Probing for Change:

Can teacher networks promote ideas spread in a complex education community?

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A thesis submitted to
Auckland University of Technology
in partial fulfilment of the requirements for the degree
of
Master of Education (MEd)

2017

Faculty of Culture and Society

ABSTRACT

The world is changing in complex and unpredictable ways. Our education system, set up to meet 20th century needs, needs to change to meet the needs of 21st century learners. In particular, we need to re-think how best to build students' intellectual capacities in ways that allow them to thrive in networks that can build social futures for their communities. If we are to do this, teachers need new kinds of professional learning and development. They need opportunities to engage in the kind of critical reflection and debate that can support transformational learning for them as adults.

The New Zealand Ministry of Education has initiated policies designed to produce this kind of change, but they are not enough. A focus on transformational learning for teachers is required: however, it is not yet clear exactly what this might look like. This thesis is a small pilot study designed to explore this. It describes a study of the experiences of a small group of teachers who were exposed to a "disorienting dilemma". This dilemma was set up as a learning experience for students, observed by the study teachers. However, its *purpose* was to disrupt the teachers' meaning-making, and to prompt them to engage in critical discourse with others: that is, it was designed as a *teacher* professional learning experience.

The teachers' responses to this experience and the discussion they had with colleagues and friends were studied (via interviews). The findings have interesting implications for the future development of teacher learning experiences that are designed to support the current policy focus on teacher collaboration and innovation within schools. For the teachers involved in this study, it was clear that, for educationally deep conversation to occur, a high level of relational trust is necessary, as is the capacity to notice—and reflect on—their own thinking about issues raised in the conversations, and to recognise shared background knowledge or experience. The teachers in this study found it difficult to think about their own learning as adults, as distinct from their perceptions of the *student* learning they observed in the study experience.

This research identifies a gap in current teacher professional learning offerings. The study teachers benefited from the opportunity to discuss their own learning experiences as adults, but more in-depth work is needed to establish how this can be supported in an on-going way.

TABLE OF CONTENTS **Page:**

LIST OF FIGURES **Page:**

LIST OF TABLES

APENDICIES

ATTESTATION

"I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgements), nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institute of higher learning"

ACKNOWLEDGEMENTS

A huge thank you to Dr Jane Gilbert for inspiring me to want to be more, know more, and do more, for the betterment of education both now and into the unknowable future, and for guiding me though a transformative learning experience that has been both cognitively challenging and personally fulfilling.

I would like to acknowledge the significant contribution of Dr Kathryn Owler in helping me to write like a 'proper' academic. Your willingness to work with me for weeks on end, guiding me though the intricacies of academic writing, with many positive words of encouragement, has completely changed my writing style.

A very special thank you to the case study school principal for trusting me with his Year 7 and 8 students, and to Danielle Myburgh for creating and implementing the 'disorienting dilemma' for the teacher professional learning activity.

A final thank you to Matthew, Jack and Izaac for the encouragement and support you gave me in the many evenings and weekends I spent in my study while you all just continued on with life.

ETHICS APPROVAL

Number: 15/337

Chapter One: Introduction

Our current education system was designed in the late 1800's to provide the skills and knowledge needed for a 20th century workforce (Beare 2001; Claxton 2008). The key assumption 20th Century education systems made was to predict the knowledge and skills learners will need in their future, and then educate them accordingly. Educational futurists argue that as the future is unknowable, it is not possible to educate for a known future. There is now concern that the Western education system will not be able to meet the changing demands of the outside world. Futurists believe we need new forms of knowledge, and increased social capacities and dispositions to live in 'postnormal' times. (Sardar, 2011, 2015).

Education needs to shift from viewing students as learners and inquirers to treating them as members of knowledge-building communities (Gilbert 2005; Scardamalia & Bereiter 2006). There is no one right way, or rubric for schools and there should not be. Each country, community, school and individual learner is diverse, with different areas of strength (Facer, 2011). Although educational futurists propose a trajectory for change (Beare & Slaughter 1993; Claxton 2012, 2014; Robinson, 2011; Scardamalia & Bereiter 2006; Wagner 2012), they argue that schools need to use networks to build new knowledge, rather than the current focus on acquiring more knowledge *about* (Claxton 2012; Scardamalia & Bereiter 2006; Wagner 2012). Future-oriented schools need to develop the intellectual capacities of every student, using networks to build social futures for their communities (Facer 2011).

> If schools are to deliver what seems to be required, however, effective and appropriate career-long professional development for the teaching workforce would seem to be an essential ingredient (Amour & Makopoulou, 2012: p. 337)

From 2011 in New Zealand, the National-led government has invested $414 million in raising student achievement (Ministry of Education, 2015). One policy, known as Better Public Service, sets a target of 85% of 18 years olds leaving school with a minimum of NCEA Level 2 by 2017 (Ministry of Education 2016a). This target of NCEA pass rate was to ensure students gain the necessary qualifications and skills to participate in the New Zealand economy. The majority of the policy initiatives implemented under this target, however, are an extension of what is already being measured in schools. There is therefore a disparity between government planning of anticipated educational change, and the initiatives to bring about this change, coupled with an undeveloped view of the role of teachers in this process. Any change initiative in an educational system requires students who can adapt to an ever-changing world, but it also requires teachers who have the capacity to sustain these students.

Investing in Educational Success (Ministry of Education, 2015a) is the only initiative to include professional learning and development for teachers, even though its focus is on improving student outcomes. The aim of this policy is to facilitate the sharing of the expertise of those identified as 'great' teachers across the new Communities of Learning, with the aim of raising overall teacher performance. However, individual teachers copying someone else's practice

may not necessarily raise the quality of teaching. As Dede remarks: “Intellectual, emotional and social support is essential for ‘unlearning’ and for transformational relearning that can lead to deeper behavioural changes that create next-generation educational practices” (Dede, 2010: p.55).

If education needs to change, then teachers need to change (Gilbert & Bull, 2014a, 2014b). Teacher professional learning and development needs to be context-specific rather than content specific and it must to address the needs of teachers as adult learners. As learners they need time and support to change their current convictions and beliefs, while exploring new alternatives (Avalos, 2011). Teachers will require professional development to help them engage in transformational learning, which will enable them to guide their students through similar learning experiences. Teachers currently educated in our 20th Century education system, require opportunities to experience and practice change. This is particularly important given the context of change identified by the futurists (e.g. Beare, 2000; Claxton, 2012; Facer, 2011; Robinson, 2011; Slaughter,1993; Weinberger, 2012).

The relationship between supporting adult learning and increasing student achievement could be built via the Communities of Learning initiative and the linked Specialist Classroom Teachers in Schools scheme (Drago-Severson, 2016; Moller & Pankake, 2006; Wagner, 2007). While more research is necessary to find ways to support teachers for the schools we want, Garvey Berger (2003), and Drago-Severson (2007) have identified some working principles including:

> Knowledge about practices that support teachers learning and growth by focussing on how teachers make sense of their experiences and how such practices actually work, across different school contexts (Drago-Severson, p.2).

According to Beavers (2009), teachers benefit from adequate time to engage in the critical reflection and discourse needed to cognitively process their changing meaning-making systems. In order to do this effectively, teachers need to talk about their practice and experience. Any professional learning and development activity must enable teachers to share their knowledge and experience with one another. For transformational learning through cognitive development to occur, it is essential that teachers engage in critical reflection and discussion about their professional practice. Yet current models of teacher professional learning and development still focus on knowledge acquisition, rather than teacher development. Schools are still being pressured by the Ministry of Education to engage in consecutive or even concurrent professional learning and development programmes which do not allow teachers the time or give them the required support to develop their own learning (Petrie & McGee, 2012).

Teachers currently working in the New Zealand education system were themselves educated in a different time, for what was assumed to be a ‘knowable’ future. (Beare, 2000; Claxton, 2012; Facer, 2011; Robinson, 2011; Slaughter,1993; Weinberger, 2012). These teachers now need to be exposed to new ways of learning and thinking, and to be given multiple opportunities to work collegially with others from diverse backgrounds (Evans, 2012). Today’s teachers need

opportunities to transform not *what* they think, but *how* they think (Garvey Berger 2003). One way of supporting this kind of "transformational learning" is via a "disorienting dilemma"[1], an experience designed to disrupt existing thinking, and to provoke critical reflections on that thinking.

This investigation is a case study of the experiences of a group of teachers who were exposed to a "disorienting dilemma". It explores the extent to which the teachers engaged in critical reflection and discourse with others after this experience. The research took place at a composite, co-educational school of approximately 800 students in a rural area of New Zealand.

The research questions were as follows:

1. To what extent do teachers discuss their professional learning experiences with others in their professional context or outside of it?

2. How extensive are these teacher interactions, and what form do they take?

3. What factors influenced whether or not the discussions took place.

The "disorienting dilemma" the research participants were exposed to took the form of an alternative way of engaging students in learning that was intended to have multiple outcomes across several disciplines. It was a one-day learning experience for 50 students, led by a teacher from another, very different school. The disorienting dilemma was intended to present an opportunity for students to increase their intellectual capacity (Robinson, 2011; Wagner, 2012), by "doing things with knowledge" (Gilbert, 2005). However, student learning from this experience was not the focus of this investigation: the focus was on the teachers.

Research participants were encouraged by the researcher to talk with others about this experience afterwards. They were told that their interactions were the focus of the research, and were given a guide for classifying the "depth" of the conversations they had with others about the disorienting dilemma.

Research participants were interviewed face-to-face by the researcher ten days after the "disorienting dilemma" experience. Participants were asked questions that aimed to find out what they thought the intent of the disorienting dilemma was, who they spoke with about it, the depth of these conversations, and why they thought they had deeper conversations with some people but not others.

[1] This concept is taken from the work of Mezirow (1997, 2004). It is explained in Chapter 2 below.

It was found that the teachers did talk with their colleagues and others about this professional learning experience: however, the majority of the conversations were of a fairly superficial nature. There was some engagement in critical reflection and critical discussion. Two of the teachers who seemed to have thought deeply about the disorienting dilemma said that they needed more time to think before they could articulate their thoughts and feelings to engage in an educationally deep conversation with another person.

The research showed that, for educationally deep conversations to occur, several conditions had to be in place. Firstly, the participants needed to have high relational trust in those they were conversing with. The deeper conversations took place with close friends and family (some of whom were teachers in other schools), as well as with colleagues with whom they had already well-developed collegial relations. Secondly, many of the participants in the conversations had undertaken their own thinking about the educational issues raised in the professional learning. Even if they had not actually participated in the professional learning activity, they were already disposed towards challenging the status quo. However, this was not the case for all participants. This was an important factor in the extent to which the conversations were seen as being deep. The third requirement for deep conversation was the extent of participants' background knowledge of the issues being challenged in the "disorienting dilemma", and the extent to which this background knowledge was shared by the conversationalists. *All* of the educationally deep conversations identified in this research were focused on student learning.

The research seems to indicate that the teachers were not 'dispositionally' ready to think about their own learning. None of the participants mentioned their own learning as a topic of conversation, even though they were aware that this was the focus of the research. Additionally, there was no shared understanding of the purpose of the disorienting dilemma, and none of the participants saw a link between the disorienting dilemma and *their own learning*. This indicates teachers' primary focus on pedagogy and student achievement, and an undeveloped capacity to consider their own learning. Even those participants who engaged in educationally deep conversation and questioned underlying theories of education, did not apply these ideas to their own learning. A view that working in "21st century" ways would have to be an extra, on top of what they already do, was evident.

A key finding from this research was that even when they are engaged in *teacher* professional learning and development that has an explicit focus on *their* learning, the teachers' focus was on how to improve student learning, not on their own cognition. In the future it could be useful to explore in more depth why teachers don't talk deeply with each other after undertaking a new form of professional development. Could it simply be a lack of time, or does the reason have to do with some deeper aspect of teachers' socialisation?

New forms of teacher professional development could give teachers new opportunities to work collegially. A collegial relationship is very distinct from a collaborative one. When teachers

collaborate, they work together to achieve a common outcome or goal, an essential part of any school operation. Collegiality however refers to the 'quality' or depth of the relations of those working together (Kelchtermas, 2006; Evans, 2012). The findings from this study show that the quality of teacher relationships [high relational trust or collegiality] was a key element in determining whether or not deep conversations occurred.

While change has not, and should not, be dictated via a one-size-fits-all model, educational futurists have proposed a trajectory for change (Beare & Slaughter 1993; Claxton 2011; Robinson, 2011; Scardamalia & Bereiter 2006; Wagner 2012). The New Zealand Government has acknowledged this trajectory with policy initiatives designed to produce change in our schools. These policies however do not go far enough. New policies and initiatives should promote transformational teacher professional learning and development. The current Investing in Educational Success initiative focuses on knowledge transfer between teachers, not transformational learning.

There is a gap between what teachers need for their professional learning and what is currently being offered to them. It is not enough for teachers to talk about their learning experiences; they need to engage cognitively in a meaningful way as adult learners, in ways that can support their on-going cognitive growth and development. Critical reflection and critical discourse should become the focus of any professional learning and development programme for teachers to enable them to engage in transformational learning.

Chapter Two: Literature Review

Introduction

In this chapter, literature from the fields of futures studies, educational change and transformational learning is reviewed. The literature from these academic fields will be critiqued and synthesised to give a comprehensive overview and establish key themes. After discussing futures studies and educational change, the chapter explores recent New Zealand government initiatives designed to bring about change in New Zealand education. The chapter will end with a discussion of transformational learning and its importance to educational change.

The literature in the first two sections of this review spans multiple disciplines acknowledging the contributions that can be made to the advancement of educational theory and practice through other disciplines. The literature discussed includes work from philosophy, psychology, technology, cognitive science, sociology, environmental science, health science and futures studies.

Futures Studies

> Welcome to postnormal times. It is a time when little can be trusted or give us confidence…the spirit of our age is characterised by uncertainty, rapid change, realignment of power, upheaval and chaotic behaviour (Sardar, 2010, p.435).

Futures Studies is an interdisciplinary field drawing on academic research from disciplines such as economics, sociology, geography, history, engineering, mathematics, psychology, physics, biology and theology. Authors in futures studies essentially argue that the world is changing rapidly, and while the future cannot be predicted, it is possible to identify possible, probable and desirable futures (Marien 2002; Masini 2006; Ringland, 2010; Sardar 1993, 2010; Slaughter 1996).

This section begins by exploring the development of Futures Studies as an academic domain. It explores its unusual academic history and explains how it has developed as a trans-disciplinary area of research. Then follows an evaluation as to how this field is influencing how we live today and how decisions being made about how we could live in the future. It is important to note that Futures Studies is not a predictive science (Dator, 2016), but rather an emerging academic area that facilitates inter- and trans-disciplinary discourse on alternative futures. As it is an emerging area of academic writing, futures studies does not have a long history (Sardar, 2010).

Futures Studies began as a technical and analytical science at the end of World War Two, concerned predominantly with military research (Masini 2006; Sardar 2010,). The 1960s saw a growth in futures thinking from more philosophical and sociological schools of thought (Masini 2006). Recent futures studies work has seen a focus on organisational and social perspectives

on the future (Sardar 2010). Most sources in this section are relatively recent, from the early 90s to the present.

Key authors include Marien (2002), Masini (2006), Ringland (2010), Sardar (2010, 2015) and Slaughter (1996). What these authors have in common is the belief that the world is undergoing radical change, and that it is possible to identity probable, possible and desirable futures (Masini, 2006). For instance, in 2010 Sardar, a science-based futurist, wrote the seminal article "Welcome to Postnormal Times", which brought to the forefront a view of our world as changing and evolving at an exponential rate across all sectors of society. This article drew together the mega-trends of climate change, capitalism's decline, political unrest, population increase and technological change, to describe a world that is now complex, chaotic and full of contradictions.

There has been criticism of the 'post normal times' concept as too Western (e.g. Kapoor, 2011, Masini 2006), or not sufficiently based in empirical evidence (Cole, 2011). However, authors such as Sardar, Ringland, Slaughter and Masini argue that it is clear that our world is changing in significant and life altering ways. Slaughter (1996) believes that the Western influences that currently prevail in futures studies will evolve over time, eventually becoming more diverse and reflecting a more global perspective.

Naisbitt coined the term 'mega-trend' in the early 1980's to describe a series of changes taking place predominantly in the USA (Slaughter, 1993). While the definition can be contested (Slaughter 1993; Maxwell 2013), the term mega-trend is usually used to describe major global, sustained events or issues that impact societies, economies, cultures and personal lives by redefining how we live in the world (Godet, 1988; Hajkowicz, Cook & Littleboy, 2010; Maxwell, 2013; Naisbitt, 1982; Slaughter, 1993). Mega-trends will have different meanings and impact for different countries, societies, and cultures due to the diverse way of interpreting each megatrend and its possible and probable effects (Maxwell, 2013). Futures studies writers, identify a number of mega-trends that are eroding the sense of stability and certainty that has characterised 20th century life (Godet, 1988; Hajkowicz, Cook & Littleboy, 2010; Maxwell, 2013; Naisbitt ,1982; Slaughter, 1993).

Using the definition of megatrend described by Naisbitt (1982) some of the megatrends mentioned by futurist writers include: global population growth, advancements and paradoxically regression in biological sciences, the digital revolution, including the increase of networked forms of knowledge, and expanding inequalities (Brinkerhoff, 2014; Godet, 1988; Hajkowicz, Cook & Littleboy, 2010; Maxwell, 2013; Naisbitt, 1982; Slaughter, 1993). Futurists also argue that there are a number of 'wicked problems' driving these megatrends. The term 'wicked problem' was first used in 1973 by Rittel and Webber to describe global issues which cannot be clearly defined, have no clear solution, and attempts at solutions have unforeseen consequences (Brinkerhoff, 2014; Rittel & Webber, 1973).

Futurists are in agreement that 'wicked problems', are global issues that generate local problems such as climate change, growing economic inequality, sustainable energy sources, international drug trafficking and social injustices (Roberts, 2000). They are big issues that affect all the people on the planet, and are mostly negative having immense impact on the very foundations of civilisation (Maxwell 2013). These 'wicked problems' are currently unsolvable with the knowledge and meaning making systems being used today (Head & Alford, 2015).

Megatrends and their associated 'wicked problems' are not abstract concepts. Futurists agree that they influence not only how we live today, but also bring into question our many and varied possible futures (Brinkerhoff 2014; Head & Alford 2015; Marien 2002; Masini 2006; Ringland 2010; Rittel & Webber 1973; Sardar, 2010, 2015; Slaughter 1996). A brief exploration into the literature discussing megatrends of networked knowledge and the digital revolution reveals the complexity and uncertainty surrounding these drivers of change.

Networked Forms of Knowledge

Several writers such as Anderson (2007), Benkerler (2011), Castells (2006), Dutton (2009), Facer (2011) and Weinberger (2012), discuss the megatrend of networked forms of knowledge. Anderson (2007) has identified every major milestone in human evolution, from the discovery of fire, to the development of reading and writing has involved the acquisition of new knowledge or an advance in our ability to store and communicate symbolic information. Castells (2006), in his book *Rise of the Networked Society,* shows how the emergence of the global information economy, particularly over the last decade, has transformed our society from the Industrial Age to a networked knowledge society.

A networked society is a system of human interaction that emphasises both individual action and structural patterns (Dutton, 2009). It is important to distinguish this networked knowledge from 'the internet'. While the Internet can support and reinforce different forms of networking, networks are much more than this (Dutton 2009; Facer 2011). Networks include computer-mediated information and communication technologies that have come to play a significant role in our lives (Benkler 2011; Castells 2007). These networks have realigned in a substantial way: "the organisation of production, power and meaning-making in contemporary society" (Benkerler, 2011, p. 723)

Networks have played a significant role in the transformation of the meaning of knowledge (Facer, 2011). According to Weinberger (2012) as knowledge has become networked, it has become "too big to know". He argues that:

> The smartest person in the room isn't the person standing at the front lecturing us, it isn't the collective wisdom of those in the room. The smartest person is the room itself; the network that joins the people and ideas in the room, and connects to those outside of it (Weinberger 2012: p.183).

Digital Revolution

Futurists also write about the digital revolution. They are aware that not only are people living longer, but that advancements in biological sciences are leading us to rethink what it means to

be human (Cliffe, O'Malley & Taylor 2008; Greenfield 2003; Sterling 2003, 2005). As Facer (2011) explains, humans are enhancing not only their bodies with machines, but also their minds with pharmaceuticals designed to increase their cognitive advantage. Futurists point to medical science suffering regression with the emergence of antibiotic resistant pathogens which implies that surgery and cancer treatments in the future are likely to be much riskier (Sardar, 2015).

Adult working lives have also been affected by the digital revolution. Brynjolfsson and McAfree (2012) explain that how we live, how we interact with each other and our surroundings, and how we engage in employment is changing dramatically (Kirilenko & Lo, 2013). The exponential increase in technological advancement is resulting in technological displacement of the work force. In traditional high labour force areas, such as manufacturing and production, workers are losing the "race against the machine" (Brynjolfsson & McAfree 2012; West, 2015). Automation has meant the "end of work" (Brynjolfsson & McAfree, 2012 p.112), for hundreds of thousands of workers (Brynjolfsson & McAfree 2012; Godet 1988; Miller 2015). West (2015) predicts that there will be 1.9 million industrial robots in use in the world by end of 2017.

This robotic revolution is intertwined with the collection and analysis of 'Big Data' from online and networked interactions, which has its own inherent issues from its use of algorithms for 'predictive analytic' correlations as correlations can be misleading and misused (West, 2015). Privacy is also endangered, with the demarcation between public and private life becoming blurred. Additionally, much of every country's critical infrastructure is on-line - such as; power grids, public health and education data, emergency response systems and transport links, raising the issue of online security, particularly when coupled with the threat of terrorism (Godet 1988; Kirilenko & Lo 2013; Sardar 2011, 2015).

In conclusion, futurists argue that there is no doubt that the world is changing in complex and unpredictable ways. If we accept this, then todays' young people are inheriting a world that is in crisis. They will need to solve the twentieth century's human-made problems, such as energy depletion, nuclear proliferation, failing free market capitalism, and the threat of terrorism (Sardar, 2010). Some futurists (e.g. Gidley 2010), believe we need new forms of knowledge, increased social capacities and fluctuating dispositions to live in these 'post-normal' times. In other words, we need new ways of thinking. Gidley (2010) writes that: "as Einstein put it a century ago, the significant problems we have cannot be solved at the same level of thinking with which we created them" (p.1040).

The call for educational change

Building on the work of the futurist authors above, some educational researchers argue that public schooling needs to change dramatically if it is to meet the needs of the young people inheriting this very different world. This next section of this literature review draws on the work of educational thinkers, cognitive scientists, technologists and sociologists to outline some recent work exploring what education's future might look like. From this work, two main themes emerge: the need to develop intellectual capacity/agility for the new times, and the need to use networks to build social futures. This section starts with a general discussion of educational change, before discussing these two themes.

As outlined in the section above some educational thinkers believe that the current Western education system is no longer meeting the needs of today's learners (Beare 2001; Claxton 2014; Robinson 2015; Wagner 2012; Weinberger 2012). Sardar (2010) argues that today's students are living in a world in transition, where "old orthodoxies are dying but new ones are yet to take their place" (p.436).

Some commentators claim that today's students need a new set of capacities and dispositions to live in tomorrow's world. They argue that while subject knowledge is still important, it is not necessary to teach this knowledge in the traditional subject-based way (Gilbert, 2005; Gilbert & Bull 2014). As information is now easily accessible and constantly changing, today's students should instead be using their time in formal education to develop their ability to "do things with" this information, to cognitively engage with it, with others, to build new knowledge. This requires a different emphasis from traditional forms of education. As Guy Claxton puts it, they need to be able to "flounder intelligently and persist with difficulty" (2014, p.5).

Current thinkers who accept the futurists' contention that the world is changing in complex and unpredictable ways, advocate for full-scale system change *not* simply on-going improvement. There are two broad themes to this work. First is the pressing need to develop intellectual capacity in every learner, and second is the case for using networks to build not just learning, but social futures.

Building Intellectual Capacity

The need for the Western education system to shift focus from teaching discipline-based knowledge within a subject, to developing individual learners' intellectual capacity via contextual learning is being advocated by many academics (e.g. Claxton 2008, 2014; Robinson, 2011; Scardamalia & Bereiter 2006; Wagner 2012). Guy Claxton in particular has used this approach in his "Building Learning Power" publications and workshops for teachers (see Claxton, 2014). Others (e.g. Ken Robinson and Tony Wagner) have made the case for creativity and innovation in education. Robinson (2011) argues that the key to educational change is to foster creativity in every student, reduce standardised testing, and focus on high quality teacher training and

development. Wagner (2012) also makes the case for the importance of creativity in education. Wagner believes that schools need to focus specifically on developing cultures of innovation and creativity. He states that schools can do this through collaboration, interdisciplinary problem solving and intrinsic motivation.

Scardamalia and Bereiter have conducted research projects in schools over many years focusing on their concept of "Knowledge Building". Their "Knowledge Building" philosophy is a constructivist-influenced learning theory. Its purpose is to engage students, both individually and collaboratively, in sustained creative work with ideas and authentic problems, with the intent to build on those ideas for the betterment of the community (Scardamalia & Bereiter 2006). Gilbert in her book "Catching the Knowledge Wave" (2005), uses Scardamalia and Bereiter's work to argue that in schools, knowledge needs to be used to create new knowledge; it is no longer enough to see acquiring knowledge as an end in itself.

The changed focus on knowledge in a 21st century education system, advocated by Claxton (2012), Gilbert (2005, 2015), Robinson (2013, 2015), Scardamalia & Bereiter (2006) and Wagner (2012), does not necessarily change what is taught in schools, but rather *how* it is taught and what students *do* with the powerful knowledge they attain. In all of these very different approaches it is argued that students need to do more than 'know' knowledge, they must be taught to 'do stuff with' knowledge (Gilbert, 2005). This underpins the case made by these authors for thinking about building intellectual capacity in new ways, ways that can support people to thrive and survive in our complex and chaotic world.

Using Networks

Not only are some Western academics wanting our education system to focus on developing intellectual capacity, but they also want to use school networks to build learning futures and social futures for their local communities (Beare 2000; Facer 2011; Slaughter, 1993; Weinberger, 2012). In 1993 Australia educationists Hedley Beare and Richard Slaughter co-authored the book "Education for the 21st Century". Twenty-three years ago they called for Western education systems to look beyond themselves to develop networked programmes with their local communities. More recently David Weinberger (2012) argues that due to exponential technological advancement, the networked world *is* the local community. The rise of networks and networked knowledge is bringing about fundamental change in how individuals view and understand the world around them (Weinberger, 2012). As Sardar (2010) explains: "we are more connected and interconnected than in any other time in history" (p.437). The digital revolution is changing how humans interact with the world, with society and with knowledge. People no longer work in isolation on individual tasks, but work in collaborative projects and networked knowledge sharing (Weinberger, 2012). There will continue to be a plethora of online and face-to-face networks which will be used for personal, social and institutional capital. These will increase in depth, value and importance as knowledge building continues to develop

and change, and as knowledge itself increasingly becomes 'too big to know' (Facer 2011; Gilbert, 2015; Weinberger 2012).

Keri Facer has explored the impact of networks in her book "Learning Futures: Education, technology and social change". She believes there is an urgent need to rethink the relationship between education and society and that education could be used as a platform for thinking about environmental, economic, social and technological change and the probable, possible and preferred futures that arise from them. These futures transcend the conventional and the orthodox outlook (Facer 2011; Sardar 2010, 2015). Beare and Slaughter (1993) argue that education has an obligation to take part in "the conversation about establishing a more equitable, peaceful and sustainable world" (p.3).

The overarching message from Beare and Slaughter (1993, 2000), Facer (2011) and Weinberger (2012), in the three books discussed above, is that schools are no longer isolated parts of an industrial machine. Schools should instead use their networks (virtual, real or even augmented reality) to build communities of learning for everyone they engage with.

Thus the educational theorists cited here argue that the underlying purpose of schools must change. Schools should focus on developing intellectual capacity/agility and developing a networked approach to learning. "Education does not need fine-tuning, or more of the same; rather the fundamental assumptions about schools have to be revised" (Beare & Slaughter, 1993, p.3). There needs to be a shift from viewing students as learners or knowledge-acquirers to treating them as members of knowledge building communities (Gilbert 2005; Scardamalia & Bereiter 2006). Schools need to be using networks to build knowledge *of* rather than knowledge *about* (Claxton 2012, 2015; Scardamalia & Bereiter 2006; Wagner 2012).

Educational Change in New Zealand

This section of the literature review focuses on what is currently happening in New Zealand. It outlines recent government policy initiatives designed to produce change in the New Zealand education system and looks at how teachers are being supported (or not) through these changes.

There is no one right way forward, no one model of change or rubric that schools can adopt, and there should not be. Each country, community, school and individual learner is diverse, with different areas of strength and areas for development (Facer, 2011). Educational futurists have however proposed a trajectory for change (Beare & Slaughter 1993; Claxon 2012, 2015; Robinson, 2013, 2015; Scardamalia & Bereiter 2006; Wagner 2012). There are some government policy initiatives that suggest the possibility of systems change, however, these initiatives also have important limitations relating to teacher support. These initiatives and their limitations are discussed below.

What is happening in New Zealand?

Since 2011 in New Zealand the government has had a strong focus on raising student achievement (Ministry of Education, 2015). Many of the policies they have instituted are designed to meet what is known as the "Better Public Service Target" – that by 2017, 85% of 18 years olds will leave school with a minimum of NCEA Level 2 or equivalent qualification (Ministry of Education 2016a). The intent of this target is to ensure students gain the qualifications and skills they need to participate successfully in the New Zealand economy.

In 2016 the government identified eight strategies and policies and twenty four education initiatives, as well as the two cross-sector initiatives: Better Public Services and the Ministerial Cross-Sector forum on raising achievement (Ministry of Education 2016b). All of these policies and initiatives were aimed at improving student achievement and accelerating success of all students at all levels of the education system. These policies and initiatives covered a broad range of areas including health and safety in schools, the setting up of the Education Council of Aotearoa New Zealand, and the new "partnership" schools. (Ministry of Education, 2016c; Ministry of Education, 2016d). Additionally in 2016, the Ministry of Education released their four year plan for schools (Ministry of Education 2016e). This plan looked at what the government hoped to achieve or implement from 2016-2020. This report included the two objectives of; better tailoring for a responsive educational services addressing the needs and aspirations of all students, and better targeting of investment, resources, support and expertise to drive innovation and improve results, and more effective collaboration at all levels to raise achievement. These objectives indicate a belief within government that schools do need to do things differently in the future. However, it is important to ask whether the initiatives they have put in place will be effective in supporting change to occur.

Are these change policies or adaptations of what educators already do?

The majority of the policy initiatives discussed above are an extension to, or a slightly modified way of doing, what is already being done in schools. In other words, they are adaptions, not change initiatives. The focus on Science (Ministry of Education, 2015b), Mathematics (Ministry of Education, 2015c), and National Standards (Ministry of Education, 2015d) promotes strategies designed, not to engage students in thinking or acting differently, but to maintain the status quo, but with better measurement of progress. These initiatives still assume the transfer of knowledge from expert to novice, and students are unlikely to notice any difference in how they are learning or how the teachers are teaching.

However, of the 24 initiatives implemented over the past four years, two could be identified as using 'networked knowledge'; the Trades Academies initiative (Ministry of Education, 2016g) and the Investing in Educational Success policy (Ministry of Education, 2016h). The Investing in Educational Success policy (Ministry of Education, 2016h) incorporates a focus on new ways of thinking about teacher PLD. These two initiatives are outlined in more detail below.

Trades Academies, otherwise known as Secondary-Tertiary Programmes, (STP) (Ministry of Education, 2016g) were established in 2011. This initiative uses different education and private enterprise networks, both human and internet based to create new forms of learning for secondary students. It has increased the capacity of available subjects for school students, as schools are now brokering learning with a variety of tertiary based education providers. Secondary schools are outsourcing their students to external education providers, such as Institutes of Learning and Industry Training Organisations, who offer content and assessment external to what is offered in schools. For 4,326 (2014) senior secondary school students, schools are now realising Bentley's "learning broker" vision for schools (Miller & Bentley, 2003). Within the Trades Academy programme students have the opportunity to develop skills, competencies and networks for life beyond school, in ways that can ease the transition between school, tertiary study and work (Education Review Office, 2015).

The Investing in Educational Success policy (Ministry of Education, 2016h), and the linked Communities of Learning initiative, have brought about a major system change for participating schools. The Communities of Learning are groups of kura and schools that work together within their local communities to overcome achievement challenges. Communities of Learning were developed for the express purpose of improving teaching practice, encouraging collaboration between teachers, helping all students benefit from great teachers across a group of schools and helping schools work together to help students transition through the education system (Ministry of Education, 2016h).

In 2016 there were 148 Communities of Learning throughout New Zealand, involving 410,000 students. These communities set shared goals or achievement challenges, based on the needs of the communities and work together to achieve them. All Communities of Learning have achievement challenges that are based around National Standards achievement for primary schools and the Better Public Service Target (of 85% of students leaving secondary school with the minimum of NCEA Level 2 (Ministry of Education 2016a).

While all of the government initiatives discussed in this section are explicitly focused on raising student achievement, the Trades Academies and Investing in Educational Success have the potential to promote system change that *could* align with approaches advocated by futurist thinkers. However, one extremely important component is missing: the necessary re-examination of teacher professional learning and development practices. If teachers are to effectively support a re-purposed view of students' intellectual development and to use networked learning, they will need major new learning, and support to do this.

Do any of these policies support educators to change?

There is a significant disparity between government planning for expected educational change, the initiatives they have implemented to bring about this change, and the role expected of

teachers in this change process. As stated by Dede the “lack of professional development is another reason 21st century skills are under emphasised in today’s schooling” (2010, p. 55). The New Zealand government has a focus on student achievement, and accelerating student success. While the government acknowledges that teachers are the single biggest influence on student success, only the Investing in Educational Success initiative points to the need to support teachers to *change* to be successful in this new school environment. As Dufour & Dufour, 2010, p 92) point out, “improvement in student outcomes will require changes in adult behaviour" However, the level of support provided for in the Investing in Educational Success initiative is insufficient.

The aim of Investing in Educational Success is to share best practice across the Communities of Learning in the expectation that this will raise overall teacher performance. According to a Cabinet paper from 21st January 2014, keeping ‘great’ teachers in the classroom and supporting them to share their knowledge with their peers across their learning community, will ensure that best practice becomes universal practice, as it will better support teachers to constantly review their teaching, encourage teachers to actively seek external observation and critique by colleagues and more experienced teachers. Teachers will be encouraged to seek and contribute to evidence of what works to improve learning (Office of the Minister of Education, 2014).

It can be argued that many of these strategies reinforce what teachers already do in schools. Doubt could be raised about the capacity of these initiatives to encourage teachers to improve the quality of their teaching. An individual teacher picking up and imitating someone else’s practice is not going to raise the quality of teaching in New Zealand. Nor will the uncritical mimicking of ‘best’ practice professional learning. Rather, as Dede (2010) puts it,

> Intellectual, emotional and social support is essential for ‘unlearning’ and for transformational relearning that can lead to deeper behavioural changes that create next-generation educational practices (p.55).

The Investing in Educational Success initiative intends to provide opportunities for teacher-led innovation in schools, for making clearly visible what is possible, new and exciting. In a Ministerial announcement on 23 September 2015 the Minister of Education Hekia Parata stated that:

> Priority will be given to schools as they grow into Communities of Learning, working together to raise achievement for all their students, and to schools with a high number of students achieving below expected levels (Minister of Education, 2015).

This indicates that schools outside official Communities of Learning will need to fund alternative professional learning from their Operations Grants if they consider teacher professional learning and development a priority.

To conclude, in the Trade Academies and the Investing in Educational Success initiatives there is a focus on teacher networked knowledge and teacher collaboration. This suggests potential for important system change. However, the underlying support for the kinds of teacher cognitive

development that could allow them to work successfully in this new environment is not yet present in either policy or practice.

Teacher Professional Learning and Development in New Zealand

Political policies are ultimately driving the trajectory of educational change, through the allocation of money and resources to fit the current governments political agenda. Underpinning this change trajectory is a plethora of government funded professional learning and development programmes, which are used to introduce the desired curriculum and pedagogical reforms (Petrie & McGee, 2012)

Professional learning and development for teachers is a complex process, which should be about "teachers learning, learning how to learn, and transforming their knowledge into practice for the benefit of their students' growth" (Avalos, 2011 p.33). It is a process requiring the emotional and cognitive engagement of teachers individually and collectively, who have the capacity to examine their own convictions and beliefs, while being willing to explore alternatives (Avalos, 2011). There can be no 'one size fits all' approach. As Kedzior (2004) puts it:

> differences in communities… teachers, and students uniquely affect professional development processes and can strongly influence the characteristics that contribute to professional development's effectiveness (Kedzior, 2004, p.2)

A 2007 a synthesis of research evidence produced for the New Zealand Ministry of Education's Iterative Best Evidence Synthesis (BES) Programme by Helen Timperley identified 10 key principles that have a positive effect on what she calls 'valued student outcomes'. Of these 10 key principles only two are focused directly on student outcomes, the other eight are focused on increasing the skills and capacities of the teachers. It identifies that teacher professional learning needs to context-specific not content-specific. The teachers need time and support to change; they need to have their knowledge of existing theories and practice challenged in a safe and trusting environment. That teacher's need to not only understand the theory but that they need on-going cyclical support to translate the theory into practice, in his or her own context. This study also noted however that:

> Regrettably, most efforts to improve student outcomes through professional learning and development are short-lived. For improvement to be sustained, short-term perspectives need to be extended to more distant horizons (Timperley, 2007: p.24).

The difficulties of short term focus on professional learning and development is reinforced in a 2012 study of professional learning in New Zealand by Petrie & McGee (2012). This study found that primary school principals were concerned that they were being pressured by the Ministry of Education to engage in consecutive and at times concurrent professional learning and development programmes, and that teachers do not have sufficient time to develop their own learning. According to Petrie & McGee,

> it is unlikely that they achieve deep understanding and greater confidence from the PD they undertake, because one year is not long enough to embed the learning before they have to move on to new PD, and the learning from the previous year is pushed to the side (Petrie & McGee, 2012 p.60).

Currently in New Zealand professional learning and development programmes focus on enhancing student outcomes by attempting to change teachers, while largely ignoring the learning needs of the teachers engaged in the professional learning and development programmes (Petrie & McGee, 2012). On the basis of their research in this area, Alton-Lee (2003); Kedzior (2004); Petrie & McGee (2012) and Timperley (2007) all identify that, in order to create the improved student outcomes governments desire, teacher professional learning and development needs to be focused *on the teacher as a learner* over a sustained period of time. That teacher professional learning and development opportunities need to build, in the teachers themselves, the capacity to engage in sustained, challenging and change driven adult learning.

Transformational Learning

If we accept the change focus of the theorists discussed above, then change is required in the education system. If this is the case, then the teachers who work within that system need to change to enable them to operate effectively (Gilbert, 2014b). Teachers will require professional learning and development to help them engage in transformational learning experiences, which in turn will enable them to guide their students through similar learning experiences. The next section outlines the literature in the areas of transformational (or transformative) learning and the related area of constructive developmental theory. It explores the usefulness of this work for teacher professional learning and development.

The role of the teacher

Teachers who were educated in the 20th century education system need opportunities to experience and develop change in practice. This is particularly important given the context of change identified by futurists (e.g. Beare, 2000; Claxton, 2012, 2014; Facer, 2011; Robinson, 2011; Slaughter,1993; Weinberger, 2012). Teachers learning skills and knowledge at a short one-day professional development course, or even a three-day conference are unlikely to encounter learning situations which give them opportunities for the kind of cognitive growth needed for "real" practice change. As Gilbert (2015) points out: "practice change requires change in the underlying way of thinking" (p. 5), in other words, it requires cognitive change.

Cognitive change or transformation is not a change in *what* a person thinks, but a change in *how* they think it. It is a change in the system they use to represent, organise and give meaning to their world (Boyd, 1991; Cranton, 1994; Freire,1998; Innel, 1998; Mezirow, 1978, 1997, 2004; Taylor, 1998). Change *at this level* is required for effective professional development (Helsing, Howell, Kegan & Lahey, (2008).

Transformational learning and adult cognitive development

Transformational learning is broadly defined as a change in a person's meaning making system that alters how they make sense of and "see" the world around them (Boyd, 1991; Cranton, 1997; Freire,1998; Innel, 1998; Mezirow, 1997, 2004; Taylor, 1998). It opens up new possibilities, and allows new ways of seeing and making meaning. It is this kind of learning that teachers need if they are to become "future-oriented". Work on transformational learning usually appears in the context of adult (not children's) learning, and there are strong overlaps with adult cognitive development theory (Helsing, Howell, Kegan & Lahey, 2008, p. 441).

This section will briefly review what transformational learning can mean in an adult learning context. There will be a focus on the work of Jack Mezirow (and his associates) and Robert Kegan's five stage model of adult cognitive development. The section concludes with an outline of Eleanor Drago-Severson's use of Kegan's stages of cognitive development in her work on the development of teachers as adult learners and its application in teacher PLD programmes

Mezirow's Work on Transformational Learning

The theory of transformational learning has a long and many-branched history. There are many definitions and many proponents of this concept (Boyd, 1991; Cranton, 1994; Freire,1998; Innel, 1998; Mezirow, 1997, 2004; Taylor, 1998). This study draws on the influential work on transformational learning theory developed by Jack Mezirow back in the 1970s. Mezirow originally conducted research on women's learning experiences on returning to study after a long absence (Mezirow,1978; Taylor,1998), and much of his work is based on this research. Over the following two decades Mezirow's theory evolved to focus on four elements, which, he argues, are key to enabling transformational learning in adult learners (Mezirow, 1997, 2004). These are discussed below.

Firstly, adults exhibit two kinds of learning: *instrumental* learning (e.g. cause and effect) and *communicative* (e.g. feelings). This aspect of Mezirow's theory uses Habermas' communication theory (Habermas, 1991; Taylor, 1998). Secondly, transformational learning involves changes to *meaning structures*, to the learner's perspectives and mental schema. Thirdly, these changes to meaning structures occur through *reflection* about content, process or premises. Mezirow (1991) differentiates between three types of reflection on experience: *content* reflection - thinking about the actual experience itself; *process* reflection - thinking how to handle the experience; and *premise* reflection - examining long-held, socially constructed assumptions, beliefs, and values that underpin the experience or problem (Merriam, 2004, p.62). For Mezirow, of these three, only premise reflection leads to transformative learning. The fourth key element involves refining or elaborating meaning schemes, learning new schemes, transforming schemes or transforming perspectives. Transformational learning can occur in multiple ways, but these four elements need to be in play. In addition, Mezirow argues that transformational

learning requires the learner to have been exposed to what he calls a “disorienting dilemma”, a learning experience or situation that disrupts how they view their world. Mezirow’s work has been taken up and developed by many others, most notably Cranton (1994), and Taylor (1997, 1998, 2000).

His work is not without its critics. For example, Merriam (2004) argues that people need certain capacities to engage in transformational learning. Mark Tennant (1993) argues that it is important to distinguish between normative psychological development (i.e. normal progress through expected life cycle stages within a given world view), and adult transformational learning. He believes that some authors confuse normal life progression stages with the stages of transformational learning. Mezirow (and Kegan dispute this, however. Mezirow believes that all adults have the capacity to engage in some level of transformational learning (Mezirow, 1997), while Kegan claims that some adults will be unable to move beyond a certain point in their normative psychological development without some form of transformative learning experience.

Kegan’s Work on Constructive Developmental Theory

Robert Kegan’s five-theory of adult cognitive development is introduced below, followed by an outline of the five stages.

Kegan’s theory of constructive developmental theory builds on the work of Swiss psychologist Jean Piaget (Kegan,1980, 1983; Taylor, 1997, 2000) on the cognitive development of children. Piaget’s work is the basis of the constructivist approach to learning in the New Zealand education system. Kegan’s theory focuses on cognitive development in adulthood, right across the lifespan. His stage-based model is built on the premise that human beings are meaning makers. For him, “our meaning is not so much something we *have* but something we *are*” (Kegan, 1980, p.374). These meaning systems shape our experiences and, in turn, the meaning we make of each experience shapes who we are. To a very great extent these meaning-making systems give rise to our behaviour and organise our thinking and feeling (Kegan,1980, 1983).

Kegan’s model identifies five stages of potential cognitive development over a lifetime (Garvey-Berger 2003; Kegan, 1980, 1983, 2000). The first stage, the *magical* childhood mind or impulsive mind, is in early childhood. The child cannot yet hold the idea of durable objects, or that things retain the same qualities over time. The world for them changes, moment to moment (Garvey-Berger 2003; Kegan, 1980, 1983, 2000). The second stage is the *self-sovereign* or instrumental mind. In this stage the world has become less magical and more complex. A person will have beliefs and feelings that remain constant over time but cannot hold their own perspective and the perspective of another at the same time. They are extremely rule-bound (Kegan, 1980, 1983, 2000). Garvey-Berger (2003), identified that while this stage was originally thought to be applicable to older children and adolescents, there is increasing evidence that

adults can spend many years in this stage as well. The third stage is the *socialised* mind. In this stage, a person will have internalised one or more systems of meaning and are able to be guided by the norms and values of their meaning system. They can think abstractly and be reflective. However, they have trouble negotiating competing ideologies. People can begin to enter this stage in adolescence; however, studies have shown that a large percentage of adults live most or all of their lives in this stage, not developing cognitively beyond this stage (Garvey Berger, 2003).

The fourth stage is that of the *self-authored* mind. To enter this stage a person has created a *self* that is the author of its own connections. Perspectives, opinions and desires they were *subject* to have become *objects* to them. They have a self-governing meaning making system. The *subject–object* distinction is the critical component of this stage. This is described by Drago-Severson (2007) in her commentary on Kegan's work:

> What we are *subject to*, we do not question and cannot *look at*; as it is *part* of us. In contrast, what a person holds as "object" in a way of knowing, he can take perspective on and *see*". What is "object" can be *reflected on and considered*; we *can* control it, be responsible of it, and manage it (p.6).

The fifth and final stage of Kegan's scheme is that of the *self-transforming* mind. Very few people reach this stage, and those who do are usually in late middle age (50+). In this stage, a person has learned the limits of their own inner systems and can look across their inner systems to see the similarities that are hidden within what they used to think were differences. A person in this stage is generally good at managing the tensions of opposites in their mind and do not have black and white thinking but shades of grey (Garvey-Berger 2003; Kegan, 1980, 1983, 2000).

Constructive developmental psychologists such as Kegan and Drago-Severson believe that the development of adult learning involves the following ideas:

> movement through a predictable sequence of 'forms' (frames of reference or meaning systems) culminating in the development of adult capacity, and in some adult learners, the ability and disposition to engage in the transformative process of critical self-reflection and reflective judgement through discourse (Mezirow, 2007, p.32).

Kegan's cognitive stages are effectively visually represented by Stewart and Wolodko (2016), clearly showing how the stages flow and how meaning making systems can change or become entrenched. The diagram is taken from Stewart and Wolodko (2016, p.249).

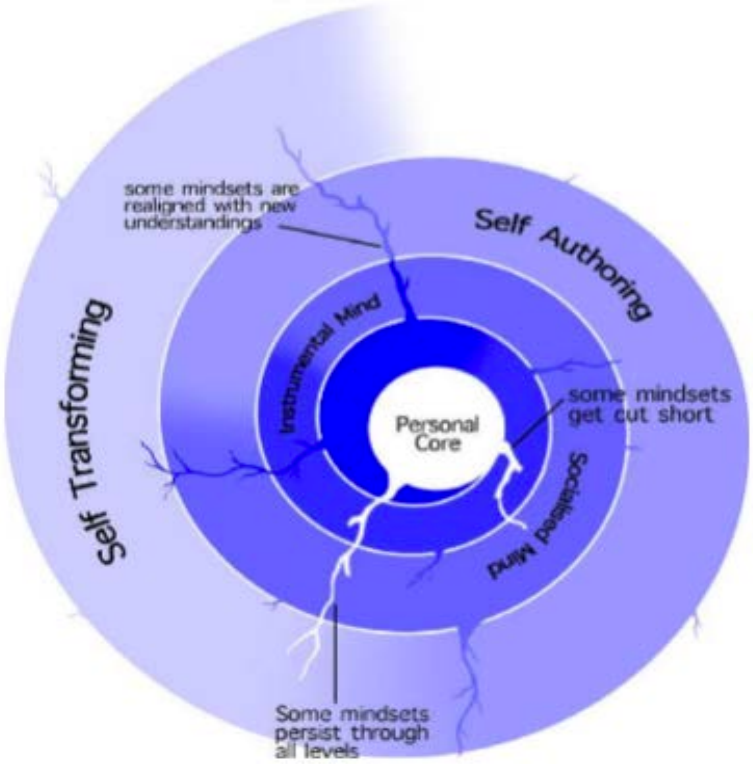


Fig. 1. Adult constructive development as an expanding consciousness with progressive transitions. Mindsets are created at various points in time and may be carried forward or may dissipate due to changing experiences and contexts.

Constructive Developmental Theory *and Transformational Learning in Teacher Professional Learning and Development – the work of Eleanor Drago-Severson*

This section outlines work advocating the development of teacher professional learning approaches that draw on transformational learning and adult cognitive development theory to treat *teachers* as adult learners. It argues that such approaches can support teachers to change *how* they think, which, as argued above, is a necessary precursor for system change in the education sector.

Eleanor Drago-Severson has applied Kegan's five-stage model of adult cognitive development to her work on identifying ways to support teachers to move between these developmental stages. For her:

> To be more effectively equipped to teach, learn and lead in todays' world, we need to learn how to support each others' growth and learning as well as our own, employ practices that support such growth and learn to collaborate and work together in teams in ways that help us to meet implicit and explicit demands that we encounter every day in our work and enable us to grow (Drago-Severson, 2016, p. 56)

Drago-Severson identifies several key factors, which she calls "pillar practices", that influence how and why teachers learn. These draw on Kegan's five-stage model. These are described

below, and later used as the basis for suggesting some steps to follow for developing "future-oriented" teacher professional learning in New Zealand. First, however, is an outline of Drago-Severson's use of Kegan's work.

Drago-Severson's Stages of Teacher Mind

Drago-Severson has taken Kegan's (1997, 1998, 2000) five stages of mind and applied this to her thinking about the cognitive development of teachers as adult learners. Her view of what these stages of mind could look like for teachers, adapted from her 2007 article *Helping Teachers Learn,* is outlined below.

Drago-Severson (2007) assumes that teachers will have developed cognitively from Stage One or the magical childhood mind, partly through their natural life development, and also as they themselves move through the education system. Therefore, in her scheme there is no allowance for Kegan's Stage One. Teachers at Stage Two or the Instrumental Mind will orient to their own self-interest and purposes. They will have concrete needs and wants and dependent on clear rules. Teachers' decision-making will be based on their own self-interest. Questions that guide their decision-making could be: "will I get punished?" or "what's in it for me?"
Teachers at Stage Three or the Socialising Mind will orient their values to others' expectations and opinions. They depend on an external authority and this authority affiliation and acceptance is crucial. Teachers at this stage will feel responsible for others' feelings, and also hold others responsible for their feelings. Criticisms and conflicts are seen as a threat. Questions that guide their decision-making could be: "Will you still value and like me?" or "Will you still think I am a good person?"

Teachers at Stage Four or the Self-Authoring Mind will orient to their own internal values and authority. Criticism is evaluated and used according to their own internal standards. These teachers are often concerned with their own performance and competence and can hold contradictory feelings simultaneously. Questions that guide their decision-making could be: "am I to maintain my own standards?" or "am I achieving my goals and being guided by my ideas?"
Teachers at Stage Five or the Self-Transforming Mind will orient to multiple self-systems. They are open to learning from other people and are committed to self-exploration. They see conflict as an opportunity to let others inform and shape their thinking, and that conflict is natural to life and can enhance their thinking. Questions that guide their decision-making could be: "how can other peoples' thinking help me to enhance my own?" or "how can I seek out information and opinions from others to help me modify my own thinking?"

Moving between stages of mind

Drago-Severson (2007) believes that it is not enough to simply identify a teacher's developmental stage: she believes it is important for professional development leaders to be

able to work with teachers within the stage they are currently in and to support them to begin to make the transition into the next one. This is long-term work.

Drago Severson (2007) has developed four principles, or what she calls “pillar practices”, that can support teachers in transformational learning that can lead to movement through the stages of mind. These practices use the concepts of critical reflection and critical dialogue, drawn from Mezirow’s work.

The first “pillar practice” identified by Drago-Severson (2007), is that of *teaming* or partnering with colleagues within, and outside of school, sharing in work and decision-making. It is through the development of learning relationships that teachers can be exposed to diverse viewpoints, build relationships, and create new networks both inside and outside of school. These learning relationships potentially create a safe context for broadening a teacher’s perspective, and develop their ability to take risks, while giving them space for considering new ways of thinking.

The second pillar practice is that of providing teachers with opportunities to take on *leadership* roles. Sharing leadership roles with other teachers can expose them to challenges that facilitate growth, in addition to creating opportunities to build relationships. Importantly the sharing of leadership offers teachers the opportunity to reflect on their own assumptions and beliefs by creating situations in which their thinking is being challenged.

Drago-Severson (2007) also believes that teachers should also be engaging in *collegial inquiry*, which is her third pillar practice. She states that through creating contexts for inquiry, reflection, and critical thinking, teachers are given multiple opportunities to develop more complex perspectives. Teachers can develop multiple perspectives through listening to and learning from others, in addition to engaging in critical reflection through both writing and dialogue. Drago-Severson (2007) believes that collegial inquiry and critical reflection can support individual teacher growth.

The fourth pillar practice is that of *mentoring*. This is the pairing of graduate and/or provisionally registered teachers with more experienced teachers. Drago-Severson believes that mentoring helps break down teacher isolation and offers leadership opportunities, supporting teacher learning. This pillar practice is supported by Higgins, Chandler and Kram (2007) and McGowan, Stone and Kegan (2007). It is important to note that all four of these ‘pillar practices’ are centred on teachers engaging in critical reflection and critical discourse.

In summary Drago-Severson (2007) has applied Mezirow’s (2004, 2006) transformational learning theory and Kegan’s (1997, 1998, 2000) five-stage model of cognitive development to develop a theory of transformational learning for teachers as adult learners. In her work there is a significant focus on critical reflection and collegial sharing, learning relationships, critical reflection leadership opportunities, collegial inquiry and mentoring. This theory acknowledges

the teacher as an individual learner situated in one of the four stages of mind identified above. Drago-Severson (2007) also identifies four 'pillar practices' that can be used in schools as part of a professional learning and development programme. A professional learning and development programme that encompasses these 'pillar practices' will enable teachers to be engaged in learning that is transformational, opening up opportunities for the teachers to move between the stages of mind, and to be "ready, willing and able" to develop and engage in future-oriented educational practices.

Conclusion

Drago-Severson (2016), Moller & Pankake (2006) and Wagner (2007), have identified a direct relationship between supporting adult learning in teachers and increasing student achievement. Raising student achievement is the aim of governments in every country in the Western world, yet teacher professional learning is still predominantly oriented around pedagogies based on content delivery rather than cognitive growth.

In order for students to benefit from the Communities of Learning initiative, the Specialist Classroom Teacher initiative or the Trades Academies policy, there needs to be much greater understanding of what we can do to develop the teachers we need for the schools we want (Garvey Berger, 2003). Teachers need time to process and make sense of their experiences; to engage in critical reflection and collegial debate with other teachers; to collaborate with other teachers to develop, trial and re-develop new practices, to reflect on education's changing purpose/s and to consider their changing role in relation to this. Doing all this is likely to produce cognitive growth.

Chapter Three: Research Design and Methods

This chapter outlines how complexity thinking has influenced the overall design of this research, and how this thinking has been used to inform what is essentially a case study methodology. It begins with a discussion of complexity thinking, focusing in particular on the approaches used in Davis and Sumara (2008) and in Osberg, Biesta & Cilliers (2008). It then explores the benefits and limitations of the use of the case study method in research on complex systems. Then there is a description of the design and implementation of the case study undertaken for this thesis.

Complexity Theory, Complexity Thinking, and Education

> Complexity theories explore the totality (the wholeness) of dynamics – forces, energies, substances and forms – permeating the whole universe and connecting everything that exists in a whirling web of dynamic interrelationships and interactions (Dimitrov ,2003, as cited in Chiva, Granido & Alegre 2010, p. 115).

Complexity theory, which informs complexity thinking, is the study of complex systems. It is used to investigate how complex systems change, evolve and adapt to both internal and external forces. Complexity theory is not a new academic area. Complex systems have always been there existed and humans have always studied them (Waldrop, 1993). Complexity theory has its origins predominantly in the hard science of physics, chemistry and mathematics, along with the soft science of biology. Complexity theory has also been applied in recent times to cybernetics, information sciences and social sciences (Morrison, 2006). Complexity thinking has emerged out of complexity theory, and lies somewhere in between the soft and hard sciences approach to complexity theory. Davis and Sumara (2008) define complexity thinking as “a way of thinking and acting” (p.18).

The 1950s saw a growing need for complexity thinking as a research approach (Whitney, Bradley, Baugh & Chesterman, 2015). As the world was been disrupted by exponentially increasing technological changes (Brynjolfsson & McAfee, 2012; Godet, 1988; Miller, 2015; West, 2015) and new networked forms of knowledge (Anderson, 2007; Benkler, 2011; Castells, 2006; Dutton, 2009; Facer, 2011; Weinberger, 2012) there was increased focus on interaction and adaption. As the world has changed, so too has the way humans synthesise information to predict, influence and adapt to the types of change being seen in the world. Advances in the ‘science’ of complexity (systems) theory have “been instrumental in the evolution of our knowledge about our world” (Francisco, 2014 p.vii).

Complexity thinking offers a foundation to “explain phenomena, patterns and tendencies observed in real world systems” (Whitney, Bradley, Baugh & Chesterman, 2015, p. 22). This development in complexity theory frameworks has seen the emergence of complexity thinking in the soft sciences of health, psychology, economics and more recently education (Morrison, 2006; Yorks & Nicolaides, 2013).

Characteristics of complex systems

There is no one generally accepted definition of complexity thinking (Gilbert, 2015; Mason, 2008; Morrison, 2006; Waldrop, 1993; Whitney, Bradley, Baugh & Chesterman, 2015), but there is a large literature in which it is discussed (see, e.g. Whitney, Bradley, Baugh & Chesterman, 2015).

According to Davis and Sumara, (2006, 2008); Hetherington, (2013); Newell, (2008); Osberg, Biesta and Cilliers, (2008) and Richardson, Cilliers & Lissack, (2001), complex systems have the following characteristics. Complex systems are *open* systems with very large numbers of elements that interact with each other in non-linear ways (Hetherington, 2013). They are unpredictable due to the large number of possibilities arising from the many possible individual interactions. These interactions adapt to positive and negative feedback loops creating a constantly changing environment. Complex systems are *learning* systems that exhibit emergence, that is, unexpected behaviours that are more than the sum of the system's parts. These behaviours exhibit patterns that are only meaningful when considering the whole system, not just the individual elements (Sachs, 2002; Checkland, 1993). The elements that make up a system are generally diverse, with some elements sharing some similarities or redundancy (Hetherington, 2013). Complex systems do not remain at equilibrium but constantly evolve, as Trombly (2014, p.18) puts it, "they exist at the edge of chaos" (von Bertalanffy, 1968; Miller, 1978). They are systems that are self-organising and self-maintaining (Davis and Sumara, 2006, 2008; Richardson, Cilliers & Lissack ,2001).

Education as a complex system

The use of complexity thinking as an educational research approach is a recent and still evolving trend (Davis & Sumara, 2008). For Davis and Sumara, (2006, 2008), Fenwick, (2010), Haggis, (2008), Mason, (2008), Morrison, (2006, 2008) and Osberg, Biesta & Cilliers, (2008), the education system and its parts (individual schools, classrooms and students) can all be considered complex systems. While there is no agreement on the definition of complexity theory (Gilbert, 2015; Mason, 2008; Morrison, 2006; Waldrop, 1993; Whitney, Bradley, Baugh & Chesterman, 2015), a number educationists are using what they call complexity thinking, in particular Davis & Sumara (2006, 2008), Osberg& & Biesta (2007) and Osberg, Biesta & Cilliers (2008).

Davis and Sumara (2008), in their book *Complexity and Education*, argue that complexity thinking *is* a natural educational research theory. They explore the multi-disciplinary nature of complexity thinking as an educational research tool, focusing explicitly on the complex nature of learning systems and the descriptive approach that complexity thinking can offer in these systems. Osberg, Biesta and Cilliers are also educational researchers who explore the concept of emergence in complex education systems. They put forward a complexity thinking epistemology that "helps us think about the world and knowledge in a way that does not result

in, or seek closure" (Osberg, 2005, p.185). Both sets of authors use complexity thinking as a tool for understanding the complex nature of education systems in order to change them. Davis and Sumara (2008) summarise the place of complexity theory in educational research as follows:

> for educationalists, complexity research might be productively understood as the study of learning and learning systems – a notion that encompasses individuals, social groupings, bodies of knowledge, cultures, and species as well as the contexts that are implied when such 'agents' are specified (p. 36).

They argue for a view of education as a complex system that is open, self-organising, and self-maintaining. Each element has unlimited interactions with the other diverse elements, both within the system, and outside of it. These interactions are unpredictable due to the positive and negative feedback loops, which influence their interactions. As they are complex systems they do not remain at equilibrium, but constantly evolve and adapt to changing environments showing that they are learning systems that have strong emergence (Davis & Sumara, 2006, 2008; Osberg, Biesta & Cilliers, 2008).

Morrison (2006) has a similar view of education as a complex system. For him:

> Educational systems, institutions and practices exhibit many features of complex adaptive systems, being dynamical and emergent, sometimes unpredictable, non-linear organisations operating in unpredictable and changing external environments (p.3).

Working on the assumption that schools (like other human systems) are complex systems that do not become less complex when analysed on a smaller scale, some difficult issues arise when attempting to design research in these systems. This is widely acknowledged, and much of the complexity-influenced research done so far in educational contexts has used case study-based approaches (e.g. Hetherington, 2013); Davis & Sumara, 2006, 2008; and Osberg, Biesta & Cilliers, 2008).

Case study as a research method in a complex system

Complexity thinking challenges the underlying assumptions inherent in a positivist approach to research. It is an epistemology that argues against the linear, the controlled and the deterministic (Morrison, 2008). As outlined above complexity thinking is being adopted by some educational researchers (Davis & Sumara (2006, 2008; Hetherington, 2012, 2013; Mason, 2008; Morrison, 2006; Osberg, Biesta & Cillers, 2007, 2008; Peters, 2008). However, as yet, there has been little work on the difficult question of how to carry out empirical research using complexity thinking. This section looks at how case study can be used with a complexity lens, exploring the issues involved via Hetherington (2013).

What constitutes a case study is contestable, but there is a general consensus that case studies require researchers to study their subject in-depth (Hetherington, 2013), and in their real-life context (Yin, 2014). It is a research method that allows the researcher to "penetrate situations in ways that are not always susceptible to numerical analysis" (Cohen, Manion & Morrison, 2004, p.181). Cohen, Manion & Morrison (2004) and Nisbet and Watts (1984), identify three

defining feature of case studies that are pertinent when applying this method in educational contexts. Firstly, case studies can capture the unique features or unanticipated events that would have been lost in large scale data collection (Nisbet & Watt, 1984). Secondly, when using case study, the researcher is integrally involved in the case, allowing them to focus on the individual elements or groups of elements to understand their perception of events (Cohen, Manion & Morrison, 2004). Thirdly, case study allows the researcher to provide a rich and vivid description of the events relevant to the case (Cohen, Manion & Morrison, 2004). The case study allows the researcher to describe behaviours rather than rules (Cilliers, 2000).

Case study has been criticised as a method. For instance, in being specific to the circumstance of individual practice it is limited in the theory it can offer (Harland 2014). Further, there are specific critiques that can be made of case studies of complex systems because they do not predict future behaviour (Hetherington, 2013). Case studies informed by complexity thinking do not offer results that can be repeated or used for comparison. Radford (2008) suggests that complexity informed research "cannot deliver the kinds of clear and simplistic lines between evidence and practice or policy that is all too frequently demanded…explanations generated are invariably fragile and open to layers of interpretation and reinterpretation" (cited in Peters 2008, p.8). Davis and Sumara (2008) also offer no positivist research promises from complexivist case studies. They state that:

> given the idiosyncratic characters, recursively elaborative, and ever-divergent possibilities of complex phenomena, accounts of complexity-informed research can never be offered as events to be replicated or even upheld as models. At best, they can serve as illustrations, not exemplars (p. 42).

Case studies do however offer opportunities for creating new knowledge. The descriptive nature of complex case studies produces dialogue about the process, rather than the outcome of the research. Trowler (2012) believes that if existing theory is an integral part of the case development then the researcher should be able to make a critical contribution to the wider knowledge in a field of enquiry.

It could be argued that a case study method is a natural fit for complexity informed research, as case studies: "investigate and report the complex dynamic and unfolding interactions of events, (and) human relationships" (Cohen, Manion & Morrison, 2004, p.181). Morrison (2006) argues that case studies are a more appropriate research methodology than randomised controlled trials for complexity theory (cited in Lewin & Regine 2000).

Hetherington (2013) has written a comprehensive account of the application of complexity theory to case study research in an educational context. Her account focuses on two main factors from complexity theory which affect how a traditional empirical case study can be used within a complexity framework. These two factors are strong emergence and complexity reduction.

Strong Emergence

Complexity thinking is concerned with identifying emergent behaviours that result from interactions between system elements (Horn, 2008). This emergence of behaviour is a crucial element in conducting case study research from a complexivist perspective (Hetherington, 2012). There are two types of emergence that can occur in a complex system, strong and weak emergence. Weak emergence is new properties arising from system interactions that could reasonably be predicted. Strong emergence however are behaviours that are not only unpredictable, but also hard to explain with current thinking (Chalmers, 2006). These are behaviours that would have been impossible to predict prior to their emergence (Osberg & Biesta, 2007).

How these emergent behaviours are identified is also of importance. As suggested by Hetherington, the position taken by the researcher in a case study using complexity theory must be from *within* the case study. By the researcher interacting with the case: "the emergent possibilities are altered since the case is always open to interactions within and between complex systems as cases" (p. 81). By positioning the researcher within the case study, it is possible to open up the case to new emergent possibilities, while closing off others.

The competing ideas of the researcher being responsive to emergent behaviour while maintaining research rigour in complex systems is discussed by Kincheloe and Berry (2004) in their interpretation of *bricolage*. This is a case study research approach that is open to possibilities, promoting reflection on data from different viewpoints and the use of new methods or tools as required in the course of the case study. When looking at the world from a complex theoretical position, *bricolage* is not a limitation but a revelation of possibilities (Morrison, 2008).

Complexity reduction

The very act of conducting research reduces the complexity of a system being studied (Hetherington, 2013). The choice of method, the artificial boundaries of the research, as well as the researcher's own understanding of complexity and how they apply it to the research are all examples of complexity reduction. In this situation, the decision to use a case study method, albeit one informed by complexity thinking, is itself a reduction. Additionally, there is further complexity reduction during the analysis of the data, when the researcher identifies key themes, and discards themes that seem to be of lesser significance.

These reductions do not limit the usefulness of a complexivist approach to case study, but rather encourage the researcher to acknowledge that while they focus on the emergent in a case study, the processes of complexity reductions are on-going, influencing the process of the research. This is not to say that reductions prevent emergence from occurring, but, as suggested by Fenwick (2010) and Rasmussen (2010), the very act of the researcher engaging with the system may allow the system to emerge in unpredictable ways. According to

Hetherington, complexity reduction and emergence do not work in opposition to each other, but rather work at the same time, using the 'both/and' logic common in post structural thinking: "thus, complexity reduction and emergency are simultaneously part of the complex way of thinking in this research stance" (Hetherington, 2013, p. 74).

Schools are complex systems and should be treated as such when conducting educational research. This is particularly the case if the research intends to offer a descriptive narrative of a process, rather than a prescriptive link between policy and actions.

The research context

The research for this thesis was undertaken on the assumption that individual schools are complex systems, operating within an education system that is in need of change, as outlined in Chapter Two. The required change needs to focus on producing students who can thrive in an ever-changing world, and teachers with the capacity to support these students. Today's teachers need transformational professional learning, learning that enables them to transform not what they think, but how they think it. Today's teachers, who were educated in and for a 20th century learning environment, need time, and the opportunity for critical reflection to make this transition.

This research investigated the experiences of a group of teachers as they were exposed to a "disorienting dilemma". Its aim was to explore the extent to which teachers engaged in critical reflection and critical discourse with others after this experience.

The research questions were:

1. To what extent do teachers discuss professional learning experiences with others in their professional context or outside of it?

2. How extensive are their interactions and what form do they take?

3. What factors influence whether or not this kind of discussion takes place.

The disorienting dilemma

The disorienting dilemma that the research participants were exposed to was a teaching approach based on an alternative way of engaging students in learning, with multiple learning outcomes across several disciplines. It took the form of a one-day learning experience for 50 students that was developed and presented by a teacher from a school external to the school in which the research was undertaken. This teacher developed this experience at the school in which she works, which has an explicitly 21st century learning focus. The teachers who participated in this research were told that they could interact with the students as they were

involved in this learning experience (if they wanted to), but they should not try to help them with their tasks.

The activity took place with fifty Year Seven and Eight students split into two groups (who were called aliens and humans). They were told that the human group had destroyed their planet and had to colonise a planet of aliens in order to find somewhere to live to survive as a race. Both groups had their own distinct cultures, language, values and economic needs (which were decided on by the students in the groups in their preparation time). The two groups of students were then forced together to see what would emerge. The activity design was underpinned by various ideas about "21st century learning" – e.g. it was intended to allow students to "do stuff with knowledge", rather than being "provided" with it. Student learning from this experience, while immense, was not a focus of this research, rather, the teachers were its "object of enquiry".

The research took place at a composite, co-educational school of approximately 800 students in a rural area of New Zealand. The researcher and the principal of this school belong to a professional learning group interested in exploring the need for change in education in New Zealand. Once granted permission to conduct research in the school, the researcher visited the school, gave a verbal summary of the research project to the teaching staff, and asked for volunteers to participate. Those who volunteered were asked to contact the researcher by email to express their interest or ask further questions. Seven people completed this process, signed consent forms, and participated in the research.

Research Focus

Research participants were encouraged by the researcher, after participating in the dilemma process, to talk with others about the experience. They were told that these interactions would be the focus of the research, and were given a guide for classify the "depth" of the conversations they had with others about this experience. They were asked to use this guide to classify the conversations they had into one or more of the following three categories:

Table One: Conversation Categories

Socially Superficial – A socially superficial conversation is a predominately one-sided conversation, and mainly involves the participant providing information to other(s). They may mention what occurred, and offer a brief comment about what they think about it, and then the discussion moves onto something else.
Educationally Superficial – An educationally superficial conversation is a rather more detailed conversation about the disorienting dilemma. The conversation may include a detailed discussion about what occurred and *both* participants in the conversation exchange views
Educationally Deep – A educationally deep conversation is a conversation that is about ideas to do with education and involves robust debate and /or participants in the conversation working together to improve the ideas that are put forward in the conversation. In this type of conversation, the participant may tell someone in detail what occurred during the disorienting dilemma, and then both participants exchange views, bringing in other related ideas and discussing what these ideas might have to do with each other. Conversation participants may come back later to continue this discussion and build on it.

Research participants were interviewed face-to-face by the researcher ten days after the disorienting dilemma experience. Participants were asked questions that aimed to find out (i) what they thought the *intent* of the disorienting dilemma was, (ii) *who* they spoke with about the disorientating dilemma, (iii) the *depth* of each of those conversations, and (iv) why they thought they had in-depth conversations with some people but not others.

Other interview questions explored whether the participants thought any of these conversations had disrupted their thinking, and, if they were to describe the disorienting dilemma to someone else, what they would focus on and why.[2] Individual Network Maps were then created to visually represent the number and depth of conversations each research participant had (see below for an explanation of network maps).

As identified by Hetherington (2013), complexity reduction is an important consideration in any case study that uses a complexity lens. In this case study, a single school is considered a complex system, even though this is of course a reduction in the system. Additionally, the individual teacher participants were considered to be complex systems, as, like the system as a whole, they can individually learn, adapt and change. The physical boundary of a single school did affect the selection of participants for this research, as only participants from that school could be selected. This was done for practical reasons. It did not however place a boundary on measuring their interactions. Further complexity reduction was necessary for the collection and analysis of data from the school. A guided interview approach was adopted for data collection, with data analysis informed by social network analysis.

Guided Participant Interviews

Individual participant interviews were chosen as the data collection method for this research. The type of interview approach chosen was the guided interview approach (Cohen, Manion & Morrison, 2004). This approach had many of the elements needed to work within complexity-thinking. A guided interview positions the researcher within the research (Hetherington, 2013).

The general questions to be asked in the interview were designed in advance with an initial outline of questions. This made the data collection more systematic, sequencing the questions in an interview order, however the guided interview approach also meant that the researcher could probe further into anything that emerged from the questions asked by the researcher (Davis & Sumara,2006, 2008; Hetherington, 2013; Osberg, Biesta & Cilliers, 2008).

The guided interview approach has some limitations from an empirical research point of view. The researcher may inadvertently omit salient topics, or the flexibility of questioning may result in substantially different responses, limiting comparability (Cohen, Manion & Morrison, 2004).

[2] See the Appendix One for a copy of the interview questions used.

From a complexity thinking perspective, these are considered complexity reductions, which are a natural part of complexity research process, and unavoidable (Hetherington, 2013).

In the guided interviews used in this research, participants were asked to report on their interactions and what they believed had influenced those interactions over a ten day period. Social Network Analysis was then used to create social network maps, for each individual participant.

Social Network Analysis is concerned with the structure and patterning of the interactions being captured and the causes or consequences of these interactions. The flow of interactions and their feedback is the central focus (Tichy, Tushman & Fomburn, 1979) of a social network analysis approach. In this research, the social network consisted of a stable set of nodes (the research participants), linked by a set of "ties", which in this case were the conversations about the disorienting dilemma (Keast, 2014).

The social network maps were created with the research participants during the guided interviews. These maps created a visual representation of the conversation flows both within and outside of the individual's complex system, changing the imagery from a focus on the individual participants to one of "constellations, wheels and systems of relationships" (Auster, 1990, p.65). The creation of these network maps allowed the researcher to capture the "architecture of complexity" (Kenis & Schneider, 1991, p. 25) of the system being researched.

Chapter Four: Data Analysis and Results

This section is an analysis of the data collected during the individual interviews with each of the research participants (which together made total of 252 minutes of talk time). The researcher listened to each interview several times, drawing out key themes from across the discussions and selecting some for further analysis. The first part of the chapter looks at the key themes that emerged from the interviews, in relation to the study's three Research Questions. The second part of the chapter describes a series of individual case studies of the experiences of the seven research participants.

Data Analysis

Research Question One: To what extent do teachers discuss professional learning experiences with others in their professional context and / or outside of it?

The interviewees were asked to show the researcher their network map, to talk about the number of conversations they'd had, and who these were with. They were also asked to comment on whether or not their conversations had disrupted their thinking.[3]

As the Network Map shows, the seven participants engaged in a total of 44 conversations about the disorienting dilemma they were exposed to. Of these 44 conversations 32 were held with educators from the school they all taught in, five conversations were held with educators from other schools, and seven conversations were held with non-educators (see Table Two below).

Table Two: Number of conversations

Participant	Number of conversations	Educator in same school	Educator in another school	Non-Educator
1	5	2	2	1
2	4	2		2
3	7	5		2
4	8	4	3	1
5	8	7		1
6	5	5		
7	7	7		

Of these conversations, 24 were considered (by the participants) to be socially superficial conversations (see Table Three below). Thirteen of the conversations that occurred were categorised as educationally superficial conversations, and there were a total of seven educationally deep conversations (See Table One above for how these categories were defined).

[3] These Network Maps appear below.

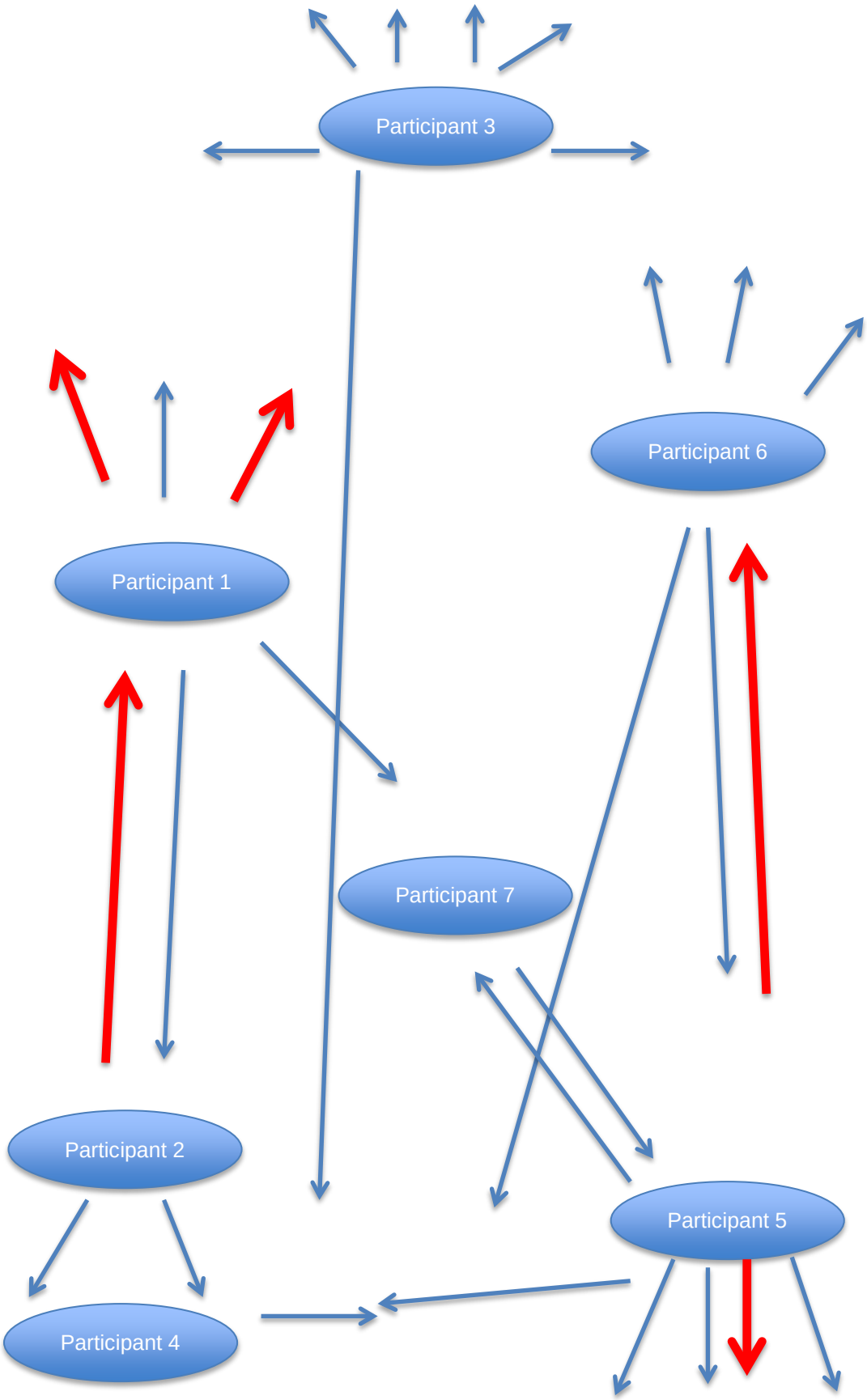
Table Three: Depth of Conversations

Participant	Social Superficial	Educationally Superficial	Educationally Deep
1	2	1	2
2	3	1	
3	6	1	
4	1	5	2
5	4	2	2
6	4		1
7	4	3	

Three of the participants' thought that one or more of the conversations they participated in had disrupted their thinking. Participants Two and Four reported conversations that referred them to readings for new information and encouraged them to think about the issues of planning and access. Neither of these conversations would, however, be considered cognitively disruptive. While these conversations may have encouraged the teachers to think, they were unlikely to have disrupted their meaning making systems, as discussed in the transformational learning section in Chapter Two. Participant Five also thought that their thinking had been disrupted after a conversation with another of the participants. This conversation centred on how different disciplines have different ways of teaching the same concepts. This could have unsettled Participant Five's meaning making system as it gave her the opportunity to make 'object' something she was previously 'subject' to, in this case a learning concept that she had only ever experienced and taught in one way (Drago-Severson (2007), Kegan (1980, 1983, 2000), Garvey Berger (2003). In other words, this teacher found herself looking at the world through new eyes.

Full Network Map of Conversations

KEY
Educationally Deep Conversation
Superficial Conversations



Research Question Two: How extensive were the interactions and what form did they take?

The interviewees were asked about the form of the conversations – about the context in which it took place, and the number of exchanges it involved. The results were collated as follows:

Table Four: The form of the conversations

Participant	Face to face	By Telephone	By Text	By Email
1	3	1		1
2	4			
3	7			
4	5	3		
5	8			
6	5			
7	7			

Research Question Three: What factors influence whether discussion takes place.

The interviewees were asked who initiated the discussions they had, and to comment on why they thought they had in-depth conversations with some people but not others.

Of the 44 conversations, 32 were initiated by the research participants themselves, 12 by others.
All participants gave reasons for why they had deep conversations with some people. Two key themes were identified: one was the extent to which there was a shared knowledge base, and the other had to with the depth or quality of their relationship with their conversational partner. Five of the seven participants identified this as a key factor. Two of the participants said that working closely with the other person in the conversation, thus having opportunities for ongoing conversations, was a factor. One said that “personality clashes are a conversation stopper”.

The educationally deep conversations took place in a variety of settings. Of the seven deep conversations, three were by telephone, three were face-to-face and one was via email. Thus real-time interaction seems to be important. Five of the deep conversations occurred outside the school setting. Two were at the school the participants work in.

Individual participant case studies

The researcher also complied individual case studies of participants, both to supplement the interview data, and to convey something of the complexity of the context in which the research took place. Each participant is part of the complex system that this research project was investigating. They are part of the school system, but they are also participants in a host of other overlapping systems that make up their lives. Each participant's interactions were different, with positive and negative feedback loops which influenced their interactions.

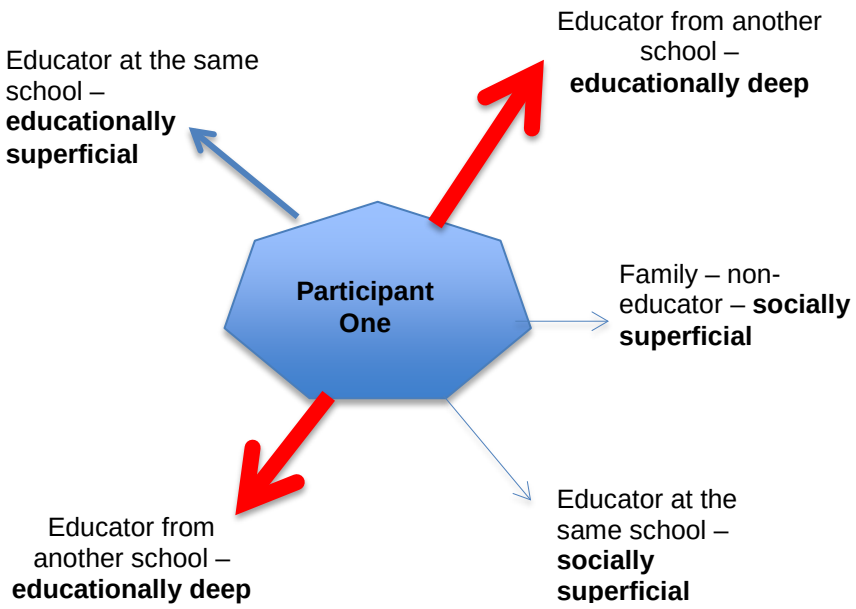
Participant One

Participant one is a middle school teacher, who has been team teaching for several years. They have completed postgraduate study in educational futures, and continue to read and think in this area. Prior to this research this participant had a strong collegial bond with a co-worker who recently left the school.

Participant one had five conversations about the intervention. Two were with educators from the same school, two with educators that taught in other schools, and one was with a non-educator. Two were identified as being educationally deep. This participant was the only one who had deep conversations by email: others were via telephone. For them an important factor for deep conversations is access to other people "who had a similar knowledge base".

Participant one thought that the activity's intention was to 'get us to think differently about ways of approaching activities that are traditionally done in a superficial way'. They described in detail one of their deep conversations, which consisted of several telephone conversations, described as follows: "we were taking the knowledge that you guys gave us…and we have already gone and twisted it and shaped it and we have developed it, and now we have new knowledge being created".

Participant One Individual Network Map

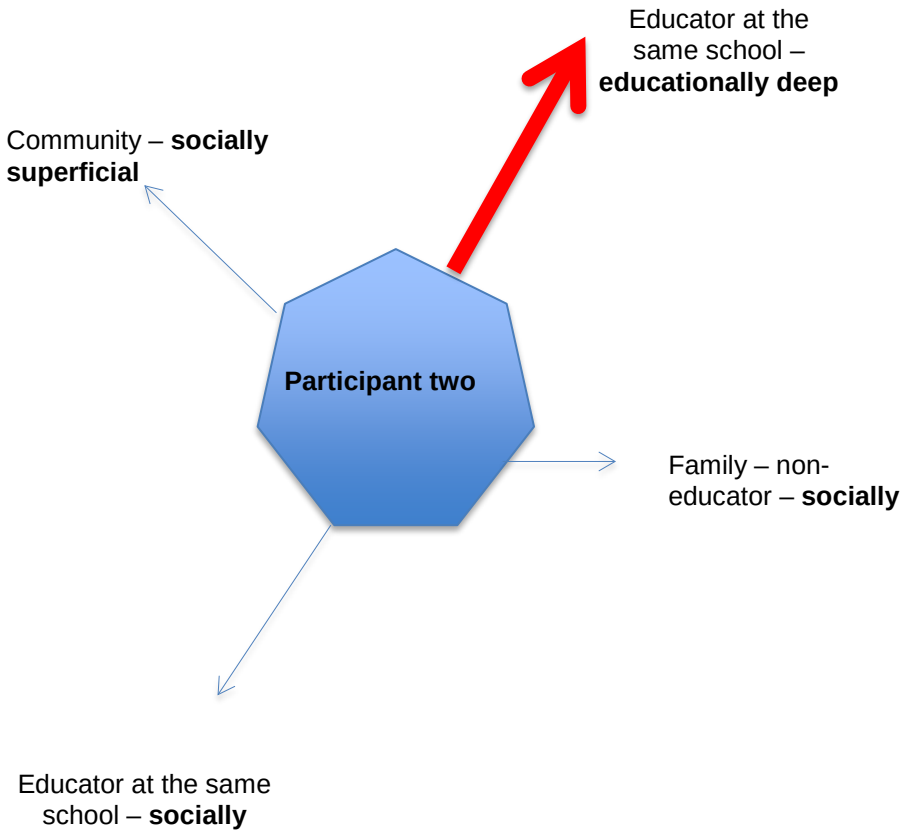


Participant Two

Participant Two is an experienced teacher, teaching in the middle school, but new to the team teaching approach taken in this school. This participant has taught in several schools in the area, teaching students at a variety of stages of their education. This participant said they were new to thinking about why we do things the way we do in education.

Participant Two participated in four conversations about the intervention, all of which were superficial. Three were classified as socially superficial and one was educationally superficial. All occurred face to face, and three were with educators at the same school. This participant said that they could not enter into educationally deep conversations, as they "had not done the readings to talk deeply about it." When asked if their thinking had been disrupted by any of their conversations, Participant Two felt that their thinking about education had been disrupted by Participant One, who (they said) "probably did when it came to making sure I did some readings."

Participant Two – Individual Network Map



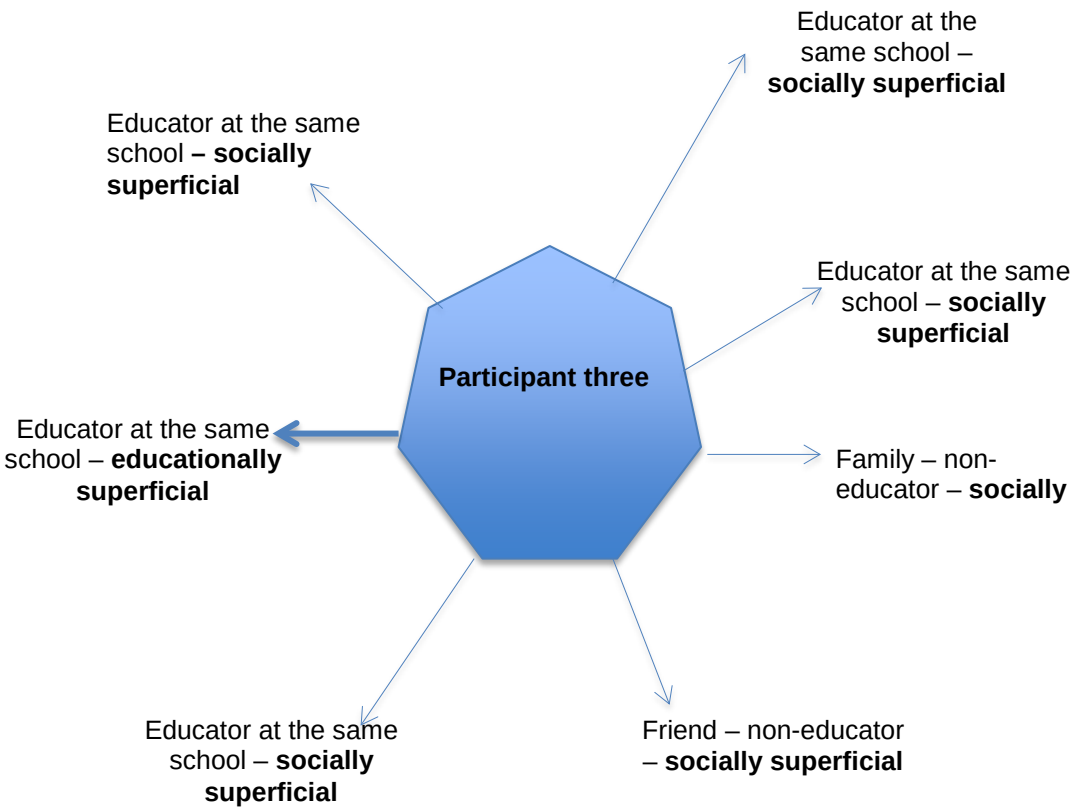
Participant Three

Participant Three is a primary school teacher with several years' experience who has been team teaching for one year. In planning for the next year, this participant indicated that they would like to go back to a "silo" classroom environment, to further explore their own pedagogy. This participant has completed post-graduate study in educational futures.

Participant Three had seven conversations around the intervention. All were in person, and five were with educators in the same school. All were identified as superficial, with a focus on simply describing what had taken place during the activity. Six were classified as socially superficial and one as educationally superficial.

This participant did not think she had been disrupted by these conversations, stating: "There was nothing that kind of stumped me and I thought gosh I need to go away and think about that and come back."

Participant Three – Individual Network Map

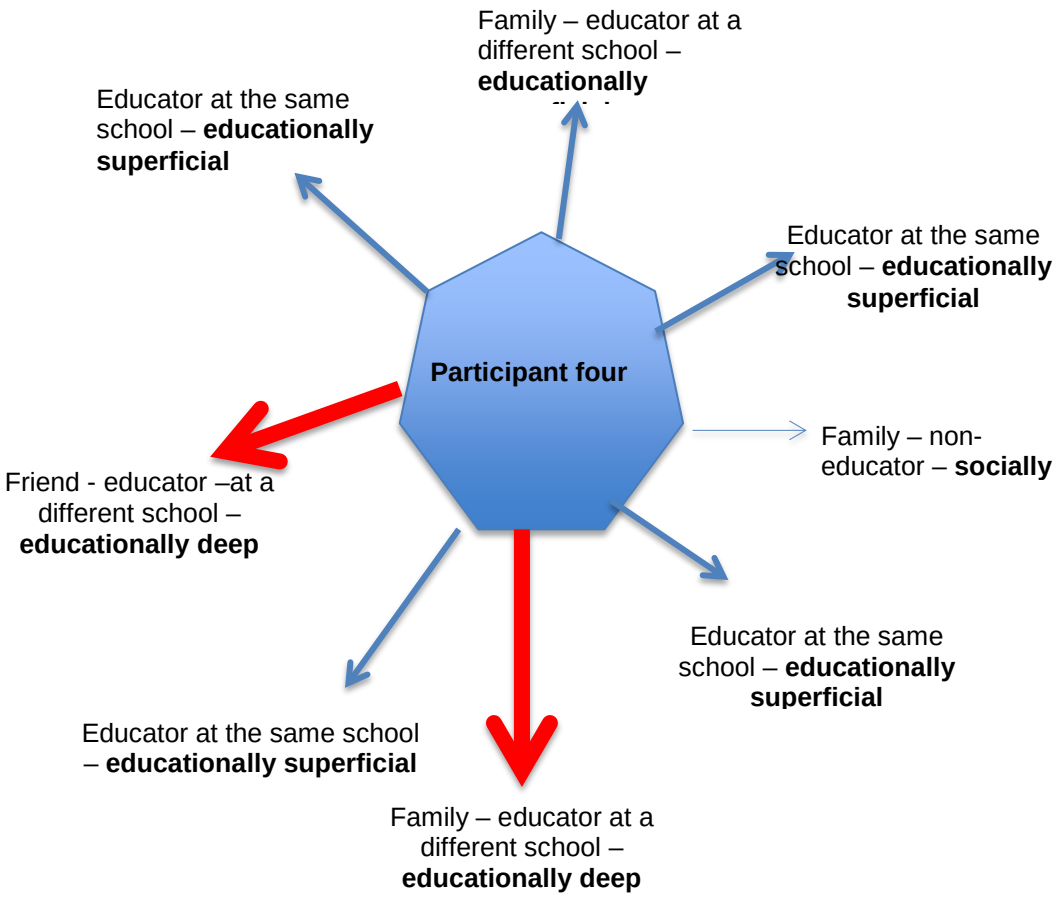


Participant Four

Participant Four is a beginning teacher, teaching in the middle school. This participant had several close relationships with educators outside their current school. Being new to teaching (and required to do this for full teacher registration), this participant was still very reflective about their practice. They did not yet have a "way I do things" approach to teaching.

Participant Four thought that the intent of the activity was: "to get us to have a look at the way we teach…. To question some of the things that we do." They had eight conversations focused on the intervention. Two were educationally deep conversations, held via telephone, with educators from other schools. These conversations focused on why things should be done differently. This participant felt that: "my relationship with each person" was a key factor in why these conversations were deep. This participant also participated in five conversations classified as educationally superficial, reporting that these mainly focused on the barriers to implementing this style of learning.

Participant Four – Individual Network Map



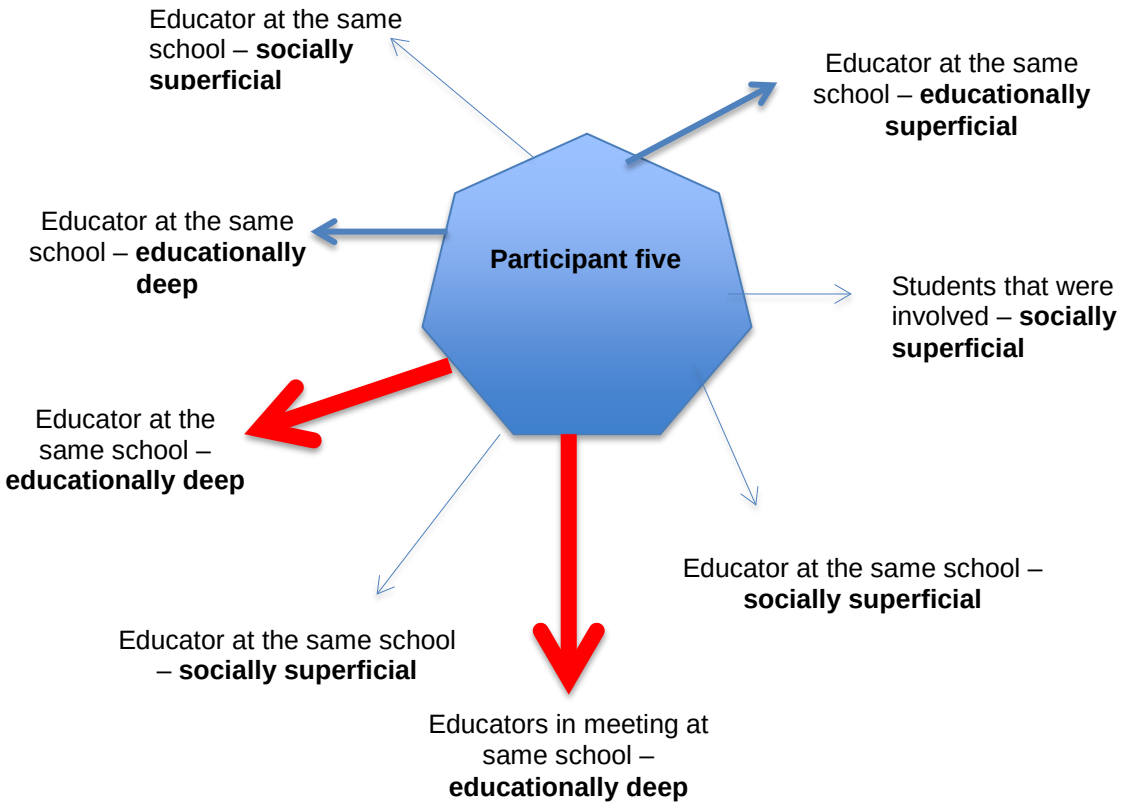
Participant Five

Participant Five is a very experienced teacher, teaching senior high school students, and holding a middle management role in the school. They have worked in this school for a long time. This participant has completed post-graduate study in educational futures, and has continued to read and think in this area.

Participant Five felt that their thinking had been disrupted though one of the educationally superficial conversations: this occurred via "talking with [Participant Seven] about different disciplines, different ways of doing the same concept."

Participant Five had eight conversations about the intervention. Seven were in person, involving other educators at the same school. They had two educationally deep conversations, which they attributed to close working relationships: "I work closely with … so we have the opportunity to have several conversations." This participant also had two educationally superficial conversations and four socially superficial conversations, mainly describing what occurred in the intervention.

Participant Five – Individual Network Map



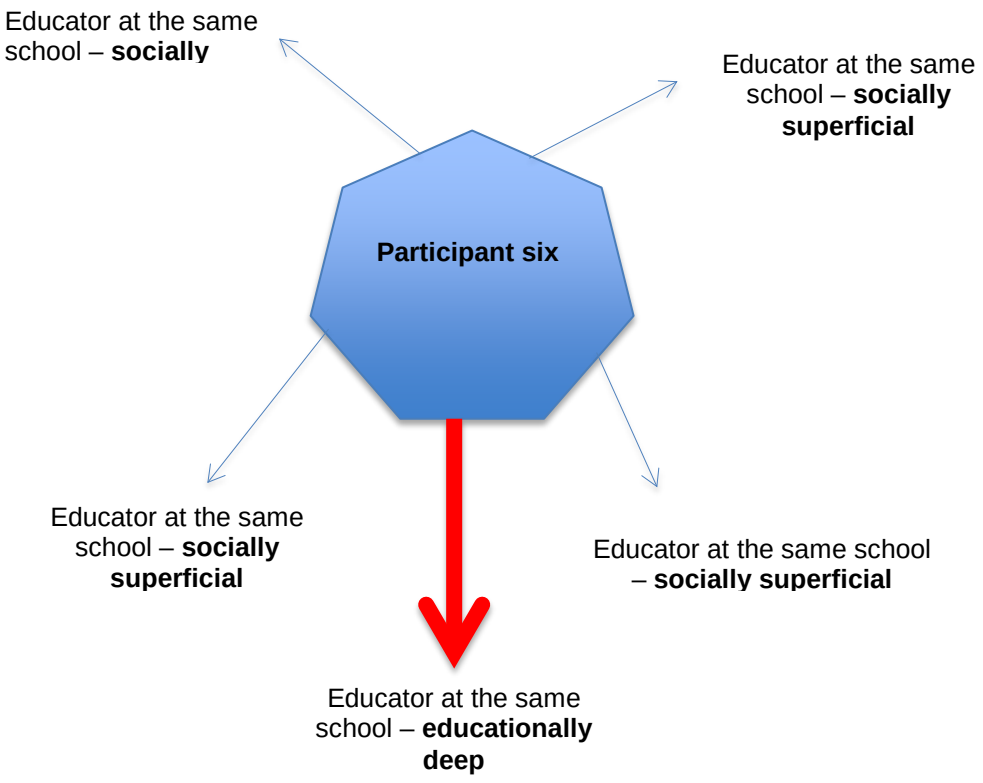
Participant Six

Participant Six is an experienced teacher, teaching senior high school students. This participant has completed post-graduate study in educational futures, and has continued to read and think in this area.

Participant Six had four socially superficial and one educationally deep conversation about the intervention. They attributed the ability to have educationally deep conversations to the shared experience of being in the activity together: "a common grounding in experience." All their conversations occurred face-to-face with educators at the same school.

This participant was the only one who made a link between the intent of the activity and the purpose of the research to, as they put it, create "a vehicle for dialogue."

Participant Six – Individual Network Map



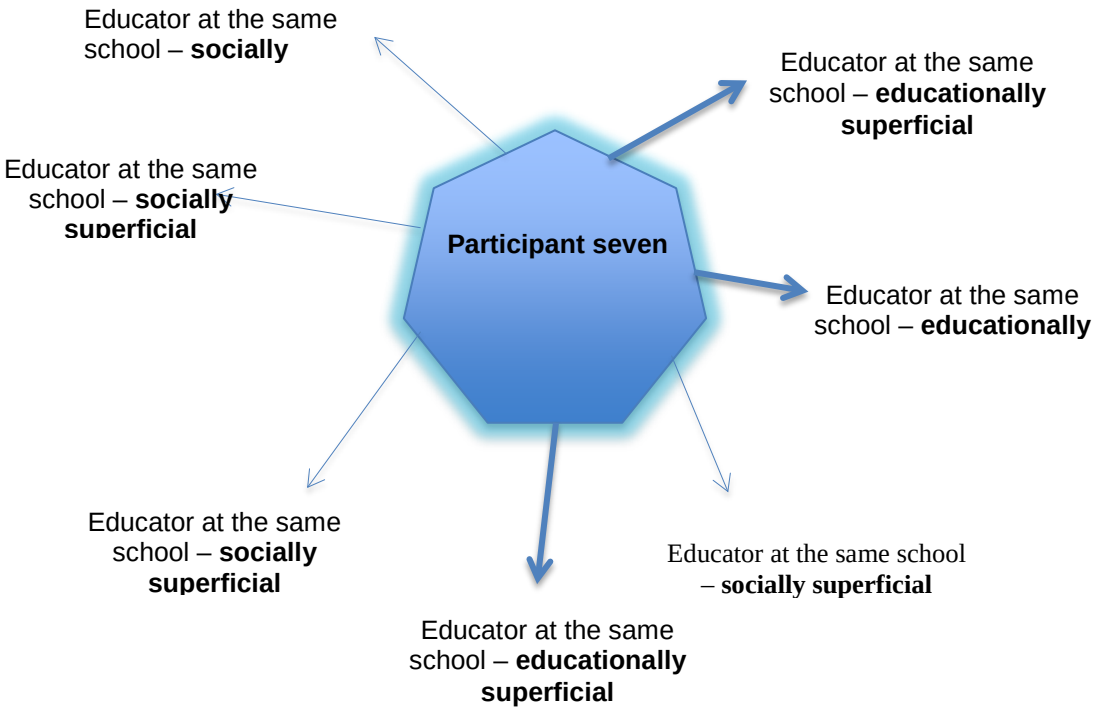
Participant Seven

Participant Seven is a very experienced teacher, teaching senior high school students, in addition to holding a middle management role in the school. They have worked in this school for a long time. This participant has completed post-graduate study in educational futures, and has continued to read and think in this area.

Seven conversations were held by Participant Seven, all in person with educators at the same school. All seven of these conversations were identified as being superficial, four were socially superficial, and three were educationally superficial.

This participant identified two reasons why in other situations they have been able to talk deeply with some people and not others. First, was accessibility: "people who I work closely with on a daily basis" and the second factor was the need to talk with people: "who have done some thinking about this, they have some background knowledge."

Participant Seven – Individual Network Map



Chapter Five: Discussion

This section discusses the findings of this research and their significance in relation to the research questions and future-oriented teaching practice. This study has some important and obvious limitations, which should be acknowledged. The sample of participants is very small, and the use of a non-traditional methodological approach (complexity-informed case study) mean that this study can only offer a description of the study situation. The findings may not be representative of other similar situations and are not generalizable: however, they do point to some interesting issues that are worthy of further investigation.

Three key themes emerge from this research. First, teachers do seem to talk with each other about their professional learning experiences. As the Network Map in Chapter 4 shows, there were many interactions between the participants and other teachers in the same school, and with other people outside the school. Most of these conversations were face-to-face. However, most were relatively superficial. Second, some of the teachers did engage in educationally deep conversations about their professional learning experiences. These teachers had spent time thinking about the educational issues raised in the activity, and were prepared for, and actively seeking, robust interaction with others that could 'push' their ideas further. Third, deep conversations were more likely to occur where there is a high degree of relational trust between the conversational partners. Most of the deep conversations occurred with close friends or family, some of whom were teachers in other schools, or with colleagues at their school with whom they had already well-developed collegial relationships. In situations where these relationships were undeveloped, participants said that they were unlikely to push things. For example, on participant involved in a co-teaching situation commented that she often thought when discussing new ideas with her colleague "this was a cool idea in my mind but you're not buying into it so I'll just push it aside."

What the participants "did" in their deep conversations was very different. One reported a conversation on how the disorienting dilemma could be adapted for use in other contexts, or in another school. In another conversation, participants talked about how they now realised their department needed to change what they were doing, and the possibilities that arose for them from the disorienting dilemma. The educationally deep conversations were characterised by participants being able to articulate their ideas about various widely-held assumptions about learning, and to talk about change in a positive way.

Some of the participants were able to engage in the kind of critical discourse recommended by Drago-Severson and Mezirow et al as a necessary pre-condition for transformational learning environments. While this was relatively limited in scope, and not focused on their own thinking, they did engage in debate with colleagues on ideas and issues raised in the "disorienting dilemma" experience. Some participants returned to this debate on more than one occasion during the study period, after having given the issues more thought. However, while necessary,

this is probably not a sufficient basis for the kind of transformational learning argued for in this thesis.

A key finding from this study was something rather unexpected. All the educationally deep conversations had a focus on *student* learning. Not one of the participants reported discussing *their own learning* in any way, even though they had been told that that this was the focus of the research, and that the intention of the disorienting dilemma was to challenge their assumptions, encourage critical reflection, and provoke debate among the participants. Thus the disorienting dilemma, in this context, did *not* achieve its objective. This could also be a reflection of professional learning and development expectations based on the previous experiences of the teachers involved. If their previous engagement in professional learning and development was predominantly (or entirely) focused on improving student outcomes, then asking them to suddenly start thinking about their learning during a professional learning activity, which additionally involves the learning of students, is a very large learning leap. They are unlikely to have much experience in being asked to think in this way, and the activity did not provide support for this.

There was a variety of views (but no consensus) on why they had been asked to observe the activity. All were oriented around student learning. For example: Participant One thought it was "getting us to think about different ways of approaching activities". They said that seeing the activity had "inspired her to focus on using language to craft curiosity and wondering". Participant Two said that she "loved seeing the students 'light bulb' moments as they worked", and that this is what she would share in conversations with others. Participant Three thought the purpose was "to see how the kids could perform without our input", commenting on how much the students had enjoyed the activity. Participant Five thought it was about "teachers letting go and giving students room to explore things." For them, the disorienting dilemma's focus was on "students owning their own learning and students experiencing something to actually prompt their critical thinking." None of the interviewees made links between their experience of the activity (and their conversations about it) and *their* learning. In a 21st century world it is no longer enough to 'know', it has become increasingly important that people are able to 'do' stuff with the knowledge they have gained (Gilbert, 2005). The participants in this case study 'know' what professional learning and development is, but they appear to see its primary focus as being to 'add knowledge' to their existing schema, not to change it. They do not appear to see this knowledge as something they should 'work with', or 'do something with'.

Participants were also asked directly to comment on whether the disorientating dilemma was an effective form of teacher professional learning, and if so, why this might be the case. While there was little consensus in the responses, many of the comments on the experience were effectively evaluations of the performance of the teacher (from another school) who designed and facilitated the activity. Some commented that it could be useful to *other* teachers: for example, Participant Two said that it could be useful, as "probably some [teachers] need to look at different perspectives… maybe try something outside the square." Others commented on it

in terms of whether they were likely to pick it up and use it in their work: for example, Participant Three said “it was quite an interesting thing that I would like to do with staff”.

A key theme running through these comments is the tendency to locate the experience *outside* themselves and their own learning. In Kegan’s terms, it seems that these teachers are “subject to”, or immersed in, “being a teacher”, and so are not able to “make object” (hold “at arm’s length”, away from themselves) teaching, themselves as teachers, or themselves as learners (Kegan 1994). If this is the case then the kind of critical reflection *on their own thinking* the intervention was designed to provoke was not really possible. Two of the participants were able to evaluate the activity in terms of what was needed to support *their* thinking (and that of other participants). For example, Participant Four said that “it possibly would have been to our advantage if we had spent more time talking about the activity at the end, and if we spoke about how we felt,” and Participant Six commented that “the conversations after the activity also provided a valuable means of PD as it allowed practitioners an effective means of dialogue.” However, none of the participants offered comments on anything they had noticed about the activity’s effect on *their* thinking. If, in its purest form teacher professional learning and development should be about ‘teachers learning, learning how to learn, and transforming their knowledge into practice for the benefit of their students’ growth (Avalos, 2011 p. 33), then these teachers’ comments indicate that they are not ‘disposed to’ (that is, ready, willing and able) thinking reflectively about their own personal learning. This is likely to be because, in their previous PLD as practising teachers, they haven’t been exposed to the type of on-going cyclical support needed to translate between theory and practice.

In the interviews, all seven participants gave various reasons why they thought it would not be possible to use teaching approaches like the one used in the disorienting dilemma experience in their current teaching environment. Some of these reasons were: the lack of classroom space and materials, lack of planning time to change their style of teaching, timetabling issues, and/or that using such approaches would not allow them to meet curriculum requirements. Two participants said that it wouldn’t work because of the views of, or relationships between, other staff at the school. They seemed to agree that working in new ways would always be an “extra”, something else to do on top of what they already do. For example, Participant Two said that the type of teaching used in the disorienting dilemma would add to teacher workload and stress levels, and lead to teacher burnout. They commented that “there is a lot [of work] in this, but you don’t stop doing the other stuff… and what’s that going to do to the future of our kids, having a burned-out teacher in front of them.” But, if the arguments made by some educationists about the kinds of changes needed for the future are correct, then there is need for ‘bigger picture’ thinking in schools. There is also a need for new *kinds* of thinking.

In summary, even though the teachers were told before the disorienting dilemma experience that the purpose of the research was to investigate their experiences of a teacher professional learning activity, their focus was on student learning; evaluating the quality of the teaching; and/or evaluating the content of the activity, *not* on noticing what the experience provoked in

their thinking. This of course is hardly surprising, given that the primary socialisation of teachers is to focus on student learning and achievement, and their role in relation to that. However, as this thesis has argued, it may be that something more is required of teachers who are charged with preparing young people for the increasingly complex, uncertain world of exponential change and unknown unknowns that seems to be our future.

Chapter Six: Implications

In Chapter Two it was argued that today's education system must change if it is to produce students who can thrive in a world that is changing in unpredictable and complex ways (Brynjolfsson & McAfee, 2012; Godet, 1988; Miller, 2015). It was argued that adult working lives are being significantly impacted by the exponential increase in technological change (Brynjolfsson & McAfee, 2012), and people are more networked than any other time in human history (Sardar, 2015). Thus wholesale change of the education system is needed, not just improved ways of doing more of the same. Areas identified for change included the need to develop every learner's intellectual capacity, and for educators to use networks to build students' learning—and social—futures. This kind of change requires teacher change. Chapter Two set out a conceptual framework for supporting the kinds of change that are needed, focusing in particular on an approach known as transformational learning. The study reported in this thesis investigated the experiences of a group of teachers as they participated in a teacher professional learning experience designed to support this kind of learning.

This chapter explores some of the implications of this study's findings, via three themes: implications for individual teachers as adult learners; implications for the design of "future-oriented" teacher professional learning programmes; and implications for government policy in this area.

The teachers who participated in this study focused on student learning, not their own. While this is likely to have been (at least in part) the result of limitations in the design of the learning activity they participated in, even when strongly prompted, the teachers had little, if anything, to say about their own learning.

There are two obvious implications of this. If teacher professional learning involving transformational learning is a necessary precondition for the development of a future-oriented teaching workforce, then much more work (and a major shift in thinking) is needed to design more appropriate forms of teacher professional learning.[4] There is a well-established research basis for such work. Chapter Two of this thesis described the work of Eleanor Drago-Severson in this area - in particular, the four "pillar practices" she recommends for work designed to support teachers' cognitive development and possible transition to the next level in Kegan's framework.[5] All four of her pillar practices rest on a foundation of teachers engaging fully in critical reflection and critical dialogue. Transformational learning requires that teachers talk with each other, in depth, about the underlying philosophies and purposes of education, that they reflect on and challenge each other's thinking, and, importantly, their *own* thinking. In this study, the teachers did talk with each other, but many of the conversations were superficial and brief.

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4 This is not to say that there is no longer any place for informationally-oriented professional learning. Of course there is, but this lies outside the scope of this project.

5 These "pillar practices" are as follows: engaging in collegial relationships with staff from both inside and outside of school; taking on leadership roles to develop their ability to consider multiple perspectives; being engaged in collegial inquiry; and mentoring new and beginning teachers.

Views were exchanged, but not explored, questioned or delved into. Very little challenging of each other's thinking was reported and there was virtually no challenging of their own thinking. However, as mentioned above, this is likely to be the result of limitations in the design of the activity they were exposed to, or the fact that it was a one-off experience. Or it could have been due to other unidentified contextual factors.

The fact that the study's express focus on teachers' thinking (which was communicated to the participants) produced little evidence of this should alert us that there is an issue here. If we accept the argument made in this thesis that future-oriented education requires new knowledge/s, new dispositions, and new ways of thinking in teachers, then teachers need to be open to the kind of learning described above. A shift in identity is required, from a role as autonomous, "finished" "knower", to a view of themselves as someone committed to their own on-going growth and development - in the context of collegial relationships with others. Ten years ago, in the Ministry of Education Iterative Best Synthesis (Timperley et al, 2007), identified that teacher learning needs to be the focus of teacher professional learning and development programmes, and that teachers need time and support to challenge their existing knowledge and practice, in a safe and trusting environment. Yet professional learning and development programmes on the whole still fall short of these ideals. Teacher learning is still not valued enough as a way of engaging positive student outcomes.

This study's findings also point to some limitations in current policy thinking about future-oriented education. As outlined in Chapter Two of this thesis, the need for change in New Zealand's education system is acknowledged at government level, and there are many policy initiatives in place that are designed to support change. However, these policies do not go far enough. Singham (1998) wrote an analogy comparing black student achievement in American schools. This can be applied to Maori and Pasifika achievement in New Zealand. In Welsh coalmines canaries are used as indicators that the system is poisoned. Singham (1998) argues that we should be seeing the lower achievement of Black (or Maori & Pasifika students) as a canary in the educational coal mine: that is, as evidence that the system is broken, poisoned, lacking sufficient oxygen for life. Doing more of the same, albeit smarter, with the same elements, will not bring the system back to life. New approaches are needed. Some of these new approaches will need to pay closer attention to the system's elements, and the way those elements interact. As McQuillan (2008) argues:

> To change the outcomes produced by a system, complex or otherwise, you must alter the interaction among system elements… Some perturbation must unsettle the system so it does not return to its prior state…Although this may seem self-evident, piecemeal reforms often occur in isolation from other elements of the school 'system'…So even though reforms are implemented, no one does anything of significance differently (p.1781).

New Zealand's current educational initiatives (e.g. Investing in Educational Success policy and the related Communities of Learners initiative) are based on transfer of knowledge from expert to novice. The students will have noticed no difference in how they are learning or how the teachers are teaching, because there is none. Historical precedent has shown that the majority

of schools take new ideas, new philosophies and new policies and assimilate them into what they already do (Claxton, 2008; Egan, 1999; Labaree, 2010; Robinson, 2011), with result that very little progress is made. This lack of progress is largely because teachers have not having had the opportunity to think and make meaning in new ways. Progress in shifting the system will only be made when teachers have opportunities for transformational learning as adult learners. This, as Drago-Severson (2016), Moller & Pankake (2006) and Wagner (2007), have shown, will raise student achievement much more effectively than the current, outdated approaches.

This research has explored the extent to which teachers talk with each other about their professional learning and development. It looked at the depth of their conversations and the conditions that appear to support them. It showed that teachers do discuss their professional learning, but the conversations tend to be superficial and are not sustained. Prior knowledge and well-developed collegial relationships appear to be necessary pre-conditions for in-depth conversations. However, while some of the teachers in the study considered ideas in relation to their implications for student learning, they were less willing to reflect on the implications of these ideas for their own thinking.

If this capacity is a necessary component of a future-oriented education system, then new forms of teacher professional learning are needed. If innovation is to come from “within the system” as intended in the Communities of Learners initiative, a step change is needed. Teachers will need support to go well beyond simply talking to each other and sharing existing practice: they will need to move up to a view of themselves as professionals committed to ongoing, life-long cognitive growth, both for themselves as adults, and for the profession.

REFERENCES

Alton-Lee, A. (2003). *Quality teaching for diverse students in schooling: Best evidence synthesis.* Wellington, New Zealand Ministry of Education.

Armour, K. & Makopoulou, K. (2012). Great expectations: Teacher learning in a national professional development programme. *Teaching and Teacher Education*, 28, 336-346.

Anderson, W. (2007). Knowledge in Evolution. *Futures*, *39*(8), 915-919.

Auster, E. (1990). The interorganisational environment: Network theory, tools and applications. In F. Williamson & D. Gibson (Eds), *Technology Transfer: A Communication Perspective*, Sage, 63089.

Avalos, B. (2011). Teacher professional development in *Teaching and Teacher Education* over ten years. *Teaching and Teacher Education*. 27(1), 10-20.

Beare, H. (2001) *Creating the future school*. London, Routledge.

Beare, H., & Slaughter, R. (1993). *Education for the 21st Century*. London, Routledge.

Beavers, A. (2009). Teachers as Learners: Implications of adult education for professional development. *Journal of College Teaching and Learning*, *6*(7), 25 – 30.

Benkerler, Y. (2011). Networks of Power, Degree or Freedom. *International Journal of Communications*, *5*, 721-755.

Brinkerhoff, D. (2014). State fragility and failure as wicked problems: beyond naming and taming. *Third World Quarterly*, *35*(2), 333-344.

Brynjolfsson, E. & McAfee, A. (2012). Humanity and technology on the second half of the chessboard *Race Aganist the Machine: How the digital revolution is accelerating innovation, driving productivty and irreversibly transforming employment and the economy*. Lexington, Massachusetts: Digital Frontier Press.

Boyd, R. (1991). *Personal Transformation in Small Groups*. London: Routledge.

Carr, M. & Claxton, G. (2002). Tracking the development of learning dispositions. *Assessment in Education: Principals, Policy and Practice*, *9*(1), 9-37.

Castells, M. (1996). *Rise of the Networked Society: The Information Age: Economy, Society and Culture*. Oxford, Blackwell.

Checkland, P. (1993). *Systems Thinking, Systems Practice*. New York, John Wiley & Sons.

Chalmers, D. (2006). Strong and Weak Emergence. In P. Clayton & P. Davies (Eds) *The Re-emergence of Emergence,* Oxford, Oxford University Press.

Cilliers, P. (2000). Rules and Complex Systems. *Emergence,* 2(3), 40-50.

Claxton, G. (2008). *What's the point of school? Rediscovering the heart of education*. Oxford: One World.

Claxton, G. (2014). *Building learning power: schools fit for 21st century***.** [PowerPoint slides]. Retrieved from wwwcie.org.uk

Claxton, G. (2012, August 15). *Can School Prepare you for anything?* [Video File]. Retrieved fromhttp://edtalks.org/#/video/guy-claxton-can-schools-prepare-you-anything.

Cliffe, D., O'Malley, J., & Taylor, J. (2008). *Future issues in socio-technical change for UK education*. Briefing paper for the Beyond Current Horizons programme. Retrieved from www.beyondcurrenthorizons.org.uk.

Cohen, L., Manion, L., & Morrison, K. (2004). *Research Methods in Education* (5th Ed). London: Routledge Falmer.

Cranton, P. (1994). *Understanding and promoting transformative learning: A guide for educators of adults*. San Francisco: Jossey Bass.

Dator, J. (2016). What future studies is, and is not. Retrieved from www.futureshawaii.edu.

Davis, B. & Sumara, D. (2008). Complexity as a theory of education. *Transnational Curriculum Inquiry*, *5* (2), 33-44.

Davis, B., & Sumara, D. (2006). *Complexity and education: Inquiries into teaching, learning and research*. Mahwah, NJ: Lawrence Erlbaum Associates.

Dede, C. (2004). *Distributed Learning Communities as a Model for Educating Teachers*. Paper modified from a study commissioned by the National Commission on Teaching and America's Future in November 2003. Retrieved from file:///Users/owner/Downloads/proceedings_14523%20(1).pdf

Dede, C. (2010). Transforming schooling via the 2010 National Educational Technology Plan. New York, Teachers College Press.

Drago-Severson, E. (2007). Helping teachers learn: Principals as professional development leaders. *Teachers College Record*, *109*(1),70-125.

Drago-Severson, E. (2016). Teaching, learning and leading in today's complex word: Reaching new heights with a developmental approach. *International Journal of Leadership in Education*, *19* (1), 56-86.

Dufor, R. (2010). How do principals really improve schools? *The Principalship, 70 (1), 34-40.*

Dutton, W. (2009). The fifth estate emerging through the network of networks. *Prometheus*, *27*(1), 1-15

Education Review Office (2015). Secondary Tertiary Programme: What works and next steps. Retrieved from www.ero.govt.nz

Egan, K. (1999). Education: Three old ideas and a new one. *Journal of Curriculum Studies*, *31*(3), 257-267.

Egan, K. (1997). *The Educated Mind: How cognitive tools shape our understanding*. Chicago, Chicago University Press.

Evans, R. (2012). Getting to No: Building true collegiality in schools. *School Matters*, Winter 2012.

Facer, K. (2011). *Learning futures: Education, technology and social change*. London, Routledge.

Fenwick, T. (2010). Normalising standards in educational complexity: A network analysis. In D. Osberg & G. Biesta (Eds.), *Complexity theory and the politics of education* (pp. 57-67). Rotterdam, Sense.

Freire, P. (1998) *Cultural Action and Conscientization*. *Harvard Education Review*, *68(*4), 476-522.

Garvey Berger, J. (2003). A summary of the constructive-developmental theory of Robert Kegan. Retrieved from http:wiki.canterbury.ac.nz.

Gidley, J. (2010). Globally scanning for "Megatrends of the Mind": Potential futures of futures thinking. *Futures, 42.* 1040-1048.

Gilbert, J. (2005). *Catching the Knowledge Wave? The Knowledge Society and the Future of Education*. Wellington, NZCER Press.

Gilbert, J., & Bull. A. (2014a). *On the Edge: Shifting teachers' paradigms for the future*. TLRI - funded (Project Id 9132). Retrieved from: http://www.tlri.org.nz/sites/default/files/projects/TLRI%20_%20Gilbert%20_%20Summary.pdf

Gilbert, J., & Bull, A. (2014b). *Exploring teacher professional learning for future oriented schooling*. Wellington, NZCER Press.

Gilbert, J. (2015). *Leading in collaborative, complex education systems*. New Zealand Education Council. Retrieved from www.educationcouncil.org.nz

Greenfield, S. (2003). *Tomorrows People: How 21st Century technology is changing the way we think and feel*. London, Allen Lane.

Godet, M. (1988). Into the next decade. *Futures*, *20*(4), 410-423.

Habermas, J. (1991*) Communication and the evolution of society*. Cambridge UK: Polity Press.

Haggis, T. (2008). Knowledge Must Be Contextual: Some possible implications of complexity and dynamic systems theories for educational research. In Mason, M. *Complexity Theory and the Philosophy of Education* (pp. 159-176). UK, Wiley-Blackwell.

Harland, T. (2014). Learning about case study methodology to research higher education. *Higher Education Research and Development 33*(6), 1113-1122.

Head, B. & Alford, J. (2015). Wicked Problems: Implications for public policy and management. *Administration and Society*. *47*(6), 711-739.

Helsing, D., Howell, A., Kegan, R., & Lahey, L. (2008). Putting the "Development" in professional development: understanding and overturning educational leaders' immunities to change. *Harvard Education Review, 78*(3), 69-94.

Hetherington, L. (2013). Complexity Thinking and Methodology: The potential of 'Complex Case Study' for Educational Research. *Complicity: An International Journal of Complexity and Education*, 10(1/2), 71-85.

Higgins, M., Chandler, D., & Kram, K. (2007). Relational Engagement and Developmental Networks. In B. Ragins and K. Kram (Eds.), *The handbooks for mentoring at work: research, theory and practice*. California, Thousand Oaks CA: Sage.

Innel, S. (1998) *Transformative Learning in Adulthood*. *ERIC Digest.* No. 200. Retrieved from ERIC database (ED 423426)

Kapoor, R. (2011). Is there a postnormal times? From the illusion of normality to the design for a new normality. *Futures, 43*, 216-220.

Keast, R., & Mandell, M. (2014). A composite theory of leadership and management: Process catalyst and strategic leveraging – Theory of deliberate action in collaborative networks. In R. Keast, M. Mandell, & R, Agranoff (Eds), *Network theory in the public sector*, pp. 15-32, New York, Routledge,

Kedzior, M. (2004). Teacher Professional Development. *Educational Policy Brief*, 15 2-6.

Kegan, R. (1980). Making Meaning: The constructive developmental approach to persons and practice. *Personnel and Guidance Journal 58,* 373 - 380.

Kegan, R. (1983). *The Evolving Self: Problem and Process in Human Development*. Cambridge, Harvard University Press.

Kegan, R. (2000). What "form" transforms? A constructive developmental approach to transformative learning. In J. Mezirow and Associates (Eds.), *Learning as transformation* (pp. 35-70). San Francisco, Jossey-Bass.

Kelchtermas, G. (2006). Teacher collaboration and collegiality as workplace conditions: A Review. *Zeitschrift fur Padagogik*, *52*(2), 220 - 237.

Kenis, P. & Schneider, V. (1991). Policy networks and policy analysis: scrutinizing a new analytical toolbox. In B. Marin & R. Mayntz (Eds) *Policy Networks: Empirical Evidence and Theoretical Considerations*, New York, Campus/Westview.

Kincheloe, J. & Berry, K. (2004). *Rigour and Complexity in Educational Research*. McGraw-Hill Education.

Kirilenko, A., & Lo, A. (2013). Moore's Law versus Murphy's Law: Algorithmic Trading and its discontents. *Journal of Economic Perspectives*, *7*(2), 51-72.

Labaree, D. (2010). *Someone has to fail: The zero sum game of public schooling*. Cambridge MA, Harvard University Press.

Marien, M. (2002). Futures Studies in the 21st Century: a reality based view, *Futures*, 35(4), 261-281.

Masini, E. (2006). Rethinking Futures Studies, *Futures* 38(10), 1158-1168.

Mason, M. (2008). Complexity Theory and the philosophy of education. *Educational Philosophy and Theory 40*(1), 4-18.

Maxwell, I. (2013). Guest Editorial. *Futures*, 104, (4/5), 3.

McGowan, E., Stone, E., & Kegan, R. (2007). A constructive-development approach to mentoring relationships. In B. Ragins & K. Kram (Eds.), *The handbook for mentoring at work: research, theory and practic*e (pp. 401-426). Los Angeles, Sage Publications.

McQuillan, P. (2008). Small school reform through the lens of complexity theory: It's "Good to Think With". *Teachers College Record*, 110, 1772-1801.

Merriam, S. (2004). The role of cognitive development in Mezirow's Transformational Learning Theory. *Adult Education Quarterly*, *55*(1), 60-68.

Mezirow, J. (1997). Transformative Learning: Theory to Practice. *New Directions for Adult and Continuing Education,* 74. San Francisco, Jossey Bass.

Mezirow, J. (2004). Forum comment on Sharon Merriam's "The role of cognitive development in Mezirow's transformational learning theory". *Adult Education Quarterl*y, *55*(1), 69-70.

Mezirow, J. (1994). "Understanding transformation Theory." *Adult Education Quarterly*,*44*(4), 222-244.

Mezirow, J. (2006). An Overview on Transformative Learning. In J. Vrowther and P. Sutherland *Lifelong Learning: Concepts and Contexts* (pp.24-39). London, Routledge.

Miller, J. (1978). *Living Systems,* New York: McGraw Hill.

Miller, M & Bentley, T. (2003). *Unique creation – Possible Futures – Four Scenarios for 21st Century Schooling*, NCSL, Nottingham.

Miller, M. (2015). Getting paid in the naked economy. *Hofstra Labor and Employment Law Journa*l, *32*(2), 279 -299.

Ministry of Education (2015). *PLD changes will lift student achievement*. Retrieved from https://www.beehive.govt.nz/release/pld-changes-will-lift-student-achievement

Ministry of Education (2015a). *Investing in Educational Success*. Retrieved from www.education.govt.nz

Ministry of Education (2015b). *Science in Society Plan*. Retrieved from www.education.govt.nz

Ministry of Education (2015c). *Focus on Mathematics*. Retrieved from www.education.govt.nz

Ministry of Education (2015d). *National Standards*. Retrieved from www.education.govt.nz

Ministry of Education (2016a). *About Better Public Services*. Retrieved from www.education.govt.nz

Ministry of Education (2016b). *Government Education Initiatives*. Retrieved from www.education.govt.nz

Ministry of Education (2016c). *Initiatives*. Retrieved from www.education.govt.nz

Ministry of Education (2016d). *Strategies and Policies*. Retrieved from www.education.govt.nz

Ministry of Education (2016e). *Ambitious for New Zealand: Four Year Plan 2016-2020*. Ministry of Education. New Zealand.

Ministry of Education (2016g). *Trades Academies*. Retrieved from www.education.govt.nz

Ministry of Education (2016h). *Investing in Educational Success*. Retrieved from www.education.govt.nz

Moller, G., & Pankake, A. (2006). *Lead with me: A principal's guide to leadership*. Larchmont NY: Eye on Education.

Morrison, K. (2006, November). *Complexity Theory and Education*. Paper presented at the APERA Conference, Hong Kong, China.

Morrison, K. (2008). Educational Philosophy and the Challenge of Complexity Theory. In Mason, M. *Complexity Theory and the Philosophy of Education* (pp.16-31). West Sussex UK, Wiley-Blackwell.

Naisbitt, J. (1982). *Ten new directions transforming our lives*. New Your, Warner Books.

Newell, C. (2008). The class as a learning entity (complex adaptive system): An idea from complexity science and educational research. *SFU Educational Review*, *2*(1),(5-17).

Nisbet, J., & Watt, J. (1984). Case Study. In J. Bell, T. Bush, A.S. Fox, J. Goodey and S. Goulding (Eds.), *Conducting Small-scale Investigations in Educational Management* (pp.79-92). London, Harper & Row.

Office of the Ministry of Education (2014). *Investing in Educational Success: The Learning and Achievement Challenge*. Retrieved from http://www.education.govt.nz/assets/Documents/Ministry/Investing-in-Educational-Success/IES-Cabinet-Paper-21-January-2014.pdf

Osberg, D., & Biesta, G. (2007). Beyond presence: Epistemological and pedagogical implications of "strong" emergence. *Interchange*, *38*(1), 31-51.

Osberg, D., Biesta, G., & Cilliers, P. (2008). From Representation to Emergence: Complexity's challenge to the epistemology of schooling. In M. Mason (Ed.), *Complexity Theory and the Philosophy of Education* (pp.181 -203). West Sussex UK, Wiley-Blackwell.

Peters, M. (2008). Complexity and knowledge systems. In M. Mason (Ed.), *Complexity Theory and the Philosophy of Education* (pp.xi –xiii). West Sussex, Wiley-Blackwell.

Petrie, K. & McGee, C. (2012). Teacher Professional Development: Who is the learner? Australian Journal of Teacher Education, 37(4), 58-72.

Rasmussen, J. (2010). Increasing complexity by reducing complexity: A Luhmannian approach to learning. In D. Osberg & G. Biesta (Eds.), *Complexity theory and the politics of education* (pp. 15-24). Rotterdam, Sense.

Richardson, K., Chilliers, P., & Lissack, M. (2001). Complexity Science: A "Gray" Science for the "Stuff in Between". *Emergence*, *3*(2), 6-18.

Rittel, H., & Webber, M. (1973). Dilemmas in general theory of planning. *Policy Sciences*, *4*(2), 155-169.

Roberts, N. (2000). Wicked problems and network approaches to resolution. *International Public Management Review*, *1*(1), 1-19

Robinson, K. (2011) The Trouble with Education *Out of our minds – learning to be creative*. Chichester UK, Capstone Press.

Ringland, G. (2010). Frameworks for coping with post-normal times: A response to Ziauddin Sardar. *Futures*, *42*(6), 633-639.

Sardar, Z. (2010). Welcome to postnormal times. *Futures, 42*, 435-444.

Sardar, Z. (2015). Postnormal times revisited. *Futures, 67*, 26-39.

Scardamalia,M. & Bereiter, C. (2006). Knowledge building: theory, pedagogy, and technology. In Sawyer. K. (2006) (Ed.), *Cambridge Handbook of the Learning Sciences* (pp. 97-118). New York, Cambridge University Press.

Sachs, J. (2002). *Aristotle's Metaphysics, Book H – Form and Being at Work, J. Sachs (trans.,* 2nd ed.). Santa Fe, Green Lion Press.

Singham, M. (1998). The canary in the coal mine: The achievement gap between black and white students. *Phi Delta Kappan*, *80*(1), 8-15.

Slaughter, R. (1993). Looking for the real 'Megatrends'. *Futures, 25*(8), 827-848.

Slaughter, R. (1996). The knowledge base of futures studies as an evolving process. *Futures*, *28*(9), 799-812.

Sterling, B. (2003). *Tomorrow Now: Envisioning the next 50 years*. New York: Random House.

Sterling, B. (2005). *Shaping Things*. Cambridge MA, MIT Press.

Taylor, E. (1997). Transformative learning: A review. *Adult Education Quarterly, 48*(1), 34-50.

Taylor, E. (1998). *The Theory and Practice of Transformative Learning: A critical review*. ERIC Digest No 374. Retrieved from ERIC database (ED 423422)

Taylor, E. (2000). Analysing research on transformative learning theory. In J. Mezirow & Associates (Eds.), *Learning as transformation: Critical perspectives on a theory in progress* (pp. 151 -180). San Francisco, Jossey-Bass.

Tennant, M. (1993). Perspectives transformation and adult development. *Adult Education Quarterly*, 44(1), 34-43.

Tichy, N., Tushman, M., & Fromburn, C. (1979). Social Network Analysis for Organisations. Academy of Management Review, 4(4), 507-519.

Timperley, H. (2008). *Teacher professional learning and development.* International Academy of Education, France, Imprimerie Nouvelle Gonnett.

Trombly, C.E. (2014). Schools and complexity. *Complicity: An international Journal fo Complexity and Education*, 11(1), 40-58.

Trowler, P. (2012). Wicked issues in situating theory in close-up research. *Higher Education Research & Development*, *31*(3), 273-284.

Von Bertalanffy, L. (1968). *General System Theory. Foundations, Development, Applications*, New York, George Braziller.

Waldrop, M. (1993). *Complexity: The emerging science at the edge of order and chaos.* New York, Simon & Schuster.

Wagner, T. (2007). Leading for Change: Five 'Habits of Mind" that count. *Education Wee*k, *26*(45), 29-32.

Wagner, T. (2012). *Innovating Learning Creating Innovators*. New York, Scribner.

Wagner, T. (2012, May 30). Play, Passion and Purpose [Video File]. Retrieved from https://www.youtube.com/watch?v=hvDjh4l-VHo

Weinberger, D. (2012). *Too big to know: Rethinking knowledge now that the facts aren't the facts, experts are everywhere and the smartest person in the room is the room.* New York, Basic Books.

West, D. (2015). *What happens if robots take the jobs?* Centre for technology Innovation at Brookings. Retrieved from www.insidepolitics.org.

Whitney, K., Bradley, J., Baugh, D., & Chesterman, C. (2015). Systems theory as a foundation for governance of complex systems. *International Journal System of Systems Engineering*, *6*(1/2),15-32.

Yorks, L., & Nicolaides, A. (2013). Toward in Integral Approach for Evolving Mindsets for Generative Learning and Timely Action in the Mindset of Ambiguity. *Teachers College Record*, 115, 2-26.

Appendix One: Interview Questions

1. What do you think the intent of the activity was?
2. In what ways could the activity be considered professional learning and development?
3. Thinking about what you observed last week was there anything you would do differently?
4. Can you show me the network map you created?
5. Tell me about the conversations you had with each of these people?
6. Who initiated the discussion?
7. While we were talking did you remember other people you talked to about the professional learning and development activity but have yet to include on your map?
8. Thinking about the people you had in-depth dialogue with, why do you think you talked deeply with them about the professional learning and development activity and not others?
9. Was there anything about the conversations you had that disrupted your thinking?
10. Did your thinking about the activity change over the last week?
11. If you were going to write a blog or a journal article about the professional learning and development experience, what would you focus on and why?

Appendix Two: Ethical Approval

AUTEC Secretariat

Auckland University of Technology
D-88, WU406 Level 4 WU Building City Campus
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E: ethics@aut.ac.nz
www.aut.ac.nz/researchethics

25 September 2015

Jane Gilbert
Faculty of Culture and Society

Dear Jane

Re Ethics Application: **15/337 Probing for change: Can teacher neworks promote ideas spread in a complex education community?**

Thank you for providing evidence as requested, which satisfies the points raised by the Auckland University of Technology Ethics Subcommittee (AUTEC).

Your ethics application has been approved for three years until 24 September 2018.

As part of the ethics approval process, you are required to submit the following to AUTEC:

- A brief annual progress report using form EA2, which is available online through http://www.aut.ac.nz/researchethics. When necessary this form may also be used to request an extension of the approval at least one month prior to its expiry on 24 September 2018;
- A brief report on the status of the project using form EA3, which is available online through http://www.aut.ac.nz/researchethics. This report is to be submitted either when the approval expires on 24 September 2018 or on completion of the project.

It is a condition of approval that AUTEC is notified of any adverse events or if the research does not commence. AUTEC approval needs to be sought for any alteration to the research, including any alteration of or addition to any documents that are provided to participants. You are responsible for ensuring that research undertaken under this approval occurs within the parameters outlined in the approved application.

AUTEC grants ethical approval only. If you require management approval from an institution or organisation for your research, then you will need to obtain this. If your research is undertaken within a jurisdiction outside New Zealand, you will need to make the arrangements necessary to meet the legal and ethical requirements that apply there.

To enable us to provide you with efficient service, please use the application number and study title in all correspondence with us. If you have any enquiries about this application, or anything else, please do contact us at ethics@aut.ac.nz.

All the very best with your research,

Kate O'Connor
Executive Secretary
Auckland University of Technology Ethics Committee

Cc: Latisha Kelly latishakelly@xtra.co.nz

Appendix Three: PGR15

POSTGRADUATE

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Student ID No	13835317	**Name**	Latisha Kelly
Faculty	Society and Culture	**School/Dept**	Education
Programme	Master of Education	**Year of submission** (for examination)	2017
Research Output	**Thesis** ☒ **Exegesis** ☐	**Dissertation** ☐	**Points Value**
Research Title	Probing for Change: Can teacher networks promote idea spread in a complex education community		

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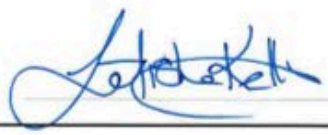
Student's Signature  **Date** 09/10/17