Leading in collaborative, complex education systems
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Jane Gilbert
AUT University
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Background

The last couple of decades have seen a great deal of discussion of how education needs to change to better meet the needs of "21st century learners".

According to the literature in this area, our education systems evolved to meet the needs of an earlier time - which is now over. Certain "mega-trends" in the world beyond education (most notably, the digital revolution, new, networked forms of knowledge, and "wicked problems" such as climate change) are calling some (not all) of education's foundational ideas into question.[1] System-wide, educationally-informed response is needed. Otherwise we can expect an increasingly fragile public education system that will slowly lose energy and eventually die.

Doing more of the same, with tighter targeting, and more technology, will *not* be enough. Preparing today's young people to thrive in the uncertainty, complexity and rapid change of "postnormality"[2] will involve radically new thinking. Developing this new thinking *across the system* requires new and different capacities *within* the system, as well as new ways of thinking *about* the system – in *system* terms.

Systems- and/or complexity-oriented approaches have been mainstream in a wide range of disciplines (e.g. ecology, neuroscience, meteorology, computer science and engineering) for a generation or more.[3] More recently, these approaches have been taken up in the social sciences, the learning sciences, management, business and leadership,[4] and in education.[5] In education their influence is particularly evident in educational philosophy,[6] curriculum studies,[7] and in the education policy/ leadership/governance area.[8]

Complexity thinking has been a strong theme in recent work by the OECD, first in the wider public policy area[9] and later in education policy work. This in turn has influenced mainstream policy work in New Zealand, including that of the Ministry of Education, and references to complex adaptive systems, networks, feedback, interaction, emergence and so on now appear regularly in policy documents.

Recent local policy developments, including the *Investing in Educational Success* initiative and its move to encourage collaboration between "clusters" or "communities of schools",

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[1]   See, for example: Gilbert (2005), Bolstad et al. (2012), Brynjolfsson & McAfee (2012), Snyder (2013), Weinberger (2011).
[2]   See Sardar (2010, 2013).
[3]   Capra (1996), Meadows (2008), Mitchell (2009), Capra & Luisi (2014).
[4]   Wheatley (2006), Snowden & Boone (2007), Garvey Berger & Johnson (2015).
[5]   Cilliers (1998), Miller & Page (2007), Byrne & Callaghan (2014).
[6]   Mason (2008), Osberg & Biesta (2010).
[7]   Davis & Sumara (2006).
[8]   Johnson (2008), Morrison (2010), Snyder (2013).
[9]   See, for example: OECD Global Science Forum (2008).

and the emphasis on "system-ness", "networked", "transformational" and/or innovative forms of leadership, are all part of this international trend. However, in many cases (including the *Investing in Educational Success* example), *elements* from systems thinking have been taken up and used outside the framework that gives them their meaning. The result of this is that these initiatives are unlikely to "work" in the ways intended: that is, in the case of IES, to produce improved student achievement by sharing "best practice" across communities of schools.

Change will not come from adding more "inputs" - new structures and new vocabulary (collaboration, clusters, networks and so on) - into the existing system. These new inputs will just be "colonised" to "old" ways of thinking, joining Modern Learning Environments, Networked Learning, Design Thinking, and a host of other "new" ideas designed to revolutionise practice that have become little more than buzz words, meaning everything and nothing.

System-wide change has to come from *within* the system, not from "top down" initiatives designed to produce specific kinds of change, thought to be knowable in advance. We need within-system initiatives designed to produce more – and deeper - *interactions* between the system's elements – people (teachers, students, school leaders, parents, policymakers, researchers, and so on) and their physical and intellectual environment/s. Increasing interaction (via appropriate structures) will shift the way the system "works" and how it "knows". Past "inputs" will be re-worked, and the system as a whole will be re-energised, with more resilience and more capacity for innovation.

The collaborative communities envisaged in IES *could* have this effect, but only if they are seen as - and allowed to function in - a system that has the capacity to generate its own new practices. To support this, new thinking is required, and new ways of working – at the policy level, but also at the school leadership and classroom level. The rest of this paper attempts to sketch out what this new thinking might look like.

Complexity thinking

Complexity is nothing new: complex systems have always existed, and complexity has long been recognised as a property of large systems (e.g. natural ecosystems or large cities). However, past attempts to understand the various systems we are part of, have involved *simplifying* them. We have used "scientific" thinking to represent them as machine-like, made up of a number of parts, each with a different function, that act on each other to "cause" certain effects. Stability, predictability and certainty were goals, and systems were managed through control of the parts ("pulling levers"). However, machines are usually "closed" systems. They go on doing what they have always done, with no new inputs, gradually winding down until they eventually stop working or die. "Open" systems, on the other hand, take in energy from outside, which makes them "out of balance" and unpredictable, but, unlike closed systems, they are capable of adapting to change.

The IT revolution (among other things) has disrupted the modern world's tendency to see systems in terms of their parts, or as distinct from each other. However, while the interconnectedness and inter-dependence of everything is now widely recognised, the challenge to "traditional" ways of thinking it offers is not. Complexity thinking has developed to fill this gap.

For complexivists, the *system* is the focus. Complex systems are assemblages of large numbers of diverse, inter-dependent elements. Interaction, feedback and adaptation is continuous and dynamic. Out of this interaction, novel, system-wide patterns emerge that could not have been predicted from the properties of the individual elements, or of the system itself. Change is non-linear (not caused by the effect of one element on another), so that small changes to the system can have very large effects, while large ones can sometimes produce little or no effect. Similar starting conditions can produce very different outcomes, depending on how the elements interact. Complex systems are self-organising (not designed or controlled by any one entity) and can quickly adapt to changing conditions.

For example, large flocks of birds flying together form a complex system. No single bird is "in charge", yet the flock's behaviour is organised, displaying a kind of group intelligence. As they fly together, each member of the flock adjusts its location and speed based on the location and speed of others nearby. Their collective actions create beautiful non-uniform swarming patterns that effectively protect individual birds from predators.

Leading in complexity

Researching complex systems usually involves highly sophisticated mathematical modelling. Drawing on this, recent years have seen the rapid growth of a substantial literature on techniques for managing or leading in complexity. The most well-known of these is the Cynefin framework, developed by Dave Snowden and colleagues.[10]

Very briefly, Snowden argues that before planning what to do in any given situation, we need to decide whether the situation is simple, complicated, complex or chaotic, and tailor our actions accordingly.

In a *simple* system, we are working with known knowns – patterns that, because they occur repeatedly and predictably in the same form (e.g. night follows day), can be responded to using "tried and true" formulae, recipes or templates, which can be followed with relatively little expertise, producing standardisable results. Snowden calls this "best practice."

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[10]   See Snowden & Boone (2007).

Complicated systems are also predictable and repeatable, but it is not yet clear *why* this is, so experts are needed, usually from different fields. Here we are working with known unknowns - new work must be done to make the unknowns known. Data must be collected, analysed, debated and argued over. Eventually the experts will agree on, and be able to define, what is going on, and what to do. Formulae can be developed and followed, and the solutions that have been developed are probably replicable, using far less expertise than was needed in the first place. Snowden calls this "good practice".

The *complex* is the realm of the unknown unknowns. There are no "right answers", only "emergent" behaviours. Nothing is predictable or repeatable: we can't separate cause from effect in advance (although it may be possible after the event). In this situation it is not possible to "know what to do", because the rules keep changing. Acting in complex systems involves strategies for "understanding the present", understanding *what the system is doing now*. Snowden advocates using multiple, small-scale "safe-to-fail" probes to test the system's response, which can then be "amplified" or "damped down". Complex systems can't be controlled, but, Snowden argues, they can be "steered" in a general direction. Leading in complexity requires agreement on a *general* direction (or "vision"), but then, once this is is established, focusing on providing conditions that allow the system to move in that direction. Maximising the "quality" of the elements in the system, and the number of high-quality interactions between the elements will be important, as will collectively-developed safe-to-fail probes. Leading in complex situations involves developing the "collective intelligence" of the system as a whole, and then allowing it to function. Expertise is useful but not sufficient: what is most needed is the ability to "notice" the emergence of new patterns. Context is everything: strategies that "work" in one situation won't perform similarly in another situation with different starting conditions and different interactions. Mandated, one-size-fits-all solutions will not "work" in complex situations.

Snowden's Cynefin Framework[11]
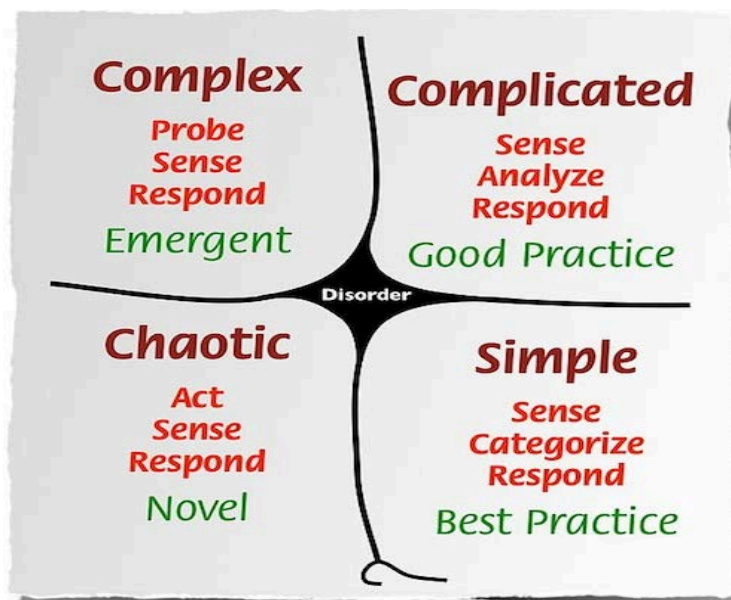
In *chaotic* situations what is going on is totally new and unknowable. There is no relationship between cause and effect – patterns can't be found, even afterwards.

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[11]   See http://cognitive-edge.com.

Leaders need to act quickly to stablise the situation and try to move it into one of the other zones.

Leading in a Complex Education System

Educational systems are usually managed – at all levels - as if they belong in the simple or (sometimes) the complicated space. However, in times of major change things *aren't* simple, or complicated: they are complex, and need to be managed that way.[12]

Seeing education as a complex system opens up new ways to work with the ideas advocated in *Investing in Educational Success* (collaboration, clusters, networks, and so on).

There is plenty of useful literature on developing the "strong" forms of collaboration that would be needed to support this approach. Hargreaves & Fullan (2012), for example, argue that strong collaboration is much more than exchanging and/or pooling existing ideas, with no space for critique and/or extension – this, they argue, just reproduces the status quo. Developing secure, trusting relationships is important, but also not enough. Leading "strong" collaboration involves building a commitment to moving ahead *together*. It involves making it possible for everyone involved to participate in robust, collegial[13] debate in which everything is up for discussion, and disagreement, uncertainty and failure are expected.[14]

However, when using this literature it is important for leaders *not* to have in mind an "ideal type", a pre-determined "way of being" to be fostered. This linear logic is incompatible with complexity thinking.[15] Acting in a complex system involves maximising interaction. Light "steering" of the system (via the safe-to-fail probes outlined above), in a context in which there is general agreement on broad goals, is possible, but the main goal is to build a resilient, knowledgeable system with a "life of its own". New practices will emerge, probably in unexpected ways, from the system's interactions.

In "postnormal times" there is no one "right answer", no ready-made solutions: everyone needs to think for themselves, and to work with others to develop locally appropriate solutions. This is the *point* of collaboration. Collective "idea improvement", prototyping, testing, and re-developing ideas[16] is a key "21st century" skill, not just for students, but for teachers and school leaders.

Leading professional learning in schools that can genuinely foster "21st century" teaching and learning alongside the concepts advocated in *Investing in Educational Success* is no small task. The "cookie cutter" approaches that currently prevail will not be adequate: new ways of thinking are required. If education is viewed as a complex system, then a good start would be to develop strategies that focus on (i) maximising the "quality" of all the elements in the system, and (ii) maximising the number, density and depth of interactions between the elements. As Harold Jarche puts it, rather provocatively:

> One should never bring a knife to a gun fight, nor a cookie cutter to a complex adaptive system.[17]

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12   For a very readable introduction to leading and managing in complexity, see Garvey Berger & Johnston (2015).

13   Not contrived or congenial – see Evans (2012) for a discussion of this.

14   See Chapter 6 of Hargreaves & Fullan (2012).

15   Osberg (2005).

16   Scardamalia & Bereiter (2006) call this "knowledge-building".

17   Taken from: http://jarche.com/2013/03/no-cookie-cutters-for-complexity/

References

Bolstad, R., Gilbert, J., McDowall, S., Bull, A., Boyd, S., & Hipkins, R. (2012). *Supporting future-oriented learning and teaching - a New Zealand Perspective*. New Zealand Council for Educational Research. https://www.educationcounts.govt.nz/publications/schooling/109306.

Brynjolfsson, E., & McAfee, A. (2012). *Race Against the Machine: How the Digital Revolution is Accelerating Innovation, Driving Productivity, and Irreversibly Transforming Employment and the Economy*. Massachusetts: Digital Frontier Press.

Byrne, D. and Callaghan, G. (2014). *Complexity Theory and the Social Sciences – The State of the Art*. London: Routledge.

Capra, F. (1996). *The Web of Life: A New Scientific Understanding of Living Systems*. New York: Anchor.

Capra, F. and Luisi, P. (2014). *The Systems View of Life: A Unifying Vision*. Cambridge: Cambridge University Press.

Cilliers, P. (1998). *Complexity and Postmodernism. – Understanding Complex Systems*. London: Routledge.

Davis, B. and Sumara, D. (2006). *Complexity and Education: Inquiries into Learning, Teaching and Research*. New York: Routledge.

Evans, R. (2012). Getting To No: Building True Collegiality in Schools. *Independent School* Magazine. http://www.nais.org/Magazines-Newsletters/ISMagazine/Pages/Getting-To-No.aspx.

Garvey Berger, J. & Johnston, K. (2015). *Simple Habits for Complex Times: Powerful Practices for Leaders*. Stanford CA: Stanford University Press.

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

Hargreaves, A. and Fullan, M. (2012). *Professional capital: Transforming teaching in every school.* New York: Teachers College Press.

Johnson, E. (2008). Ecological Systems and Complexity Theory: Toward an Alternative Model of Accountability in Education. *Complicity: An International Journal of Complexity and Education*, 5(1), pp.1-10.

Mason, M. (ed.) (2008). *Complexity Theory and the Philosophy of Education*. Wiley-Blackwell: Chichester UK.

Meadows, D. (2008). *Thinking in Systems: A Primer*. White River VT: Chelsea Green Publishing.

Miller, J. and Page, S. (2007). *Complex Adaptive Systems: An Introduction to Computational Models of Social Life*. Princeton NJ: Princeton University Press.

Mitchell, M. (2009). *Complexity: A Guided Tour*. Oxford: Oxford University Press.

Morrison, K. (2010). Complexity Theory, School Leadership and Management: Questions for Theory and Practice. *Educational Management Administration and Leadership*, 38(3), 374-393.

OECD Global Science Forum (2008). *Applications of Complexity Science for Public Policy: New Tools for Finding Unanticipated Consequences and Unrealised Opportunites*. Downloaded from: http://www.oecd.org/science/sci-tech/43891980.pdfSardar, Z. (2010). Welcome to postnormal times. *Futures* 42 (2010), 435-444.

Osberg, D. (2005). Redescribing 'Education' in Complex Terms. *Complicity: An International Journal of Complexity and Education,* 2(1), pp.81-83.

Osberg, D. and Biesta, G. (eds.). (2010). *Complexity Theory and the Politics of Education*. Rotterdam: Sense Publishers.

Sardar, Z. (2013). *Future – All That Matters*. London: Hodder & Stoughton.

Scardamalia, M. and Bereiter, C. (2006). Knowledge Building: Theory, Pedagogy, and Technology. In K. Sawyer (Ed.), *Cambridge Handbook of the Learning Sciences* (pp. 97-118). New York: Cambridge University Press.

Snowden, D. and Boone, M. (2007). A Leader's Framework for Decision-Making. *Harvard Business Review* 85(11), p.68.

Snyder, S. (2013). *The Simple, the Complicated, and the Complex: Educational Reform Through the Lens of Complexity Theory*. OECD Education Working Papers, No.96. OECD Publishing. http://dx.doi.org/10.1787/5k3txnpt1lnr-en.

Weinberger, D. (2011). *Too Big to Know*. New York: Basic Books.

Wheatley, M. (2006). *Leadership and the New Science: Discovering Order in a Chaotic World*. San Francisco: Berrett-Koehler.