Complexity and chaos in remote schools

Lecture Number 3 in a series presented by the Remote Education Systems project within the Cooperative Research Centre for Remote Education

24 June 2015, Room 1.01, School of Education, Flinders University

Abstract

The dominant discourse surrounding education for remote Aboriginal and Torres Strait Islander students uses a language of deficit, disadvantage and failure. Analysis of the CRC-REP's Remote Education Systems project data challenges the validity of these descriptors on the basis that stakeholders of remote schools do not describe education in this way. How then do they describe it? Analysis of the data suggests that many stakeholders describe education in terms of complexity framed by the challenges associated with an array of student, family, community, cultural, school and teacher/teaching factors.

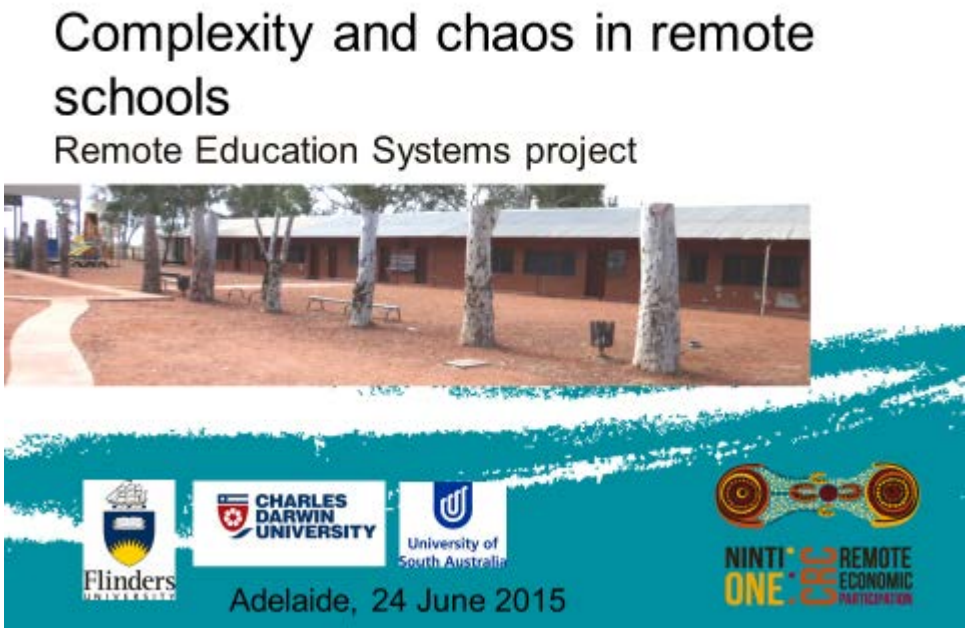
In this lecture the proposition of complexity and chaos in remote education is considered in the light of complexity theory. While education systems generally have been described as 'complex', the term may be more apt for *remote* education systems. Their tendency to operate balanced 'on the edge of chaos and order', the unpredictability of their behaviour, the array of elements in the systems, and the way the systems co-evolve with their environments all point to a neat fit with the idea of 'complex adaptive systems'.

Given this fit, what might the implications for strategic policy be? Attempts to shift the system through means that are best suited to simple or complicated systems where inputs, outputs and outcomes are relatively predictable, have been tried over and over in recent years, but to little effect. The RES data provides clues as to why this is so and indeed what could be done differently, if in strategic policy terms, the system was treated as a complex adaptive system.

This lecture will be of interest to those with an interest in remote education, from strategic policy, teaching, leadership, teacher preparation, community development or administrative perspectives. There will be opportunities for attendees to ask questions and offer comments on the presentation.

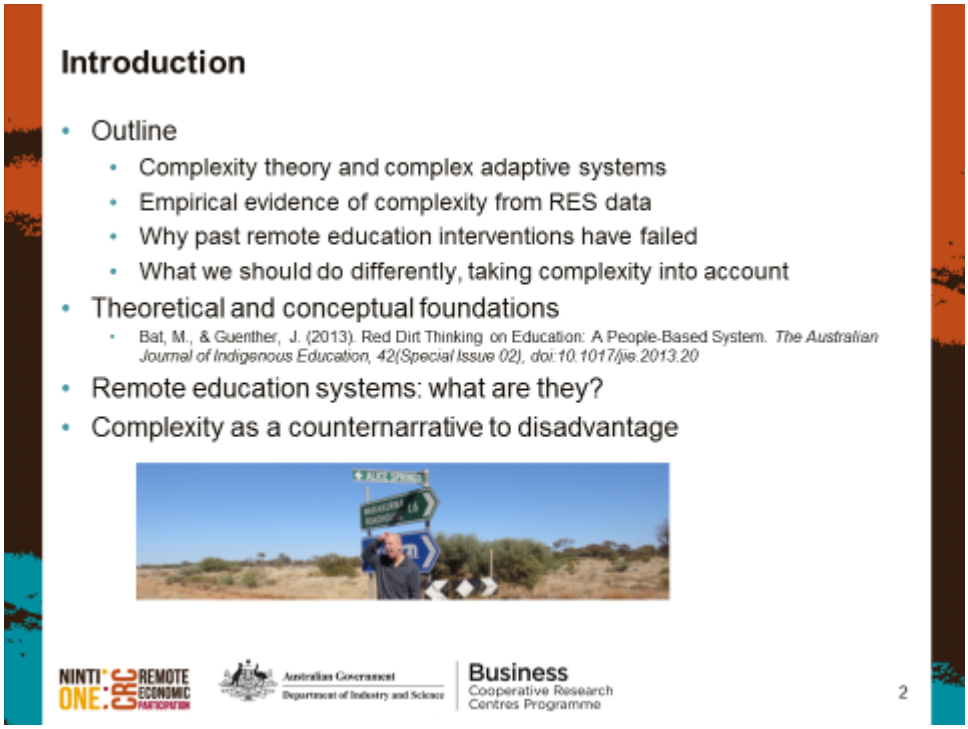
Bio

John Guenther is the Principal Research Leader for the Remote Education Systems project with the Cooperative Research Centre for Remote Economic Participation and Flinders University. John has worked as a researcher and evaluator in remote Australian contexts—particularly the Northern Territory—for the last 12 years on issues related to education, training, families and children, justice, child protection and domestic violence. His current role is focused on understanding how education systems can better respond to the needs of students and families living in very remote Aboriginal and Torres Strait Islander communities.



Introduction

This lecture builds on some conceptual work that was generated early on in the RES project. And I acknowledge Melodie Bat's contribution to this work (see Bat & Guenther, 2013). In that work, we conceptualised remote education as local people-based systems rather than large government or non-government bureaucracies. We used a complexity theory framework to examine the systems and saw that often, the policy environment tries to work with remote education as if it were simple, or perhaps complicated where causes and effects are linear and largely predictable. But our experiences and our research observations show pretty clearly that causal pathways are not linear. Nor are the predictable.



In this lecture when I talk about 'systems' I am referring to those locally based systems of education. We could see these small systems as systems within systems or elements of a larger system. However, I would rather talk about the broader strategic policy environment's engagement with local remote education systems.

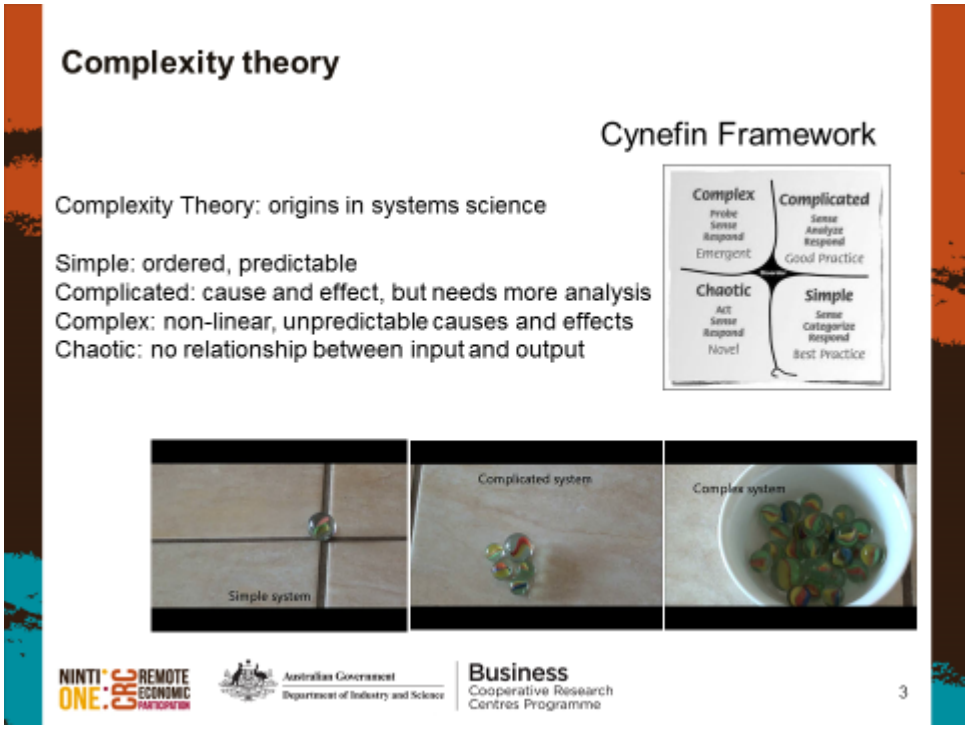
My aim in this lecture is partly to demonstrate from the empirical data of the RES project, how people describe complexity in remote education. More importantly though, I want to use the lens of complexity theory to provide an explanation of why attempts to improve remote education have failed. To some extent the reasons for the failure are reflected in the empirical narratives of complexity we have uncovered in our research. Finally, and perhaps most importantly, I want to offer some suggestions about how remote education could be improved if we took complexity theory into account.

The conceptual work we did two and a half years ago provided something of a theoretical foundation on which to draw as we started gathering data. While we didn't necessarily anticipate descriptors of remote education as complex systems, many of our respondents did in fact talk about their experiences of remote education as complex and in one case, chaotic. By contrast, they didn't talk about remote education as 'disadvantaged' or deficient. In the last lecture I suggested that rather than students being disadvantaged in remote schools, it was teachers and the various system bureaucracies that were disadvantaged.

I'll come back to what our respondents said about complexity shortly.

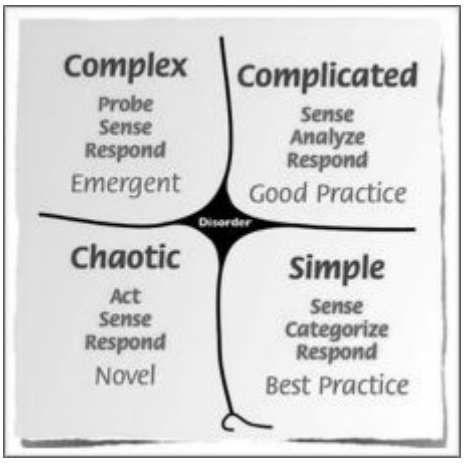
Before I do though, I'll touch on complexity theory, and complex adaptive systems as lenses through which we can see and understand remote education.

Complexity theory and its application to remote education systems



Complexity theory has its origins in systems science (Flood & Carson, 1993). A system, by definition is a collection of elements that behave as a whole. Complex systems can be contrasted with complicated, simple and chaotic systems.

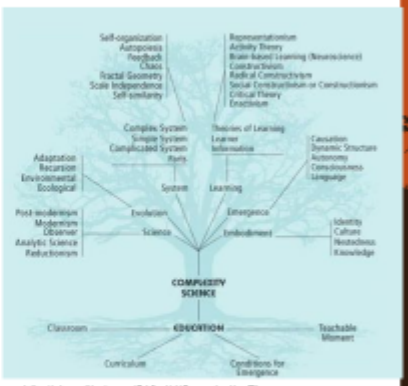
Figure 1. Cynefin Framework



The Cynefin Framework (Snowden, 2011) explains the differences. Simple systems are ordered with predictable cause and effect outcomes. Complicated systems do have a relationship between cause and effect, but require expert analysis because of the number of possibilities available. In complex systems the cause and effect processes are intertwined with non-linear, and unpredictable relationships. In chaotic systems, there is no relationship between input and output and gaining more data or information about the problem or an intervention designed to address the problem won't necessarily help solve the chaotic problem (B. W. Head, 2008).

Characteristics of Complex Adaptive Systems

- Large number of elements
- Networked in multiple ways
- Continuous interactions
- Co-evolving relationships
- Self-organising
- Patterns emerge from interactions
- Tend toward maximum entropy unless they receive energy from their environment
  - "Balanced between order and anarchy, at the edge of chaos" (Dodder and Dare 2000:3)



http://etec.ctlt.ubc.ca/510wiki/Complexity_Theory

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Beyond these distinctions, complex systems have a large number of elements that are networked in multiple ways and which interact on a continuing basis. Relationships co-evolve in complex 'adaptive' (as opposed to determined) systems; they are self-organising, and recognisable patterns emerge from the interactions. Complex Adaptive Systems will tend toward maximum entropy (disorder) unless they receive energy from their environment. They are "balanced between order and anarchy, at the edge of chaos" (Dodder & Dare, 2000, p. 3)

Some applications (among many more)

- Economics (McGregor, 2012)
- Socio-ecological systems (Levin et al., 2013).
- Solving 'wicked' problems (Head & O'Flynn, 2015)
- Explains dynamics of organisations (Callahan & Milne, 2004)
- Organisational leadership (Schneider & Somers, 2006)
- Strategy development (Hammer et al., 2012)
- Research and evaluation (Rogers, 2008; Westhorp, 2012)
- Educational philosophy (Mason, 2008)
- Education theory (Davis & Sumara, 2010)
- Education system reform (Snyder, 2013)
- Strategic policy: shifting systems (Boal & Schultz, 2007; Bates 2012; Brown 2010)

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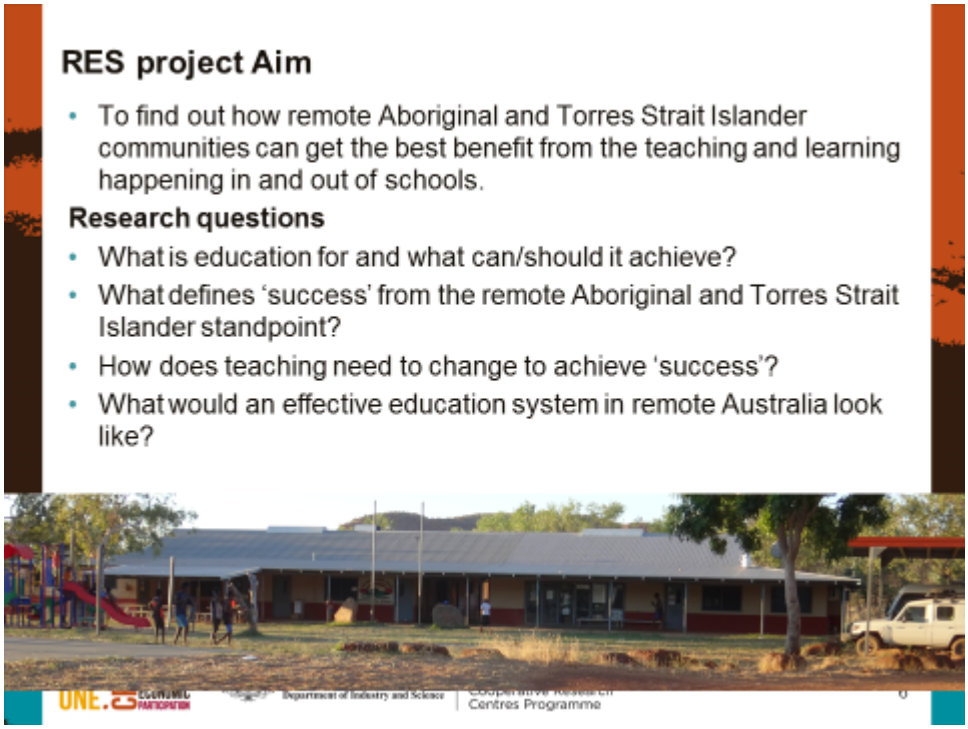
Complexity Theory's application has spread beyond its systems science origins to other disciplines including economics (McGregor, 2012) and socio-ecological systems (Levin et al., 2013). It has been used to solve wicked policy problems (Brian W Head & O'Flynn, 2015), to explain the dynamics of

communities of practice in organisations (Callahan & Milne, 2004), organisational leadership (Schneider & Somers, 2006), strategy development (Hammer, Edwards, & Tapinos, 2012) and how research and evaluation methodology can be applied in complex contexts (Hawe, Bond, & Butler, 2009; Rogers, 2008; Westhorp, 2012). In the field of education, complexity theory has been applied to educational philosophy (Mason, 2008) and as a theory of education itself (Davis & Sumara, 2010).

Snyder (2013), writing for the Organisation for Economic Cooperation and Development (OECD) considered educational reform through a complexity lens. He notes, based on parallels with complex ecologies of food webs that 'influence on any given node… rarely extends beyond two or three degrees of separation from any other node' (p. 15). He goes on to suggest that policy interventions should target particular 'nodes' (rather than multiple nodes) where system-wide impact is achieved through a ripple effect. While this may be all well and good, in a 'closing the gap' environment, it raises questions about whether or not it is possible to intervene more quickly to shift a complex adaptive system. Boal and Schultz (2007) suggest that leaders in complex organisations do play an important role in shifting systems, but that it takes time and a constant narration of the organisation's vision and purpose. There isn't much comfort in this for those trying to work with Australia's remote education systems. Nor is there much comfort in this for those determined to shift systems by command and control approaches, or where the logic of improvement is reduced to achievement of narrow performance targets. But this is exactly what current strategic policy attempts despite repeated failure. In the UK, Bates (2012, p. 52) comments that 'policy-makers seem to spend a lot of time at the design board, abstracting and simplifying in an attempt to control the complexity that often defies centralised control'. In contrast, the way policy should work in complex systems (including remote education systems) is to garner the knowledge and resources of those embedded within the systems to effect the kind of change that evolves or emerges (Brown, 2010; Hazy & Uhl-Bien, 2015).

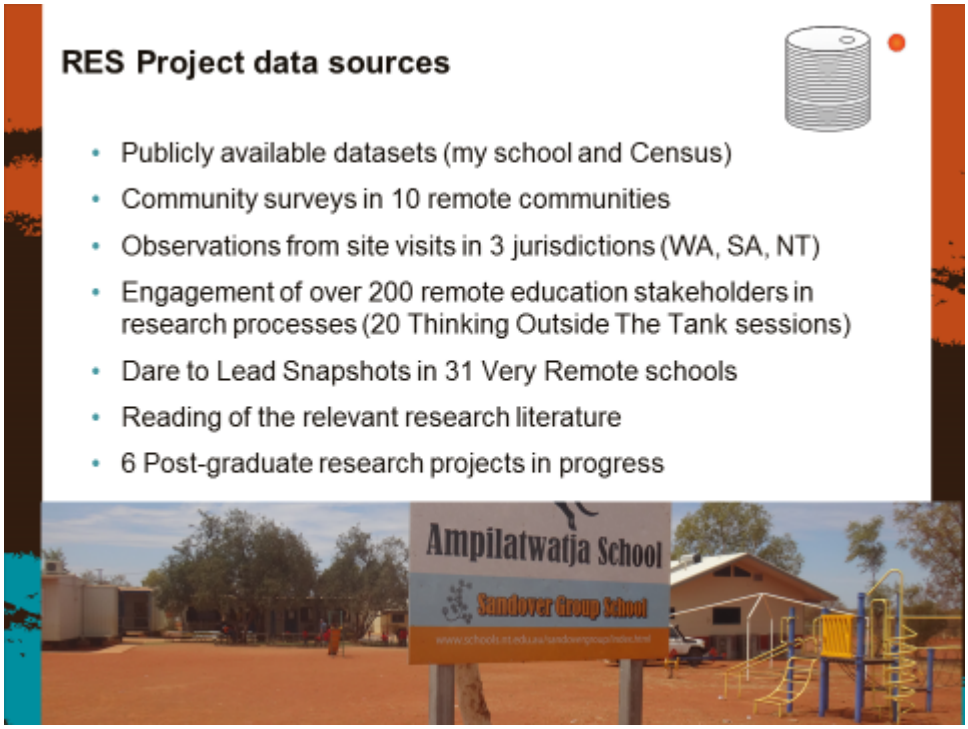
Methods

The data I will present here comes from three years of qualitative data gathering from educational stakeholders in very remote Australia. Our research questions drove the direction of our data collection.



I should also point out that while overall, our research is concerned about Aboriginal and Torres Strait Islander standpoints, the data I will present about complexity comes mainly from non-Indigenous stakeholders. The theme of complexity cuts across the four questions. That is, complexity as an issue was raised in the context of the purpose of education (RQ1), success in education (RQ2), teaching (RQ3) and system responses (RQ4).

RQ1	What is education for in remote Australia and what can/should it achieve?
RQ2	What defines 'successful' educational outcomes from the remote Aboriginal and Torres Strait Islander standpoint?
RQ3	How does teaching need to change in order to achieve 'success' as defined by the Aboriginal and Torres Strait Islander standpoint?
RQ4	What would an effective education system in remote Australia look like?



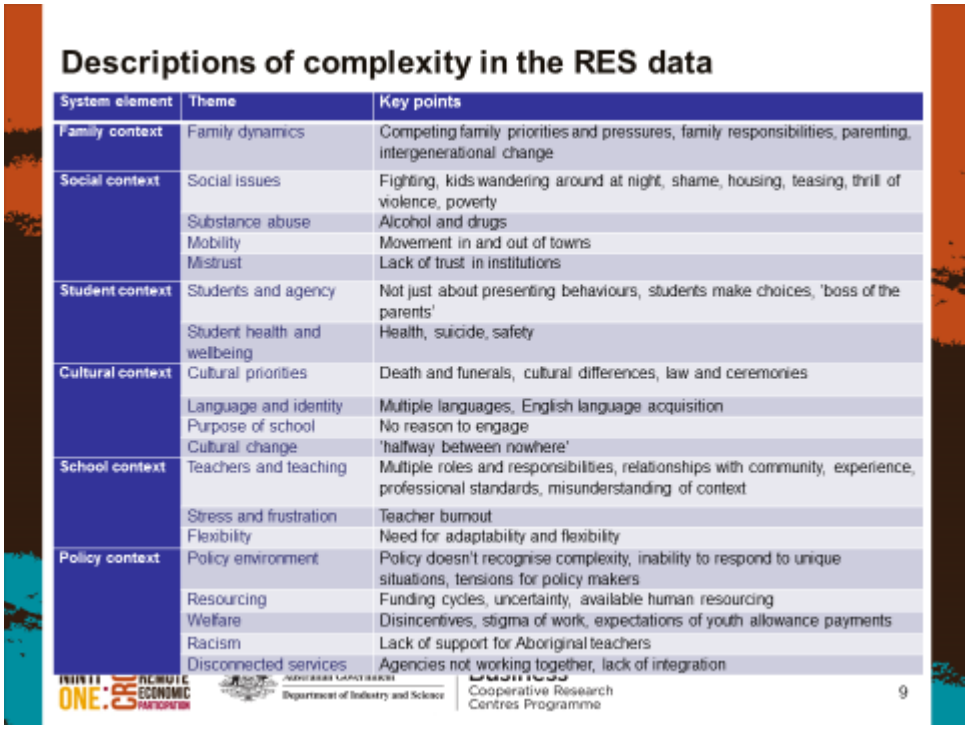
Our research draws on both qualitative and quantitative sources. These include:

- Publicly available datasets (my school and Census);
- Community surveys in 10 remote communities;
- Observations from site visits in 3 jurisdictions (WA, SA, NT);
- Engagement of over 200 remote education stakeholders in formal qualitative research processes (20 Thinking Outside The Tank sessions);
- Dare to Lead Snapshots in 31 Very Remote schools ; and
- Reading of the relevant research literature
- 6 post-grad research projects covering topics related to boarding schools, technology, SACE completions, culturally inclusive curriculum, school readiness and health and wellbeing.

The qualitative data I refer to in this lecture comes from community surveys, observations, thinking outside the tank sessions, interviews and *Dare To Lead* Collegial Snapshots.

In analysing our data, we are of course subject to our own biases, which I acknowledge. The RES team analysed the data together through a process of critical interpretation. In the case of the data about complexity we collectively pulled together references in the sources--using NVivo as a tool--which were connected to the broad concept, though not necessarily with Complexity Theory in mind.

Descriptions of complexity in the RES data



The table shows how respondents described the concepts associated with complexity. Note that in most cases, respondents, while describing complexity, did not have the definitions discussed earlier, in mind. Rather they were describing complexity in terms of the multiple aspects of the problems, challenges or issues they saw. We found 81 references to complexity.

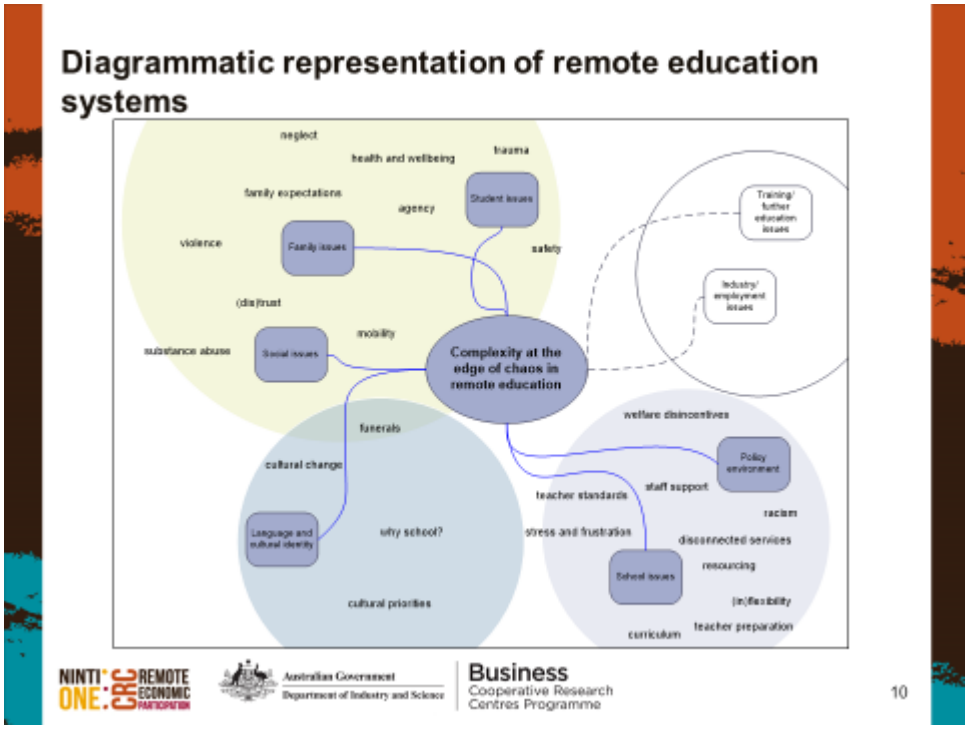
I have divided the table into system elements (broad groupings of actors in the system), themes associated with these elements, and key points included within the themes. I haven't tried to quantify individual themes. The point of the table is to recognise the range of themes or issues that make up the complexity perceived by respondents. What stands out pretty much straight away is the number of actors and system elements, and the potential for interaction between them. So while the respondents didn't base their discussion on the earlier descriptors of complexity, that is exactly what they were giving tangible evidence to.

Table 1. Descriptors of complexity in remote schools (n=81)

System element	Theme	Key points
Family context	Family dynamics	Competing family priorities and pressures, family responsibilities, parenting, intergenerational change
Social context	Social issues	Fighting, kids wandering around at night, shame, housing, teasing, thrill of violence, poverty
	Substance abuse	Alcohol and drugs
	Mobility	Movement in and out of towns
	Mistrust	Lack of trust in institutions
Student context	Students and agency	Not just about presenting behaviours, students make choices, 'boss of the parents'
	Student health and wellbeing	Health, suicide, safety

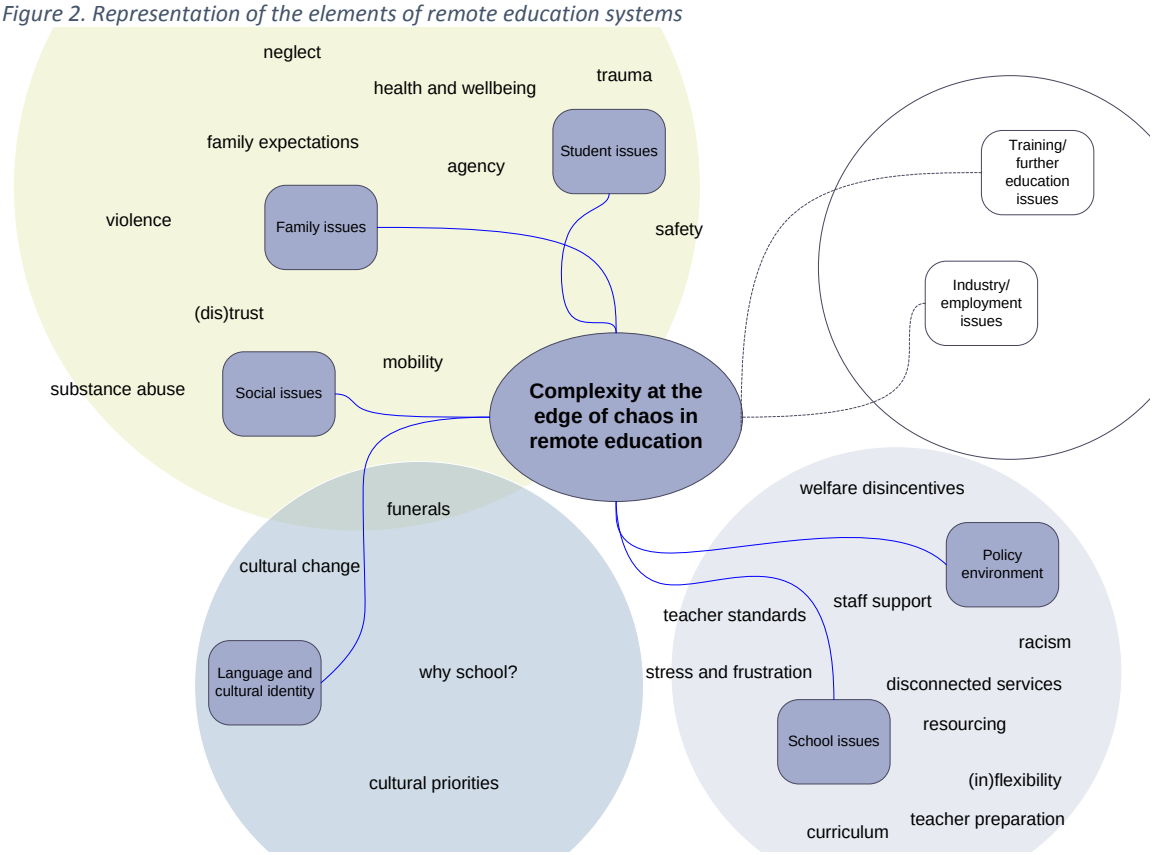
System element	Theme	Key points
Cultural context	Cultural priorities	Death and funerals, cultural differences, law and ceremonies
	Language and identity	Multiple languages, English language acquisition
	Purpose of school	No reason to engage
	Cultural change	'halfway between nowhere'
School context	Teachers and teaching	Multiple roles and responsibilities, relationships with community, experience, professional standards, misunderstanding of context
	Stress and frustration	Teacher burnout
	Flexibility	Need for adaptability and flexibility
Policy context	Policy environment	Policy doesn't recognise complexity, inability to respond to unique situations, tensions for policy makers
	Resourcing	Funding cycles, uncertainty, available human resourcing
	Welfare	Disincentives, stigma of work, expectations of youth allowance payments
	Racism	Lack of support for Aboriginal teachers
	Disconnected services	Agencies not working together, lack of integration

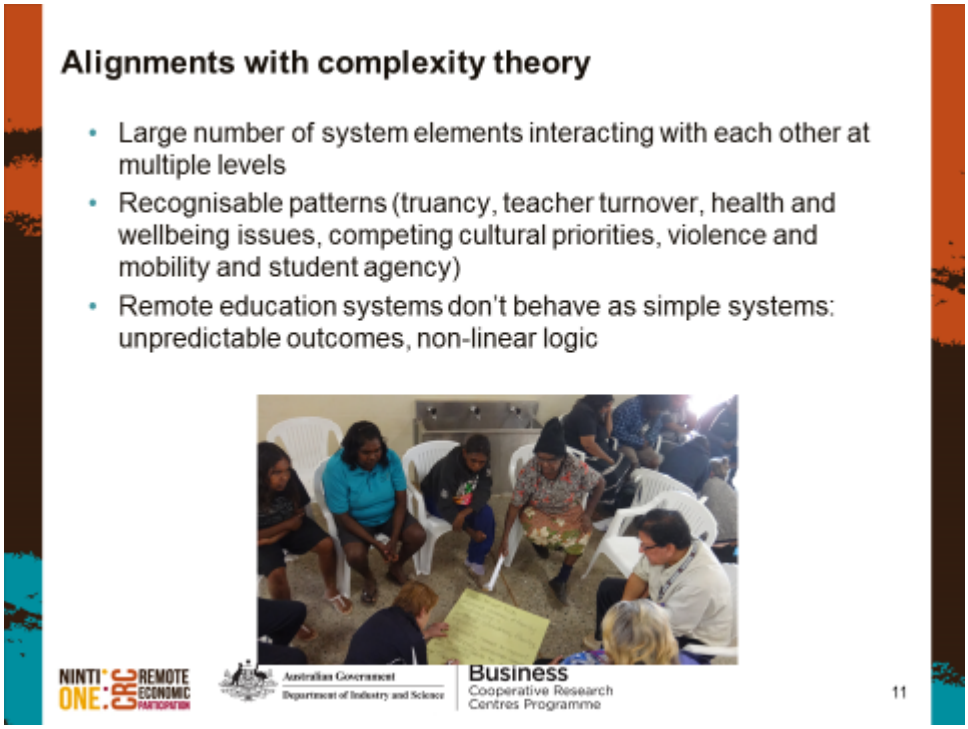
But before we get too carried away with the breadth of elements associated with what appear to be complex systems, let's just consider for a moment who is making these assertions. Of the 81 responses coded to the themes identified in the table, 67 came from non-remote stakeholders. In other words, while systems are complex for non-remote stakeholders, remote Aboriginal stakeholders do not see them the same way. This should not come as a surprise. The bulk of remote Aboriginal stakeholders don't see issues like cultural priorities, language, student agency, or family issues as being unusual, different or complex. Rather they are normal parts of daily life. So to be clear, the systems are complex not because remote Aboriginal stakeholders make them so, but rather systems are complex because non-remote stakeholders operate in contradictory paradigms that don't fit the remote context.



What is perhaps more interesting is the absence of system elements or agents. If we see remote education as part of the broader economic and social landscape, we should perhaps see elements associated with what would normally be beyond school. I have in mind here, industries, employers and post-school training providers, and perhaps higher education providers. I've included these in the diagrammatic representation of the data in the figure here. But in their discourse, stakeholders did not mention employers, trainers, or pathways beyond school as adding to complexity or being particularly problematic. Those parts of the system just weren't on their radar.

Figure 2. Representation of the elements of remote education systems



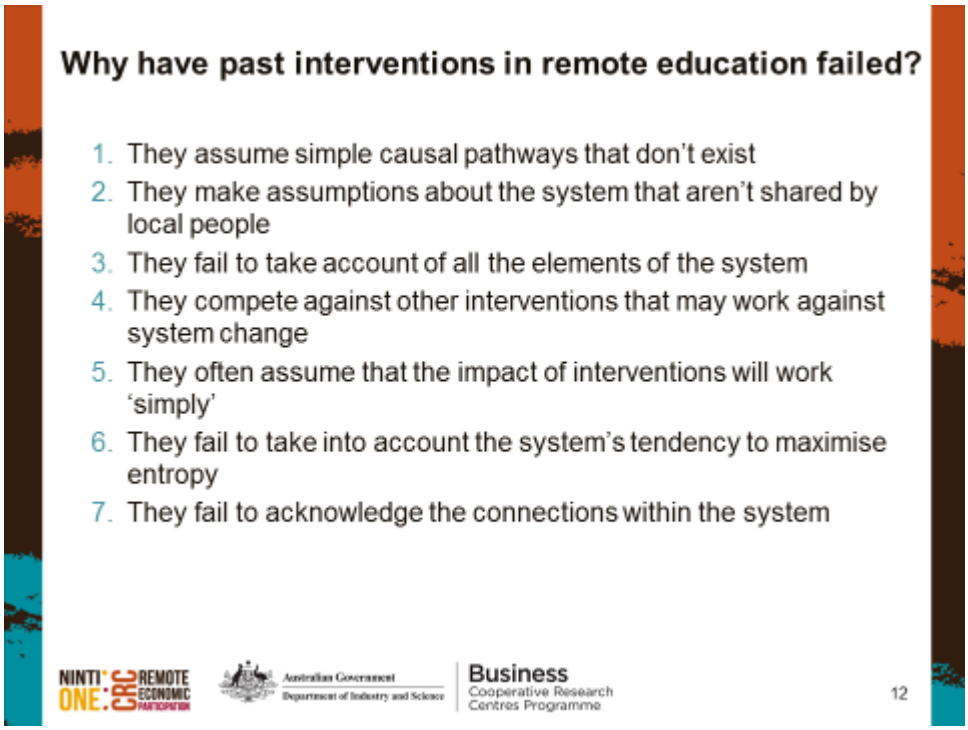


If we align the characteristics of complex adaptive systems that I mentioned earlier, with the observations we have made in the data we can see quite a bit of congruence. *Firstly*, there is a large number of system elements that all interact with each other at multiple levels. At the interface of education in schools the daily interactions (described in the data) occur regularly with teachers, students, families, cultures, communities, school leaders, and the policy environment. These elements don't necessarily share a common purpose (or language) and lead to feelings of stress and

frustration particularly among teachers, who try to keep chaos at bay. *Secondly*, the patterns that emerge from these interactions are recognisable almost anywhere in remote Australia. They include patterns of truancy, teacher turnover, health and wellbeing issues, competing cultural priorities, violence and mobility and student agency. *Thirdly*, when we consider the systems as holistic entities they don't behave the way simple systems do with predictable cause and effect linear logic. This point leads me not to ask why past interventions in remote education have seemingly failed (Wilson, 2014).

Why have past interventions in remote education failed?

I now want to turn to some of the practical implications of the findings in relation to theory and strategic policy in remote education. I'd like to suggest that past interventions in remote education have largely failed for a number of reasons. Whether you look at strategies that are designed to improve attendance, improve academic outcomes, improve retention rates, improve transition to further education and training the overwhelming conclusion that I draw from the evidence, is that nothing has worked particularly well. Why is this so?



1. They assume simple causal pathways that don't exist

For example, they assume that increasing attendance could be achieved by apply pressure through the welfare system. Or that improved attendance will lead to better academic outcomes. Or perhaps they assume that school leads to employment, enterprise or some form of economic participation. This is then reflected in simplified complex problems, such as 'getting children to school, adults into jobs, and making communities safer' (Australian Government, 2015, p. 1).

2. They make assumptions about the system that aren't shared by local people

For example, they may assume that the system is disadvantaged when locals don't share the same understanding of advantage and disadvantage. Similarly, locals and non-locals do not share notions of success and aspiration.

3. They fail to take account of all the elements of the system

For example, as our data shows, the assumed connection between school and work (and what it means) is absent from discourse of those at the coal face. Similarly, expectations of training and further education as a follow on from school don't exist.

4. They compete against other interventions that may work against system change

For example, in Snyder's (2013) terms, hope of a ripple effect is dashed by other interventions that bombard the system using other entry points. National Partnership programs were a good example of how this happens at a strategic policy level. Multiple interventions are applied to multiple components of the system and because of the multiple causal pathways from the intervention to the system we can never be sure what impact any of the interventions had (see for example Atelier Learning Solutions, 2012).

5. They often assume that the impact of interventions will work 'simply'

For example, in one recent attempt in South Australia, an intervention was designed to increase the days kids spent at school with the simple logic that more time at school leads to more learning, leads to better outcomes. Similarly truancy programs often work on the assumption that good outcomes will automatically flow from getting kids to school. As I noted earlier, simple logic doesn't work in complex systems.

6. They fail to take into account the system's tendency to maximise entropy

Some interventions, like the School Enrolment and Attendance Measure (SEAM) program, which threatens welfare cuts for parents who fail to send their kids to school, seem to assume that behaviour changes will be sustained because the threat remains. But the reality is that when the people responsible for the program leave, the behaviours return to where they were. This kind of intervention temporarily decreases the entropy of the system within the local context, but only temporarily while resources are applied. The moment the pressures are withdrawn the entropy of the local system increases and it returns close to its pre-intervention state—a state which, to outsiders, looks like disorder.

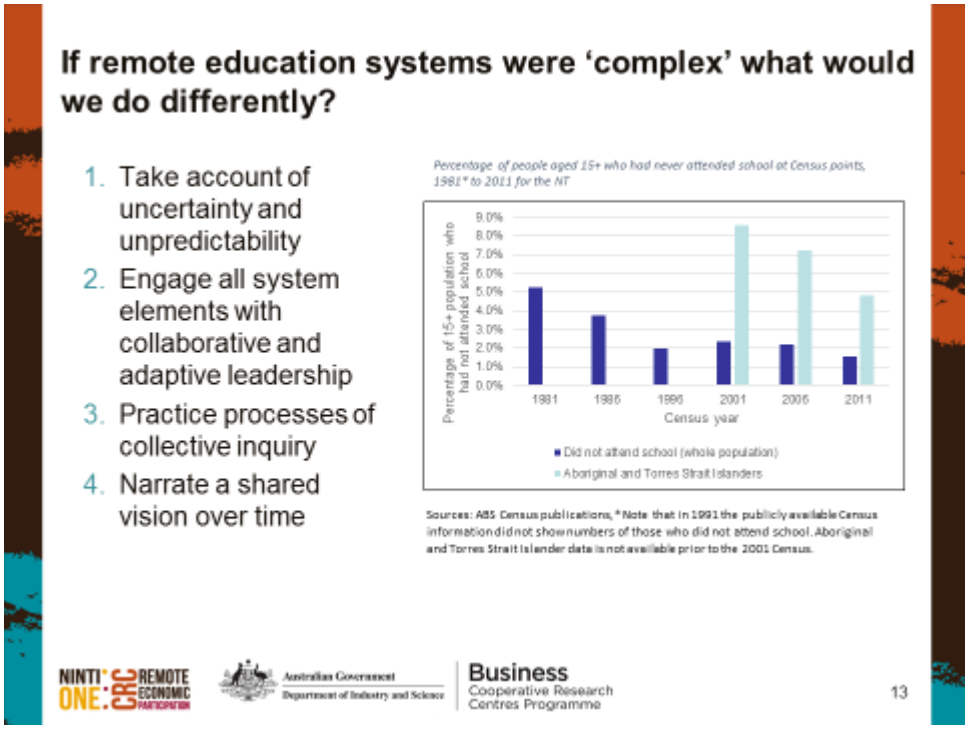
7. They fail to acknowledge the connections within the system

While our respondents identify most of the elements of complex remote education systems as discrete elements, they fail to see how they are linked together. I suspect that the same applies to those who design interventions. With some exceptions we see many interventions designed for delivery within the silos of the bounded areas, represented by the circles in the diagram. For example, programs that are designed to improve literacy and numeracy at school (such as Quicksmart, Accelerated Literacy, Literacy Scaffolding, Reading Recovery or phonics programs) mostly operate within the classroom and take little account of the broader context of the student.

Even where interventions are designed to be collaborative, they are mostly focused on one aspect of collaboration, such as service delivery (excluding service use). Inter-organisational collaboration is not enough to effect the kinds of change needed to shift education systems in remote communities (see for example Guenther & McRae-Williams, 2015).

If remote education systems were ‘complex’ what would we do differently?

It’s all very well to say what we shouldn’t do, but given the complexity of remote education systems, what should we do to shift them, so that improvement occurs? I’d like to suggest four ways that the strategic policy environment could respond more effectively to complexity in remote education systems.



1. Take account of uncertainty and unpredictability

One approach often used to deliver services better and more efficiently in educational or social interventions is to apply evidence-based best practice. Unfortunately, the basis for best practice assumes simple systems with linear and predictable logic are at play. The Cynefin Framework suggests (Snowden, 2011) that in complex systems, **emergent practice is what we should be looking for** rather than best or good practice. Emergent practice allows for experimental, novel and unique approaches. In complex systems, one-size-fits-all approaches don’t work. Randomised control trials won’t work. Anything that depends on simple cause and effect logic won’t work. And these things won’t work for the reasons I described earlier. Complex systems are inherently unpredictable. They require creative and novel approaches.

2. Engage all system elements with collaborative and adaptive leadership

I noted earlier that ‘collaboration’ tends not to be sufficient in itself to achieve better outcomes in complex social environments. Most often this is because those who collaborate tend to have a common purpose (for example, educational service providers) so while they may work together well, they miss an important element of working in complex systems, which is to work with those who don’t have a common purpose. Head and Alford (2013) suggest that

> *[Adaptive leadership] deals with diversity by involving multiple parties in a manner that not only brings out their differential knowledge but also enables the*

surfacing of contending values and interests, and dialogue between those in whom they reside. (p. 20)

Effective collaboration, in a complex environment, means working across the elements of the system. So in the model I presented earlier, for school leaders it means working with staff at the school, families and students, cultural leaders or elders, policy makers, employment services and training providers. Such **leaders act in a complex environment as 'collaborative capacity builders'** (Weber & Khademian, 2008), drawing from and building the collective knowledge of all those within the system.

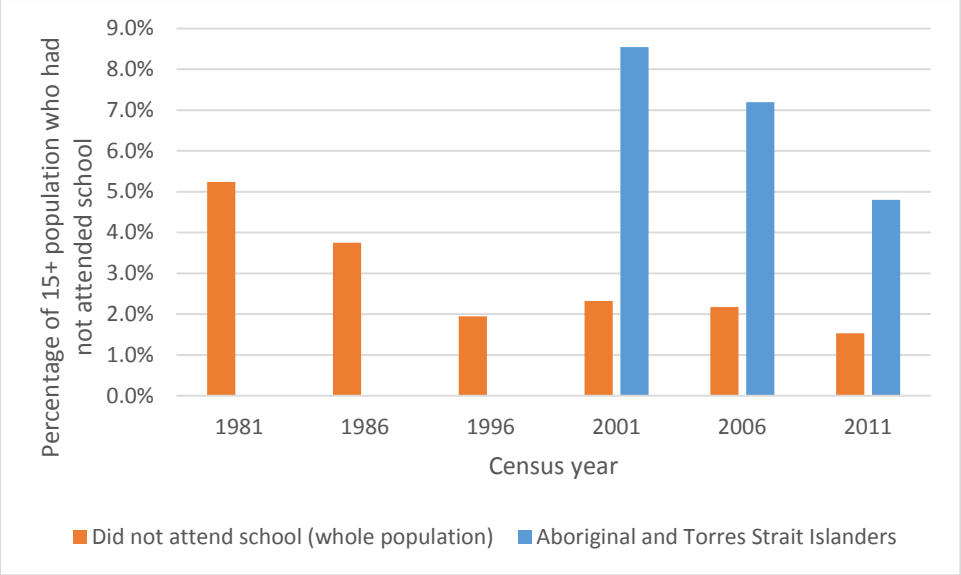
3. Practice processes of collective inquiry

Given what I've just said, complex systems require different analytical tools and processes than simple ones. Data about the systems need to draw on collective knowledge from individuals, communities, organisations, and in the case of Indigenous communities, indigenous knowledge systems. Brown (2010) describes a transdisciplinary approach to collective inquiry that a) identifies the range of worldviews involved, b) establishes the validity of evidence that these knowledges can provide, c) creates conditions that foster creativity, and d) develops strategies that allow for all contributing knowledges to share possible actions for the future. In short, what this means is that knowledge generated for problem solving in complex systems requires contributions from all stakeholders. In remote contexts, it **requires a repositioning of the researcher and the research to take into account all stakeholders' standpoints** (see Guenther, Osborne, Arnott, McRae-Williams, & Disbray, 2014).

4. Narrate a shared vision over time

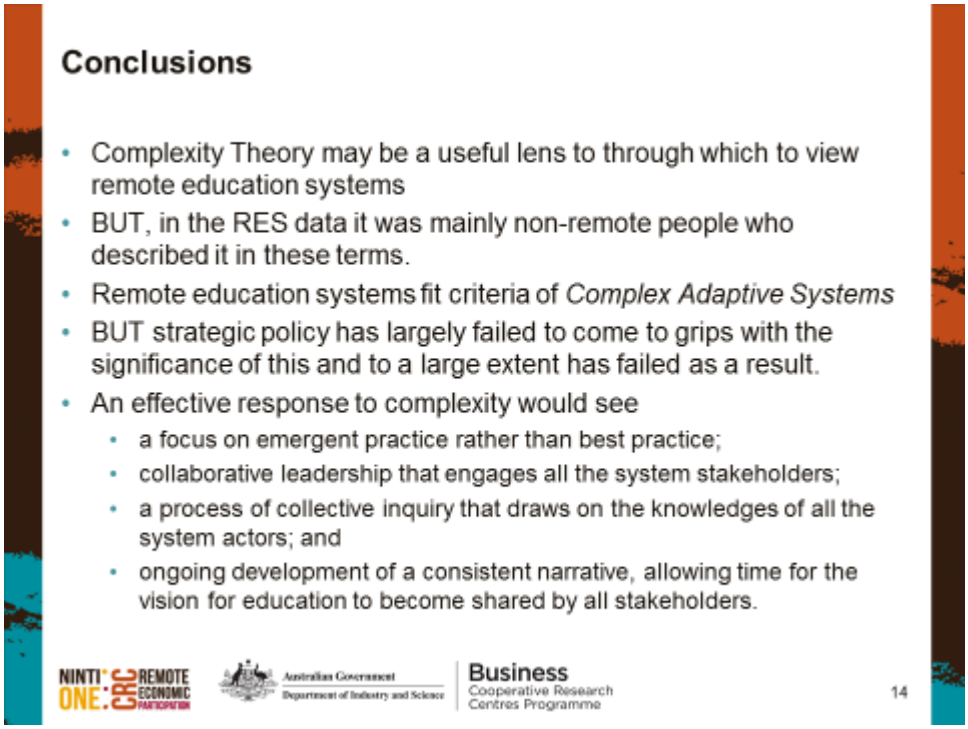
History matters. Not because we need to dwell on it, but because it defines a story of the past that connects us with the present and the future. As noted earlier (Boal & Schultz, 2007), leaders have a role in creating and re-articulating a narrative over time. This might seem frustrating when time is seemingly short. **But in complex systems time is an important factor in change**. Consider the chart, which shows the proportion of people aged 15 and over who have never attended school in the Northern Territory. While policy-makers lament the slow progress of change in Indigenous education, the chart shows that for the Northern Territory at least, the proportion of Aboriginal and Torres Strait Islanders who had not attended school almost halved between 2001 and 2011. Compared to other jurisdictions 5% of a particular population group not having been to school sounds appalling. But the point is, change has happened. It is happening. And it is probably because of the repeated narrative about the importance of schooling, which is now being re-narrated by many Aboriginal and Torres Strait Islanders. The system has shifted, maybe not fast enough for our liking, but it has shifted nevertheless.

Figure 3. Percentage of people aged 15+ who had never attended school at Census points, 1981 to 2011 for the NT*



Sources: ABS Census publications, * Note that in 1991 the publicly available Census information did not show numbers of those who did not attend school. Aboriginal and Torres Strait Islander data is not available prior to the 2001 Census.

Conclusion



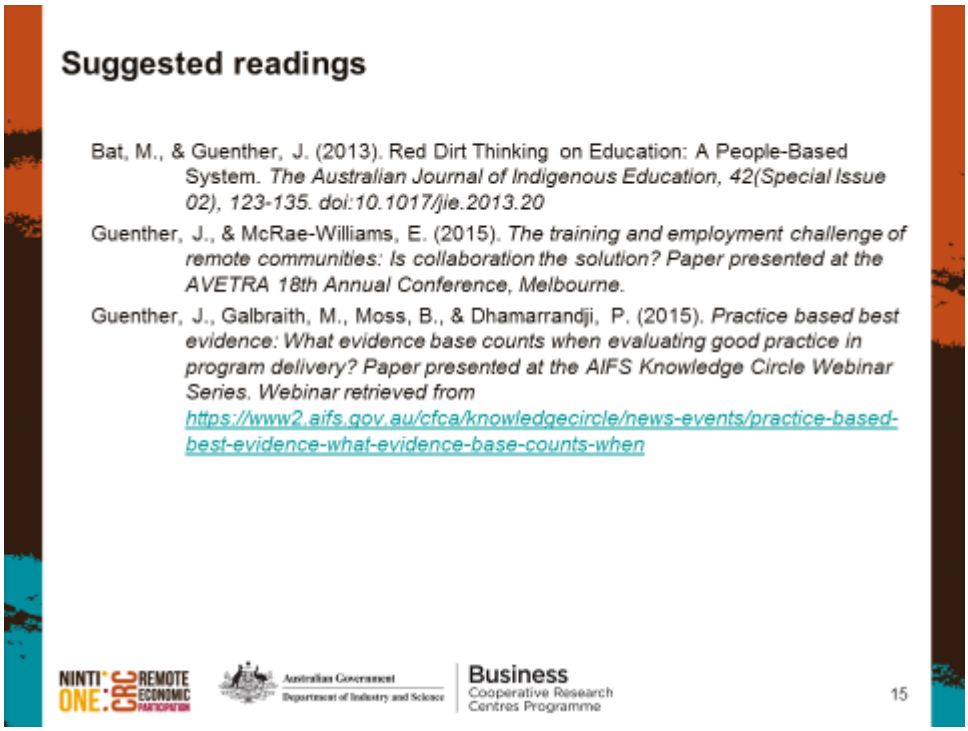
In conclusion, what I have tried to do in this lecture is provide a Complexity Theory lens through which to see remote education systems. My purpose for doing this arises from the Remote Education Systems project data, which represents remote education systems, not as disadvantaged but rather as complex local systems. Let me be clear though that by and large, this view of remote education comes predominantly from non-remote stakeholders. In short, remote education systems are complex for non-remote stakeholders, not for remote Aboriginal stakeholders.

With that proviso in mind, complexity arises from the multiplicity of relationship networks within the system, the non-linearity of inputs to outcomes, the unpredictability of outcomes. Further we can treat remote education systems as 'Complex Adaptive Systems' because they tend to evolve with their environment, are somewhat self-organising and produce patterns of behaviour that emerge from the multiple and continuous interactions that occur within the systems.

If we think of remote education as a series of 'Complex Adaptive Systems' it is not too hard to see why past interventions have failed. They fail because the policy environment fails to take into account the inherent unpredictability of the systems, the non-linear causal pathways, the full array of system elements, the systems' tendencies to maximise entropy (or move to disorder) and to co-evolve with its environment.

What I have suggested is needed (and I don't think this is an exhaustive list) is 1) a focus on emergent practice rather than best practice; 2) collaborative leadership that engages all the system stakeholders; 3) a process of collective inquiry that draws on the knowledges of all the system actors; and 4) the ongoing development of a consistent narrative, allowing time for the vision for education to become shared by all stakeholders.

This last point is particularly important. One thing is clear. There are no magic bullets or quick fixes to the challenges of remote education.



Questions for discussion

1. Does it make a difference that local Aboriginal people don't see remote education as complex?
2. What can universities do to prepare new teachers for the complexities they will face in remote teaching?
3. What could school leaders do with complexity theory?
4. Where does the urgency for change in remote education systems come from?
5. What are the implications for measuring success in complex systems?
6. Are remote education systems that much different to rural, regional or urban systems?

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More about RES

http://crc-rep.com/remote-education-systems

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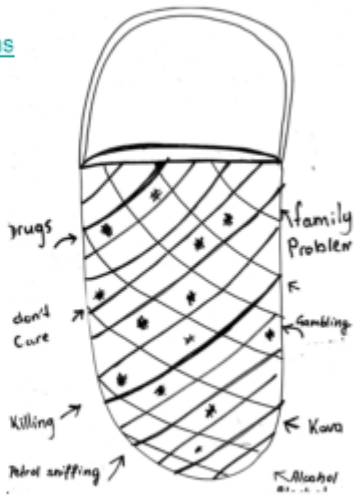

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