NZCER
Rangahau Mātauranga o Aotearoa

Exploring Teacher Professional Learning for Future-Oriented Schooling

Working Paper 1 from the Back to the Future project

Jane Gilbert and Ally Bull, NZCER

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New Zealand Council for Educational Research

In educational discussions today, there is concern that our schools are not adequately preparing today's learners for the increasingly fast-changing world they will live and work in. The terms "future-oriented" and/or "21st century" teaching and learning occur frequently in policy documents, and "future focus" is a key principle of our national curriculum.[3] However, while there is a great deal of talk about "21st century" *learners*' needs, and how best to meet these needs, there is very little discussion of what "21st century" or "future-oriented" *teachers* look like, or how today's teachers might become "future-oriented". This, it seems to us, is a major gap. Developing a future-oriented education system cannot be done without teachers who understand—and are committed to doing—what is needed. However, many of today's teachers are not well-prepared for this work, and most professional learning programmes are not designed to scaffold the kind of "future practice" needed.

What qualities do future-oriented teachers need? To what extent are these qualities *different* from those required of 20th century teachers? How are these qualities best developed? Can we expect *all* teachers to develop them? Can these new qualities be simply added to a 20th century teacher's existing repertoire of knowledge and skills? While there is a focus on teachers' ICT knowledge and skills, the educational research literature has had little to say on other qualities needed by future-oriented teachers, and these questions are not a focus in the wider education sector.

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[1] The Back to the Future project has become part of a TLRI-funded project called *On the Edge: Shifting Teachers' Paradigms for the Future*. See http://www.tlri.org.nz/tlri-research/research-progress/school-sector/edge-shifting-teachers%E2%80%99-paradigms-future for details.

[2] Jane Gilbert is now at AUT University.

[3] However, according to a recent report by the Education Review Office, the *future focus* principle of *The New Zealand Curriculum* is not well-understood in the sector (Education Review Office, 2012). Rather than framing the design of everything we do in our schools, "the future" seems to be an abstract construct that is mentioned, but then ignored in the return to "business as usual".

The project described in this paper is designed to explore these questions. Its starting point is that becoming a future-oriented teacher involves something *more* than accepting and implementing constructs developed by others: it involves major cognitive shift. Future-oriented teachers need to be able to deconstruct—and rethink—many of 20th century education's taken-for-granted assumptions—about the purpose of schooling and curriculum, and about the role of teachers. The project is set up to investigate whether or not this kind of cognitive shift is possible for 20th century teachers and, if it is, what helps it to occur? Are some teachers more "ready" for this kind of change than others? If some are, why is this?

This paper is a "working paper" in that it outlines some of the early findings of a pilot project. The ongoing project is complex, and we are continuing to refine the research design. However, the initial findings we outline here, while rather "raw", throw up some interesting issues that are a useful starting point for considering what "future-oriented" teachers might look like.

The paper begins with some brief background to the project as a whole. It then describes the pilot project (which was carried out in 2012), outlines the initial findings, and briefly discusses the work we are now doing.

Future-oriented education—what is it, why do we need it, and why don't we have it?

In the later years of the 20th century, the terms "21st century learning", "future-oriented learning" (and others)[4] began to be used to refer to a cluster of ideas that, it was argued, would help schools change to better meet the needs of 21st century students/society. Now, a decade and a half into the 21st century, the literature on these ideas is vast. They are deployed in many different contexts, framed by many different disciplines, in support of a wide variety of different political purposes. The result of this is that these terms are now little more than slogans. They are being used to mean everything and nothing, and their transformative potential has been diluted. What was this cluster of ideas? What was "21st century" about them? How and why is it argued that change is needed? Because these ideas were the starting point for the project described in this paper, we provide a brief outline here.[5]

In scholarly and policy work on the future of education, there is widespread agreement that our education systems are no longer "fit for purpose". They have not kept up with developments in

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[4]   For example, some commentators are now using the term "Education 3.0".
[5]   For a fuller account see Gilbert (2005) or Bolstad and Gilbert (2012).

the outside world, and the need for change is now urgent. The current system was set up to meet 20th century, Industrial Age needs: to reproduce forms of knowledge that were valued in Industrial Age contexts, and to screen and sort students for Industrial Age forms of employment. While it does this reasonably well, the 21st century world needs it to do new and different things. However, the existing system has a great deal of inertia, and change is hard. Work in this area usually identifies three key "drivers" of change:

1. the need for better "system performance" (more students achieving to higher levels)
2. major economic change (new "weightless" globalised, economies in which knowledge is the key source of new growth, and innovation, creativity, and design skills are highly valued)
3. the exponential rate of technological change.[6]

While there is a lot of talk about the first of these three drivers, especially in policy contexts, discussion of the *educational* implications of the other two has been superficial. Yet these two are *why the first matters*.

Briefly, as a result of certain major—and ongoing—economic and technological (as well as social and political) changes, two things have happened that have major significance for education. One is that knowledge, in the new "knowledge societies", has a new meaning, one that calls into question just about everything in 20th century education systems.[7] The other is that the so-called "digital revolution" is set to dramatically change how we think about work and employment. This also calls into question the fundamentals of 20th century education.[8] These two changes are *the* reason that we now need an education system capable of educating *everyone*—not just an elite few—to tertiary level. However, and this is important, this would *not* be tertiary education as we now know it.

These trends, if taken seriously, are a major challenge to the Industrial Age model of education. However, the educational policy and practice response to them has been patchy at best.

At the policy "theory" level there is talk of the importance of "personalising" student learning; building students' "learning power"; rethinking teacher–student (and school–community) relationships; and new ways of thinking about equity and diversity.[9] References to

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[6] See, for example, Murgatroyd (2011).
[7] See Barlow (1994), Stehr (1994), Castells (2000), Gilbert (2005), Weinberger (2011).
[8] See, for example, Brynjolfsson and McAfee (2011, 2014).
[9] For example, see Bolstad and Gilbert (2012), Ministry of Education (2006).

"competencies", "learning skills"[10] and the "4Cs" of 21st century learning appear frequently.[11] However, in the strategic context, the term "21st century learning/skills" is usually linked with discussions of the need to provide increasingly sophisticated digital infrastructure—the need to invest in ultra-fast broadband and improved device access for students and teachers.[12] This is obviously important: however, investment in ICT alone does *not* trigger the kind of cognitive shift that is necessary for developing a future-oriented education system.[13]

At the operational level, the system has focused on developing higher achievement "targets" (e.g. by 2017, 85 percent of 18-year-olds achieving NCEA Level 2 or above),[14] and requiring more formal and regular measurement of student achievement at all levels of the school system. This strategy, while important, will not produce a *future*-oriented system. The achievement targets and the measures of achievement come from a system that was designed to assess students' acquisition of "old"—that is, Industrial Age—knowledge and skills. While some of this "old" knowledge is foundational (and still needed), 21st century learners need an *orientation* to knowledge that is very different from that encouraged in the 20th century system. In addition, at a more practical level, the current focus on this kind of achievement is diverting schools *away* from becoming more future-focused. It is also marginalising critical thinking, collaboration, creativity, and so on as "soft skills"; that is, not what *really* matters.

Some schools are using ideas and tools developed by educationists in other countries to scaffold their future-oriented development. For example, many New Zealand schools have used the concepts of "personalisation" and/or "co-construction", along with the "Nine Gateways" and "Four Deeps", developed in the work of the UK educationist David Hargreaves and his colleagues.[15] Others are drawing on the US-developed "Big Picture Learning" concept,[16] and many new schools are using the Modern Learning Environments concept to guide the design of

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[10]   Learning how to learn; life-long learning; and building learning power.
[11]   These 4Cs are: Critical thinking and problem-solving; Communication; Collaboration; and Creativity.
[12]   For example, in the Foreword to the Ministry of Education's most recent *Statement of Intent 2013–2018* it says: "New technology has the power to transform how children and young people learn. We will develop and implement a digital education strategy, which will support schools and educators to harness new technologies to prepare students with 21st-century skills" (Ministry of Education, 2013, p. 2). See also Ministry of Education (2014).
[13]   For a summary of the large body of research demonstrating this, see Dumont, Istance, and Benavides (2010).
[14]   Ministry of Education (2013, p. 2).
[15]   See, for example, Hargreaves (2006).
[16]   See www.bigpicture.org

their learning spaces.[17]   In general, however, schools are using these concepts, not to develop "next practice", but to add to and refine *20th century* practice. This is not helpful, firstly because schools already have too much to do without adding more new tasks, but secondly, and perhaps more importantly in the present context, because ideas imported from elsewhere and added to existing frameworks do not disrupt the assumptions that need to change. As one of the participants in the research project outlined here put it:

> *My assumption in the past was that because we were 'doing' the Gateways, that meant we were providing a 21st century learning environment, when in fact, we were doing the gateways for 20th century goals.* (N)

New ideas are important but, on their own, delivered by others, they are *not enough* to produce the kind of change that is needed. As constructivist learning theorists have argued for three decades or more, adding new ideas to an existing schema does *not* usually change the schema. The new ideas are assimilated or made to fit with the existing schema, or, if this can't be done, they are put aside and/or rejected.[18] Cognitive change requires a change in the underlying schema. It requires a change, not in *what* an individual thinks, but a change in *how* they think. It requires a change in the *system* that is used to represent, organise, and *give meaning to* ideas.[19] This kind of change is difficult.[20] Most people are unwilling—or unable—to make this kind of schema-level change unless certain conditions are in place.[21]

The starting point of the project described here is that becoming a future-oriented teacher involves this kind of schema-level change. The project was designed to evaluate the extent to which a group of teachers could be supported to change in this way—if at least some of the necessary conditions are provided. The project is part of a wider programme of work that is attempting to put into practice some of NZCER's earlier theoretical work on future-oriented education.

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[17] See www.edtalks.org/channel/modern-learning-environments
[18] See, for example, Posner, Strike, Hewson, and Gertzog (1982), Strike and Posner (1985), Derry (1996).
[19] Kegan (1994, 2000).
[20] See Kahneman (2011) for an account of this.
[21] The literature on the conditions for cognitive change is huge. Very briefly, some of these conditions are thought of as follows: (1) having opportunities to articulate current beliefs, and to explore the assumptions underlying those beliefs; (2) experiencing some sort of "cognitive dissonance"—i.e. exposure to experiences or ideas that conflict with and cannot be incorporated into existing schema; (3) opportunities to work with others to investigate the source of this cognitive dissonance (e.g. in ambiguities, contradictions, and/or faulty reasoning); (4) opportunities to envision and consider alternative points of view. Cognitive change is an individual *and* a social process. Most people need *structures* to scaffold this process, and most people need to do this *with others*. For some recent work in this area, see Drago-Severson (2012), Baxter-Magolda and King (2004).

The Back to the Future project

The Back to the Future project was a pilot, and the findings outlined here represent the very early stages of the wider programme of work. The number of participants was small and the findings are based on data that are derived mainly from participant self-reports, collected via regular written reflections, and/or comments made as they participated in the intervention. However, we think that this process produced some material that is worthy of further investigation.

This project was a small action research project involving NZCER researchers working with two clusters of secondary school teachers in the North Island of New Zealand. It had two parts—an intervention designed to provide support for schema-level change, and research designed to explore the effects of that intervention. The intervention took place independently from the research project, and was carried out by different people. However, because it is the "object of inquiry" of the research project, it is described briefly below. This is followed by an account of the research project itself.

Part I—The intervention

The intervention was a teacher professional learning programme designed to support the kind of cognitive shift described above. It had three parts:

1. A university postgraduate paper. This paper, entitled *The Future of Schools in Aotearoa New Zealand,* and taught by Jane Gilbert, was specifically developed as part of this project. The paper's content explored various "big ideas" about how and why schooling needs to be different in the "knowledge societies" of the future. Its pedagogy was designed to give the paper's participants contexts for translating and using these ideas in their practice. The paper was taught in blended format (i.e. mainly online, but with two intensive weekend block courses) in Semester Two (July to October) 2012.

2. A professional development workshop. This one-day workshop was designed to help teachers think about their own thinking, and to explore how and why they think the way they do. It was facilitated by Jennifer Garvey Berger (who is a leadership consultant and expert in adult cognitive development). Participants explored their underlying assumptions (and their reasons for holding them), and looked at how some of these assumptions can block change.

3. Cluster work in teacher/principal groups. An experienced teacher-facilitator (Margaret Giroux) with practical experience in working in alternative/innovative educational contexts was employed by the project to meet with small groups of participants as the course progressed. Her role was to support them to process their thinking from the course and the workshop, and use it to develop a practice-based innovation (this was one of the course assignments).

These experiences, taken together, were designed to provide the conditions for cognitive change outlined above.[22]

Part 2—The research project

About 20 people participated in the 2012 university course. Of these, nine agreed to participate in the research project. Two of these people were principals, one was a deputy principal, five were secondary teachers, and one was an educational leadership consultant. These nine people were all offered the opportunity to participate in the professional development workshop and the cluster work outlined above. However, not all were able to take up this opportunity—for various reasons, mainly pressure of other commitments. All of the nine volunteers were interviewed at the beginning of the course, and their contributions to group discussions during the weekend block sessions were observed and recorded. They were also asked to write reflections on their thinking at several points during the course, which were sent to the researchers. Five of the nine volunteers did this more than once. At the end of the course, four people made a commitment to work in partnership with the researchers on the next stage of this project. The findings reported below are derived from data from this group of four people, because, in terms of the project design, we only have "full" data sets from these four people. We think these findings point to some interesting issues that are worth following up. However, there are some fairly obvious limitations. The data set is very small, and our data-gathering methods need further refinement—in terms of practicality and robustness. It was a challenge to design methods that can generate useful data from multiple sources across time, without

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[22] In footnote 21 above.

imposing extra work on busy teachers. There were also some ethical challenges involved in researching the effects of an intervention involving assessment for academic credit.[23]

Findings

Based on their self-reported reflections, all four participants made significant shifts in their thinking over the period of this pilot project. However, these four participants, for various reasons, all appeared to be "ready" to make such a shift. All were able to identify specific aspects of the PLD programme that had helped them to do this, and some key ideas emerge as "threshold concepts".[24]

Changes in thinking

While all four reported adding a great deal to *what* they know, they also appeared to make a shift in *how* they know.[25] In addition, all identified a shift in how they saw themselves as people, and how they saw the world. For one participant, the experience was an "identity quake":

> *[This university course] has been a very different paper—I'm not the same person I was eight weeks ago. … This [new way of thinking] involves a change in identity. I have defined myself as a knower, relied on finding stuff out, being safe and living in a knowable world. This is about changing my mental model of how the world is, and how I am in it.* (G)

For another:
> *This learning is what I have been looking for, for several years … and now it is here I can't un-know, un-learn or un-think it.* (J)

All said that they had developed a sense of the enormity of the change required, and a sense of its urgency. They said:
> *We have a moral obligation—once we know this stuff we have to do something about it. I'm surprised about just how passionate I'm feeling about this stuff. Originally I did the paper to think about 'what next' for the school. I'm surprised at how I've come to believe we have an ethical obligation to lead in this way.* (N)

> *Educators who do not or will not or choose not to be part of this change will need to sign off.* (J)

> *Transformative practice is so different that it makes its predecessor look absurd.* (F)

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[23] The course teacher did not participate in any of the data collection or analysis activities, and had access to the data set (in anonymised form) only after all course assessment activities had been finalised.

[24] A "threshold concept" is a core concept in a discipline that, once understood, transforms the learner's perception of that discipline (Land, Meyer, & Smith, 2008).

[25] This distinction, between a shift in *what* someone knows ("informational" learning) and a shift in *how* someone knows ("transformational" learning), comes from Kegan (1994, 2000).

The researchers were interested in the "causes" of these shifts. Were they facilitated by aspects of the experience and/or personal qualities of the participants? Or were they supported by aspects of the professional development programme? Or were both important?

While it is impossible to definitively "know" what produced these shifts, the participants themselves had views on what had happened to them. These views, taken from their interviews and reflections, are grouped below in two sections, one focusing on information on the participants' individual qualities and/or readiness for change, and the other on information on features of the PLD.

Personal features and contextual conditions

The four participants all seemed to be personally "ready" to engage deeply with the ideas discussed in the postgraduate paper. These ideas weren't especially new to any of them. All four said that it was probably necessary to have at least "bumped up against" these ideas previously (and they probably wouldn't have signed up for the course if they weren't already interested in them). These four participants were ready to go deeper, to go past or beyond the slogans of "21st century learning". As they put it:

> *I didn't feel exposed to new ideas but rather the ones I had been musing over and encountering previously became four dimensional as opposed to two.* (F)

> *At the course I noted how my thinking had shifted lots—and this led me to 'reason' why I am engaged in the paper—the Buddhists say that when the pupil is ready, the teacher will appear. Well I have been 'ready' for some time to think, ponder and wonder differently.* (J)

> *This has been in my thinking for a long while. I wondered where I had got it from. I have done lots of reading and thinking about, conversing, etc. The foundation always for me has been the individualization of learning/education, and really the 'networked society' and 'knowledge society' are exponential applications of this belief.* (J)

> *I have been going back and really trying to nut through what personalizing learning means in a future-oriented perspective. It's easy to think of it as doing what we should have been doing well all along (like attending to the aspirations of each student) but I'm finally getting that in the 21st century context, it means something much deeper. I guess it comes back to what Leadbeater says around shallow and deep personalization as much as having an informative rather than a transformative perspective.* (N)

> *So why was I so engaged? It wasn't new to me. Maybe I was working to 'get it' at a different level?* (G)

The particular contexts these people are working in seemed to contribute to their readiness. All are very experienced teachers. Two are principals who have been in their current positions for 10 or more years. As one of them said:

> *I'm now confident to shake the tree. You need at least seven years' experience to feel like that.* (J)

The two principals saw their current contexts as providing the sense of urgency for change. One leads an Area School.[26] He is very conscious that his school has sole responsibility for all of the schooling of its students, and that the 5-year-olds who began school in 2012 will graduate in 2025. This, for him, intensifies the need to think very carefully about how they are preparing their students for their future. In addition, the school's location means that many of the school's teachers have children attending it—these teachers have a personal *and* a professional interest in the quality of the education the school provides. The other principal leads a secondary school serving a tightly knit rural community. She has lived in this community all her life. She has a long-term investment in it and deep, respectful relationships with a wide range of community members. She believes she has an ethical responsibility to better prepare the young people of her community for their futures—for their benefit, but also for the community's benefit. All of the participants reported a developing sense of "moral imperative", a sense of urgency, and a sense of their responsibility as leaders to play a role in bringing about change.

As well as being willing to engage deeply with ideas, all four participants had the ability to tolerate uncertainty, to stay in/with the discomfort of an uncertain space. Some of them experienced this as a significant mental and emotional "leap":

> *I felt exhausted—on the edge of truly not knowing—this sat with me for several days.* (J)

> *I'm trying to 'divorce' myself from control of the outcome. I believe I can do this now.* (J)

> *I am looking over the edge and glimpsing something that is of great value, but I only see outlines, or partially, and I'm hungry for a bit more clarity.* (G)

> *If it doesn't change who you are and how you know—you haven't 'got' it. It's just one more good idea, and there are too many already. You have to stay in the uncomfortable space.* (G)

One also spoke of an increasing willingness to try to understand different perspectives:

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[26] Area Schools are State schools, usually in rural, and often isolated settings, that provide learning programmes for students from Years 1 to 13 (i.e. from early primary right through to senior secondary) on one site.

I am noticing that I can be more curious about things that used to make me angry—I can have an argument with my partner and be more interested in <u>why</u> he thinks like this, rather than being annoyed that he can't see this is the sort of thinking that contributes to the problem. Unless I can understand others' thinking, I am just as biased as they are. (G)

Important aspects of the professional development

The participants identified aspects of the PLD programme that changed their thinking. These included some of the "big ideas" discussed, as well as some of the processes used. The ideas were described by the participants as "aha moments", or, as one put it:

… when you said [X], the light went on—I got that. (J)

However, they also said that the opportunities they had to revisit the ideas several times, to think, read (and re-read) key texts, and to network and have in-depth discussions with others on the course were very important factors in their learning.

There were two "content" sections of the course that all participants said had a major effect on their thinking. These were material on the wider historical context (the educational implications of the move from the agrarian to the industrial and then digital age), and material on the changing meaning of knowledge. They said that it was this material that had produced the sense of urgency they now had, and the sense of the magnitude of the changes needed:

[The historical context material] was really engaging because I gained a real sense of the imperative urgency of the work and thinking we have been doing. (F)

One key point was the exponential change coming … was likened to the enclosure and industrial age changes … huge impact—this gave me perspective of why I 'didn't find what I was seeking' … I felt much closer to the 'getting it point' than I did previously. (J)

If you don't know the underlying principles—changing details makes no difference at all. (F)

We need to be clear about what it means to be an educated person today. (N)

Knowledge's new meaning was identified by all participants as a deeply challenging idea.[27] However, while they struggled with it, they recognised its significance to the development of "21st century" education:

We need to see knowledge in new ways. (N)

What I'm having most trouble with is the new idea of knowledge. (G)

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[27] See Gilbert (2005) for a description of this idea.

Knowledge resides outside the person. Knowledge can be created in a nanosecond—in the 'nexus space'. This new meaning of knowledge is far more foreign to us and it's a really difficult concept to get. (J)

If knowledge is no longer linked to truth …? So where did truth go? (F)

Other ideas in the university paper identified by participants as transformative were as follows:

- that schools have many different—and conflicting—purposes
- that school subjects are not the same as the disciplines they are derived from
- that schools serve a sorting function—the normal curve is deeply embedded in educational thinking, so that someone has to fail
- that "standardisation has to go".

Ideas in the workshop on thinking that were cited as being powerful for participants were:

- theories of adult development (and the fact that this work exists)
- the Cynefin framework[28] (for understanding complexity)
- the role of dissonance in transformative learning
- the difference between incremental/informational learning and transformative learning.

Participants also said that, while the workload of the course was at times daunting, especially for teachers with full-time, extremely demanding jobs, the level of work required played a key role in changing their thinking. As one put it:

I was pushed to exhaustion—it was as though I hit the wall—and then suddenly I could think differently. It was like a marathon runner going through the wall—I found new energy. (J)

The volume of reading really helped—you just have to get into the water and swim. (J)

Another participant said that the discipline of having to write reflections on her reading and construct assignments helped her to clarify her thinking in a way that she would not have done otherwise.

All participants valued the opportunity to talk with other course members grappling with the same ideas:

I'm hungry for conversations that have depth, and I found some of these at the weekend deeply challenging and different. (G)

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[28] See Snowden (2000, 2002), Kurtz and Snowden (2003).

There's something too passive about electronic media—small face to face discussions are powerful. (F)

You can't beat just coming together to chew the fat. (N)

As well as opportunities to talk, the participants all valued quiet time on their own to digest and reflect on the course material, but said that this was often hard to achieve with their busy work lives.

In summary, this particular group of educators seemed to share some key characteristics. During the pilot project they reported shifts in *what* they knew, but also shifts in *how* they knew. The ideas in the professional development were not new to them, but they were able to engage with them more deeply, and see things in new ways. They were hungry for in-depth discussions of these ideas with others. At times they were confused and uncertain, but they were able to tolerate this. They took the time to reflect deeply, to go inside themselves to look in on their *own thinking*, resisting the impulse to jump straight to action on behalf of their students or other teachers. They said they had changed as people during this professional development, that they had gained an appreciation of the enormity of the shift in thinking needed, and a sense of urgency. They identified a number of "threshold concepts" they thought it was necessary to "get" before their understanding could progress—in particular, key ideas from the history of education, adult development, and transformational learning. Finally, these participants were all at points in their careers/lives where they were ready, willing, and able to face new challenges, and to turn these challenges into opportunities for development. As one put it:

This is really, really important to me. I wouldn't not be here. It is absolutely great. (J)

This pilot project is part of a wider project on future-oriented education. In thinking about how best to scaffold the development of future-oriented teachers, we drew heavily on research in the area of what is known as "transformational" learning. This is now a large body of work, much of which is focused on developing practical strategies and pedagogies and, in the US at least, it seems to be quite influential in the educational leadership field.[29] While working on this project, we were struck by the extent to which our participants welcomed the challenge to their

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[29] For example, Kegan (1994, 2000), Dirkx (1998), Mezirow (1997), Baxter-Magolda and King (2004), Drago-Severson (2007, 2012), Garvey Berger (2011).

world view, and their apparent desire for this sort of learning. According to them, this kind of transformational learning is not a common experience in current teacher and/or school leader PLD in New Zealand. We don't have robust data on this, and we don't have expert professional knowledge in this field, but it seems to us that, if this is the case, then we might want to investigate why this is.

Outcomes, issues, and next steps?

In this pilot project, a small group of teachers were offered opportunities to explore and reflect on ideas about educational change. They were exposed to ideas about adult cognitive development and transformational learning, and had opportunities to reflect on and be challenged by these ideas with peers. As a result of these experiences, according to the teachers' self-reports, there was significant cognitive shift. This has (hopefully) provided these teachers with a stronger foundation from which to lead change—in their schools, and in their wider communities.

Participating in this project gave the researchers a more nuanced understanding of the kinds of support that "works" for teachers who are interested in undergoing the "step change" needed to be future-oriented. It also intensified their sense of the complexities of the project's original goal, which was to explore some of the practical implications of NZCER's theoretical work on future-oriented education. For the researchers, there are some obvious issues here.

One is that the level of input experienced by the participants in this project is clearly not scalable or sustainable, with current resourcing. This study was exploratory. It was designed to "test the waters", to see what is possible in a space where, it seems, everything is being called into question, and there are no ready-made answers. It wasn't our intention to produce a framework or model for future-oriented teacher PLD:[30] however, given the results of this work, it seems clear that there is a need for some thinking about how best to develop the intellectual infrastructure needed for a future-oriented education system.

A second, related issue is the question of how best to support the participants in this project as they try to continue this work after the project finishes—on their own as individuals, in their schools with their colleagues, and in wider, ideally expandable networks beyond their current

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[30] See note 33 below.

schools. Our thinking about this has led us to design an expanded version of the project described in this paper, in partnership with the pilot project's four participants. Thinking about how we could address the question of how *not* to see our participants as "research subjects" that we say goodbye to, once the project is over, has not been straightforward. While the project is, to some extent, "action research", its aim is *not* to describe and improve current practice, but to co-operatively develop "next practice".

This is a complex space and, by definition, there are no ready-made models to follow. In thinking about how we can move forward in this space, we have been drawing from the leadership/change management literature—that is, from outside education. This literature, building on the transformational learning work, uses complex adaptive systems theory to think about what leading into the future might look like. For example, Jennifer Garvey Berger and Keith Johnston in their forthcoming book[31] write that, in today's complex world, change leaders need new "habits of mind". Drawing on Snowden et al.'s[32] model for working in the complex spaces of the 21st century, they argue that "leading into the future" involves abandoning the idea that there are "right answers" out there. Rather, problem definition, data collection, and experimentation all need to be carried out *together*, alongside each other, in a continually repeating cycle in which the aim *isn't* to "solve" whatever has been identified as "the problem", but to understand the system, to learn, and to have one's thinking changed, along the way. As they put it:

> The key lever in a complex system is learning. The key methods are conversation, discovery, and experimentation.[33]

To this we might add collaboration—in the sense, not of working *alongside* or parallel to each other (co-labouring), but engaging in a process of learning together to develop "next practice", not as individuals, but as collectives of *connected* selves, in specific context/s.[34]

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[31] Garvey Berger and Johnston (2014).
[32] Snowden (2000, 2002), Kurtz and Snowden (2003).
[33] Garvey Berger and Johnston (2014, p. 47).
[34] As Maurice Alford (2014, p. 66) puts it: "Best practice is contextual. Let us collaborate [in our particular contexts], rather than copy." Next practice cannot be copied, it cannot be taken from templates developed by others: it is developed through collaboration in the specific context in which it will be practised. Alford is drawing here on a quote from Antonio Gaudi, architect of many celebrated buildings in Europe—"Copiers do not collaborate".

In Snowden's model this "probing" for the future is best done via what he calls "safe-to-fail" experiments—small-scale investigations that can be carried out in the current context and monitored to see if they are having any effect (in shifting the system *away* from what it is "inclined" to do). When these investigations are going well, they need to be able to be quickly expanded, and where they fail (as many will), it needs to be possible to shut them down and repair any damage.[35] Devising these safe-to-fail experiments requires participants to ask different kinds of questions, take multiple perspectives, and develop the ability to "see the system" (as opposed to focusing on elements in it).

The "full" version of this project[36] is informed by these ideas. We are treating the intervention, which now involves two new cohorts of teachers, as a "safe-to-fail" experiment. The data we are gathering appear to show potential "system" effects, but more work is needed—both in analysing the data, and in figuring out whether or not these effects are expandable. We are continuing to learn together, as a group of connected but diverse selves, in what we hope will be an ongoing, long-term relationship.

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[35] See Snowden (2007).

[36] See note 1 above—the project is now called *On the Edge: Shifting Teachers' Paradigms for the Future.*

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