs), evidence about the pedagogy of learning in MOOCs remains limited. This paper reports on an investigation into the pedagogy in one MOOC - Oxford Brookes University's 'First Steps in Learning and Teaching in Higher Education' MOOC (FSLT12). FSLT12 was an open and free professional development opportunity for people moving into HE teaching. It was a small course (200 participants registered from 24 countries) which was focused on introducing HE teaching skills, and, uniquely, to deliberately integrate open academic practice as a vital part of professional development for HE teachers. A qualitative, case-study approach was used in the research, based on surveys, interviews, and social media, to provide evidence about how people learned in this course and consider wider implications for teaching and learning in higher education. The evidence shows that participants who completed the course were able to learn autonomously and navigate the distributed platforms and environments. The most challenging issues were acceptance of open academic practice and difficulty in establishing an academic identity in an unpredictable virtual environment. An interesting and significant feature of the course was the support for learners from a number of MOOC 'veterans' who served as role models and guides for less experienced MOOC learners. The research shows that small task-oriented MOOCs can effectively support professional development of open academic practice	76	The paper was published in The International Review of Open and Distance Learning (now known as The International Review of Open and Distributed Learning). On its website, the journal has announced that as of December 31, 2015, according to Google Scholar, IRRODL was ranked as the top open access educational journal in educational technology and sixth overall. It is ranked 13th of all educational journals (h5 index = 36; h5-median = 65) and is the only open access journal in the top 20. (IRRODL Announcement January 9th, 2016). Oxford Brookes University's research ethics committee ethically approved the research.	Related dissemination outputs from: http://openbrookes.net/firststeps12/research/dissemination/ Roberts, G et al. (2013). x v c: Hybridity in through and about MOOCs. In Proceedings of OER13: Creating a Virtuous Circle. Nottingham, England (PDF x v c: Hybrid learning in MOOCs) Roberts, G et al. (2012a). "Open Line: Not Just Moocin' About." In ALT-C 2012: A Confrontation with Reality. Manchester: Association for Learning Technology. http://www.slideshare.net/georgeroberts/not-just-moocin-about Roberts, G et al. (2012b). "What Is Necessary and What Is Contingent in Design for a Massive Open Online Course?" In Open Horizons: Sharing the Future. Aston University, Birmingham: Higher

				Education Academy. http://www.slideshare.net/georgeroberts/what-is-necessary-and-what-is-contingent-in-mooc-design
Contribution	This paper contributes to MOOC pedagogy by exploring how MOOC participants behaved in the MOOC and engaged with cMOOC principles and the designed activities. The MOOC had been designed specifically as a hybrid MOOC, but with many cMOOC characteristics. The argument made in this paper is that opening a Higher Education traditional course can improve teaching and learning and encourage innovation and new pedagogical practices. A well-established face-to-face course can be blended with an open online course to build on and enhance an institution's existing reputation and retain the uniqueness of the teaching team's expertise. This research contributes to an understanding of the characteristics which influence the pedagogy and design of cMOOCs.			

Summary 9. Topic – Rhizomatic learning

Paper Title	Abstract	Citations	Journal/Conference Status	Dissemination
Mackness, J., & Bell, F. (**2015**). Rhizo14: A Rhizomatic Learning cMOOC in Sunlight and in Shade. *Open Praxis*. 7(1), p. 25-38 http://openpraxis.org/index.php/OpenPraxis/article/view/173	The authors present findings from the first stage of research into a "home-grown" connectivist MOOC, Rhizomatic Learning: The Community is the Curriculum (Rhizo14). We compare the surface view of the MOOC that has been presented in a range of open blog posts and articles with the view from beneath the surface that we have found in data we have collected (some anonymously). Our analysis reveals a positive, even transformative, experience for many participants on the one hand, but some more negative experiences and outcomes for other participants. These findings highlight the need for further research on the ethical implications of pedagogical experimentation, interrelated processes of community and curriculum formation, the role of the MOOC convener, and learner experiences within MOOC communities. In this paper, we report on the alternative experiences of Rhizo14 participants and identify issues that need to be explored more deeply.	25	Open Praxis is the International Council for Open and Distance Education's (ICDE) peer-reviewed open access scholarly journal focusing on research and innovation in open, distance and flexible education. It is published by http://www.icde.org/open-praxis. Since 2015 Open Praxis has been included in relevant indexes and databases	This research has been disseminated both on and offline. Conferences ALTMOOCSIG Conference UCL, London, 2014 Liverpool John Moores University Teaching and Learning Conference 2015 Our blogs Jenny Connected Francesbell's blog

Contribution	This research contributes a critical perspective on the design of a cMOOC in which participants were required to form a community to create their own content and curriculum. It critiques the ethical approach to teaching and learning, the decentring of the role of the teacher, positive and negative aspects of the learner experience, the meaning of the word 'course' in relation to MOOCs and the role of content in a MOOC. One of the most significant contributions of this paper is that it raised the profile of the silent majority in MOOCs and other online learning spaces and elicited their 'voice'. This research has foregrounded the vulnerability of learners in open online spaces and the need for an ethical approach which will protect their psychological safety and ensure their identity development.

Summary 10. Topic – Emergent and transformative learning

Paper Title	Abstract	Citations	Journal/Conference Status	Dissemination
Williams, R., Mackness, J., & Pauschenwein, J. **(2015).** *Using Visualization to Understand Transformations in Learning and Design in MOOCs*. In A. Mesquita & P. Peres (Eds.), Furthering Higher Education Possibilities through Massive Open Online Courses (pp. 193 – 209). IGI Global book series Advances in Higher Education and Professional Development. doi:10.4018/978-1-4666-8279-5 http://www.igi-global.com/chapter/using-visualization-to-understand-transformations-in-learning-and-design-in-moocs/137322	MOOCs have captured the attention of large numbers of learners (and a few venture capitalists). Clearly something exciting and different is happening which is transforming how people learn, what people learn, as well as how learning events are designed and valued. This chapter attempts to understand these transformations, using a visualization tool (Footprints of Emergence) which enables learners, teachers, designers and researchers to reflect on, articulate, and learn from these reflections. The tool enables all of them to map the emergent and transformational aspects of learning in large groups, such as MOOCs. It requires the person engaging with the learning process to be honest and courageous – because they are engaging not only with their learning, but also with themselves and their own identities – personal, social, cultural and professional. Epistemic and ontological shifts in transformative learning are difficult, even scary and unsettling. We demonstrate how the Footprints of Emergence described here can help people to navigate through the uncertainty and unpredictability with some degree of reassurance.		This book chapter was published by IGI Global in Further Higher Education Possibilities through Massive Open Online Courses. Founded in 1988, IGI Global, headquartered in Hershey, Pennsylvania (USA), is a leading international academic publisher of more than 3,100 reference books, 180 journals, encyclopedias, teaching cases, proceedings, and multiple databases. IGI Global book and journal publications are highly cited in a number of prestigious indices. http://www.igi-global.com/about/	
Contribution	This book chapter contributes to an understanding of MOOCs as complex liminal spaces in which emergent learning occurs. The authors			

	suggest that design for deep learning must provide 'supportive, reasonably safe transitional spaces'. They contribute a new tool, the Footprints of Emergence framework, for understanding the epistemic and ontological transformational shifts that occur in the liminal spaces of MOOCs. This tool recognises MOOCs as complex adaptive systems and that many factors need to be considered to reflect on and evaluate learning in these new unpredictable, learning spaces.

Summary 11. Topic – Rhizomatic learning

Paper Title	Abstract	Citations	Journal/Conference Status	Dissemination
Mackness, J., Bell, F., & Funes, M. **(2016).** The Rhizome: a problematic metaphor for teaching and learning in a MOOC. *Australasian Journal of Educational Technology*, 32(1), 78–91. doi:10.14742/ajet.v0i0.2486 http://ajet.org.au/index.php/AJET/article/view/2486/1342	Deleuze and Guattari's principles of the rhizome were used to inform the design of a massive open online course (MOOC), Rhizomatic Learning: The Community is the Curriculum, which came to be known as Rhizo14. In a previous paper about learner experiences in this course our reported findings from a qualitative survey (which enabled anonymous responses) raised concerns about the ethics of using experimental pedagogies in designing MOOCs. In this paper, we continue this research and report learners' understandings of the rhizome as applied in Rhizo14, from what participants have told us in email interviews and from our own reflections on participation in the course. Our findings reveal that many participants could relate to and welcomed the anti-authoritarian, anti-hierarchical characteristics of the rhizome, but that knowledge and understanding of Deleuze and Guattari's conceptual principles of the rhizome was more difficult. Lack of engagement with theory and lack of appreciation of the incompleteness and complexities of the rhizome metaphor can result in negative consequences, such as imbalances in power relations and increased vulnerability for some learners.	4	'The Australasian Journal of Educational Technology is a refereed academic journal publishing research and review articles in educational technology, information and communications technologies for education, online and e-learning, educational design, multimedia, computer assisted learning, and related areas. AJET is published by the Australasian Society for Computers in Learning in Tertiary Education (ASCILITE). …. In December 2007 AJET announced the retirement of its printed version… Thereafter AJET became an open access, online only journal….' (http://ajet.org.au/index.php/AJET/about/history). AJET has been included in relevant indexes and databases. In 2015 AJET was ranked by Google Scholar	The authors are independent researchers and do not represent any institution. At the start of the research, we shared our ethical approach on our blogs and sought feedback from the Rhizo14 community. In particular, we were aware that this was 'insider' research (Dwyer & Buckle, 2009), which we discussed in the first published paper on Rhizo14. As such, whilst we did not share our survey data with the Rhizo14 community, being concerned to protect the anonymity of respondents, we did share our research process through a number of blog posts. Jenny Connected

			metrics as follows: h5 index = 33; h5 median = 43	Francesbell's blog
Contribution	Some researchers (e.g. Veletsianos, 2013a) have noted the paucity of research into the learner experience in MOOCs, particularly research that elicits the learner voice. Others have noted the need for further research into the role of the teacher in MOOCs (Bayne & Ross, 2014). This research has contributed to addressing both these gaps in the research. It has elicited Rhizo14 MOOC participants' understanding of the rhizome metaphor for teaching and learning and questioned the ethics of experimenting on learners in the design of MOOCs which adopt this metaphor. This research has foregrounded the vulnerability of learners (Barnett, 2007) in open online spaces and the need for an ethical approach (Marshall, 2014) which will protect their psychological safety and ensure their identity development. The research contributes to an understanding of the relationship between learning spaces, structure and agency, individual learners and identity development in complex learning landscapes.			

Summary 12. Topic – Structure and agency in a hybrid MOOC

Paper Title	Abstract	Citations	Journal/Conference Status	Dissemination
Mackness, J., & Pauschenwein, J. (**2016**). Visualising structure and agency in a MOOC using the Footprints of Emergence framework. *Tenth International Conference on Networked Learning. Lancaster*. http://www.networkedlearningconference.org.uk/	In this paper, the authors examine the teacher/facilitator's role as MOOC designer in achieving an appropriate balance between structure and agency in the design of a specific MOOC, and consider whether this balance was achieved by analysing the learners' experience of this MOOC. To do this we used a tool known as Footprints of Emergence, which enables designers, teachers, learners and researchers to visualise the course design and their learning experience in any course. Drawing Footprints of Emergence requires deep reflection on 25 factors which influence learning in complex learning environments, such as MOOCs. The context for this research was the Competences for Global Collaboration MOOC (cope15) offered by FH Joanneum, in Graz, Austria, in Spring 2015. Cope15 attracted 460 students from different disciplines; 302 were active at least once. The course convener designed the MOOC using an approach which combined Salmon's model for moderating small groups of learners with the principles of cMOOCs and connectivism		This is a well-established and respected biennial conference, which has been running for 20 years. It is a research-based conference on networked learning in Higher Education, life-long learning and professional development, organised by Lancaster University, UK, Aalborg University, Denmark, Open Universiteit, Netherlands and Open education Europa. 'Conference proceedings are peer-reviewed by international researchers and published in electronic proceedings and online,' (http://www.networkedlearningconference.org.uk/call/themes.h	The research was disseminated at the 10th Networked Learning Conference, which publishes peer-reviewed proceedings online. It was also disseminated on our blogs Jenny Connected Jutta Pauschenwein

	and the structuring of xMOOCs. The visualisation offered by the design footprint of cope15 helped to frame their discussion and planning. At the end of the MOOC learners were asked to draw a Footprint to reflect on their learning experience and provide a written reflection. 30 participants agreed to their Footprints and written reflections being analysed for this research. Our preliminary findings suggest that attention to structure and agency using the Footprints of Emergence visualisation tool enables the design of a MOOC to meet learners' needs, and supports end of course reflection and evaluation.		tm)	
Contribution	This paper contributes a new approach to evaluating the design, teaching and learning in a cMOOC with a particular focus on the balance between structure and agency. The research made use of the unique Footprints of Emergence framework (developed by the author) to examine the alignment between the MOOC teachers' design intentions and the participants' learning experiences in the MOOC. The multi-dimensional framework enables greater in-depth reflection on learning than usually elicited through traditional end of course surveys.			

Summary 13. Topic **–** Rhizomatic learning

Paper Title	Abstract	Citations	Journal/Conference Status	Dissemination
Bell, F., Mackness, J., & Funes, M. **(2016).** Participant association and emergent curriculum in a MOOC: Can the community be the curriculum? *Research in Learning Technology* (2016). http://www.researchinlearningtechnology.net/index.php/rlt/article/view/29927	We investigated how participants associated with each other and developed community in a MOOC about Rhizomatic Learning (Rhizo14). We compared learner experiences in two Social Networking Sites (SNS), Facebook and Twitter. Our combination of thematic analysis of qualitative survey data with analysis of participant observation, activity data, archives and visualisation of SNS data, enabled us to reach a deeper understanding of participant perspectives and explore SNS use. Community was present in the course title and understood differently by participants. In the absence of explanation or discussion about community early in the MOOC, a controversy between participants about course expectations emerged that created oppositional discourse. Fall off in activity in MOOCs is common and was evident in	**1**	The paper was published by Research in Learning Technology. "Research in Learning Technology is the peer reviewed Open Access journal of the Association for Learning Technology (ALT). It aims to raise the profile of research in learning technology, encouraging research that informs good practice and contributes to the development	The authors are independent researchers and do not represent any institution. At the start of the research, we shared our ethical approach on our blogs and sought feedback from the Rhizo14 community. We were aware that this was 'insider' research (Dwyer & Buckle, 2009), which we discussed in the first published paper on

	Rhizo14. As the course progressed fewer participants were active in Facebook and some participants reported feelings of exclusion. Despite this, activity in Facebook increased overall. The top 10 most active participants were responsible for 47% of total activity. In the Rhizo14 MOOC both community and curriculum were expected to emerge within the course. We suggest that there are tensions and even contradictions between 'Community is the Curriculum' and Deleuze and Guattari's principles of the rhizome, mainly focused on an absence of heterogeneity. These tensions may be exacerbated by SNS that use algorithmic streams. We propose the use of networking approaches that enable negotiation and exchange to encourage heterogeneity rather than emergent definition of community.		of policy. The journal publishes papers concerning the use of technology in learning and teaching in all sectors of education, as well as in industry." RiLT has been included in relevant indexes and databases. In 2015 RiLT was ranked by Google Scholar metrics as follows: h5 index = 20; h5 median = 29	Rhizo14. As such, whilst we did not share our survey data with the Rhizo14 community, being concerned to protect the anonymity of respondents, we did share our research process through a number of blog posts. Jenny Connected Francesbell's blog
Contribution	This paper contributes to an understanding of the complexity of open learning environments by showing how social networking sites such as Facebook and Twitter influence learning, community and curriculum formation. In particular, the research contributes to an understanding that technology is not neutral. It both shapes and is shaped by users (Veletsianos, 2013c). Researchers are increasingly recognising that the algorithms employed by sites such as Facebook promote the visibility of 'likeminded people who discuss, confirm, validate and strengthen the group's position' (Kirschner, 2015), leading to homogeneity and communities that are characterised by Kogan's (2000) warm glow communitarian notion of community. Such communities resist negotiation and alternative perspectives, resulting in convergence and the loss of diversity, which is a key principle of cMOOCs.			

Appendix 4: Research Findings

Empirical Papers	***Research Questions***	***Findings*** *(Sourced from the Papers)*
Foundations of communities of practice: enablers and barriers to participation	What are the factors that influence participation in a virtual community of practice?	"The findings show that five dimensions either enabled or constrained participation. These were emotion, technology, connectivity, understanding norms and learning tensions. As enablers, these dimensions led to successful participation within an online community of practice, but as constraints, they led to peripheral participation." (Abstract)
The ideals and reality of participating in a MOOC	To what extent do participants experience autonomy, diversity, openness and connectedness/interactivity in a connectivist MOOC?	"The research found that autonomy, diversity, openness and connectedness/interactivity are indeed characteristics of a MOOC, but that they present paradoxes which are difficult to resolve in an online course. The more autonomous, diverse and open the course, and the more connected the learners, the more the potential for their learning to be limited by the lack of structure, support and moderation normally associated with an online course, and the more they seek to engage in traditional groups as opposed to an open network. These responses constrain the possibility of having the positive experiences of autonomy, diversity, openness and connectedness/interactivity normally expected of an online network" (Abstract).
Learning in a small, task-oriented, connectivist MOOC: pedagogical issues and implications for higher education	How did cMOOC design principles and activities in the FSLT12 MOOC enable participant learning? What are the implications for learning of the principles and activities used in the design of FSLT12? What are the possible implications of small task-oriented cMOOCs for higher education?	"Participants who completed the course were able to learn autonomously and navigate the distributed platforms and environments. The most challenging issues were acceptance of open academic practice and difficulty in establishing an academic identity in an unpredictable virtual environment. An interesting and significant feature of the course was the support for learners from a number of MOOC 'veterans' who served as role models and guides for less experienced MOOC learners. The research shows that small task-oriented MOOCs can effectively support professional development of open academic practice" (Abstract).
Liminal participants and skilled orienteers: learner participation in a MOOC for new lecturers	What are the triggers for active participation in a short MOOC (FSLT12)? What are the learner experiences of participation and how do learners interact with content and with each other?	"Learners in a MOOC inhabit a liminal space. Active MOOC participants are skilled orienteers. Engaging local expertise of experienced MOOC learners and developing participatory skills in new learners is a key strategy for those who organize and facilitate MOOCs." "Three main themes emerged: (1) Navigation: New participants felt overwhelmed by technical issues, multiple channels, and a perceived need to multitask, while experienced learners were judicious about planning their route; (2) Transformative learning: Ultimately, learners experienced a transformative shift, but it required reflection on practice, community support, and self- organization; (3)

		Reciprocal Relationships: New learners needed time to determine their audience and core community, as well as to realize mutual relationships within that community" (Abstract).
Rhizo14: a rhizomatic learning cMOOC in sunlight and in shade	What are the ethical implications of experimenting on MOOC learners?	"Our analysis reveals a positive, even transformative, experience for many participants on the one hand, but some more negative experiences and outcomes for other participants. These findings highlighted the ethical implications of pedagogical experimentation. These affected the Interrelated processes of community and curriculum formation, the role of the MOOC convener, and learner experiences within MOOC communities" (Abstract).
The rhizome: a problematic metaphor for teaching and learning in a MOOC	How do learners experience the use of the rhizome as a conceptual framework for teaching and learning in a MOOC?	"Our findings reveal that many participants could relate to and welcomed the anti-authoritarian, anti- hierarchical characteristics of the rhizome, but that knowledge and understanding of Deleuze and Guattari's conceptual principles of the rhizome was more difficult. Lack of engagement with theory and lack of appreciation of the incompleteness and complexities of the rhizome metaphor can result in negative consequences, such as imbalances in power relations and increased vulnerability for some learners" (Abstract).
Visualising structure and agency in a MOOC using the Footprints of Emergence framework	What are the MOOC teacher/facilitator/designer's roles in achieving a balance between structure and agency and how can the Footprints of Emergence visualisation tool be used to support this?	We verified that "attention to structure and agency using the Footprints of Emergence visualisation tool enables the design of a MOOC to meet learners' needs, and supports end of course reflection and evaluation" (Abstract).
Participant association and emergent curriculum in a MOOC: Can the community be the curriculum?	How do MOOC participants associate with each other and develop a community and can the community be the curriculum?	"We suggest that there are tensions and even contradictions between 'Community is the Curriculum' and Deleuze and Guattari's principles of the rhizome, mainly focused on an absence of heterogeneity. These tensions may be exacerbated by social networking sites that use algorithmic streams. We propose the use of networking approaches that enable negotiation and exchange to encourage heterogeneity rather than emergent definition of community" (Abstract).
Conceptual Papers	***Research Questions***	***Findings*** *(Sourced from the Papers)*
Emergent learning and learning ecologies in web 2.0	Can emergent learning be validated and self-correcting and is it possible to link or integrate emergent and prescribed learning?	"The paper argues that although social networking media increase the potential range and scope for emergent learning exponentially, considerable effort is required to ensure an effective balance between openness and constraint. It is possible to manage the relationship between prescriptive and emergent learning, both of which need to be part of an integrated learning ecology" (Abstract). This led to the Footprints of Emergence visualisation tool.
Connectivism and dimensions of individual	How can the meaning of the four key principles of connective environments, autonomy, diversity,	"[We] suggest that definitions of all four principles can be expanded to recognize individual and psychological diversity within connective environments. [We] also

experience	openness and connectivity and the dimensions of individual experience be informed by personality and self-determination theory?	suggest that such expanded definitions have implications for learners' experiences of MOOCs, recognizing that learners may vary greatly in their desire for and interpretation of connectivity, autonomy, openness, and diversity" (Abstract).
Footprints of emergence	Can we develop a practical tool to help us describe multi-variate, self-organised, complex, adaptive and unpredictable learning in new open learning landscapes?	"We draw on complexity theory and our experience as researchers, designers, and participants in open and interactive learning to go beyond conventional approaches." "By doing this, we have not only come up with a practical tool which can be used by curriculum designers, but also realised that the curriculum itself can usefully be treated as emergent, depending on the dynamics between prescribed and emergent learning and how the learning landscape is curated" (Abstract).
Open research and open learning	What are some of the issues associated with open research and open learning and how do these impact on the shift from traditionally closed to open research?	"This paper describes the authors' journeys from traditionally closed to open research. Using a narrative approach, the authors draw on their recent research experience to explore the influences on this shift and how it aligns with their increasing work in emergent learning. The shift has itself been an emergent process. Changes in both open research and open learning are based on 'social software', which changes the relationship between public and private space, and formal and informal forms of speech and writing. This creates a new hybrid, or 'mashup' between open research and open learning, which goes beyond 'open scholarship'" (Abstract).
Using visualization to understand transformations in learning and design in MOOCs	How have MOOCs transformed learning and how can the Footprints of Emergence visualisation tool be used to provide meaningful insights into these transformations?	"MOOCs have captured the attention of large numbers of learners (and a few venture capitalists). Clearly something exciting and different is happening which is transforming how people learn, what people learn, as well as how learning events are designed and valued. The visualisation tool enables learners, teachers, designers and researchers to map the emergent and transformational aspects of learning in large groups, such as MOOCs. It requires the person engaging with the learning process to be honest and courageous – because they are engaging not only with their learning, but also with themselves and their own identities – personal, social, cultural and professional. We demonstrate how the Footprints of Emergence can help people to navigate through the uncertainty and unpredictability with some degree of reassurance" (Abstract).

Appendix 5: Statements in Support of my Intellectual Contribution

Roy Williams

This is to provide some details of the contribution of Jenny Mackness to the field of Learner Experiences in MOOCs.

There are several aspects of Jenny Mackness's intellectual contribution to the field over the years that need to be mentioned.

It does need to be stressed that our research has always been collective, in the sense that identifying the boundaries between one person's contributions and another's has not only not been an issue, it has rightly been considered rather counterproductive to furthering good and useful research methodology, theory, data, and analysis.

1. Open research

From the beginning of our collaboration (informally in CCK08, then formally in published research, starting with CCK08) Jenny was the driving force in developing an approach to research that was innovative in its subject matter – the two CCK08 papers were among the first on MOOCs; innovative (for me) in truly open-minded research in a virtual group (some of whom met some time later, and some who have still not met, in the same room); and innovative in using wikis collaboratively not only for 'internal' research purposes, but perhaps more importantly to create a record, all (or nearly all) of which would later be made public as 'meta'-data of the actual process and interaction of the research process itself.

Jenny Mackness was also largely instrumental in initiating and framing the paper on open research and open learning.

2. MOOCs and fully open learning

The research on MOOCs and what we might call 'fully open learning', i.e. in which both the learning and even the curriculum are 'emergent', i.e. not prescribed and predetermined, was high risk (on the part of its initiators, who we regard as Stephen Downes, together with George Siemens), as well as by our initial research group, as there was by definition little in the existing research literature to base our methodology on. Jenny brought strong and detailed experience and knowledge from communities of

practices, and from many years of learning to bear on the matter. Other authors brought different experience, and collectively we (both including me, and in several papers, with other authors) created a set of methodologies and analytic frameworks, which Jenny Mackness had a major role in developing. These coalesced around 'emergence', and around the interplay between 'structure' and 'agency'.

3. Structure and Agency, and Ethics

Structure and agency needed both a framework and a set of tools – the latter to enable a degree of comparison and aggregation of insights and analysis across different contexts and learning and teaching. Within the papers that Jenny and I collaborated on, as well as those she collaborated on with others, she made a substantial contribution, particularly on the issue of ethics, which she has always insisted is a crucial, and very sensitive area in 'fully open' learning. She brought her insights on other research projects back to bear upon those that we worked on together, and I am sure she did likewise, in applying and testing the insights and the tools that we developed to other contexts and research (in which I had no direct role).

4. Tools

One of the ways we developed our methodology and, hopefully, our contribution to the fields of research and practice was through a set of theoretical frameworks -on emergence, complexity, as well as the tools for collaborative reflections, (or 'probes' i.e. tools which become part of the learning process as well as part of the analytic and collaborative process). Jenny Mackness developed, critiqued, changed, and contested these frameworks and 'probes', and applied them to other contexts, to enable the collective research group/s she was working with, as well as the research groups I was involve with, to apply them, critique them and move forward.

Jenny Mackness has, in my view and in my experience, made a substantial contribution to research, methodology, theoretical frameworks, and practice in the field, and taken research, theory and practice an important step forward. It has also been a pleasure to work with her.

The list of readers, and citations of research she has worked on is substantial, and continues to grow.

Mariana Funes

To me, Jenny's intellectual contribution to our research was in her ability to see the larger picture of the field, identify what is under-researched and set up a focussed question for collaborative research. In the case of Rhizomatic Learning, our topic, it was her in depth knowledge of MOOCs and education more widely that led to our analysis of 'community' in the Rhizo14 MOOC as a case study for the potential use of this approach in wider educational settings.

A contribution that to me is even more original is how Jenny uses remote collaborative technologies in such a way as to build a research methodology online that makes contributors at ease and committed to a project. The difficulties of remote unfunded research cannot be over-emphasised; Jenny was single handedly responsible for creating the collaborative research process that enabled herself, myself and one other to produce 3 peer reviewed papers. The use of simple digital tools like wikis and Google apps in a research savvy manner - is something that I consider unique to her way of working.

Carmen Tschofen

In 2011, I had the privilege of co-authoring "Connectivism and dimensions of individual experience," published in The International Review of Research in Open and Distributed Learning, Vol 13., No. 1 (2012), with Jenny Mackness. My work with Jenny simultaneously explored and utilized connective learning and research concepts, thereby modeling innovative pathways for independent scholarly work. Jenny's experience with emerging research environments (especially those outside of formal research institutions) facilitated us in addressing the challenge of researching and collaborating across disciplines and exploring academic and theoretical work new to each of us. Using dedicated research wikis and other communicative tools, we benefitted from an iterative process that included defining research parameters; gathering and critiquing significant research; reflective dialogue; and writing. Within our co-working structure, we were able to develop and challenge each other's knowledge bases and theoretical understandings, thereby creating a conceptual sum which was significantly greater than its parts. Our accountability and responsibilities in developing the paper were to the work itself, whereby traditional academic metrics for co-authorship were superseded by the collaborative and unboundaried work environment and end product.