LEARNING FOR SUSTAINABLE TRANSITIONS THROUGH THE LENS OF COMPLEXITY THINKING

Anneke Muller
SPL, Stellenbosch University
"Our situation is not comparable to anything in the past. It is impossible, therefore, to apply methods and measures which at an earlier age might have been sufficient. We must revolutionize our thinking, revolutionize our actions, and must have the courage to revolutionize relations among nations of the world. Cliches of yesterday will no longer do today, and will, no doubt, be hopelessly out of date tomorrow." Einstein (1948) ‘A Message to Intellectuals’ In: Green, J. (Ed.) 2003. Albert Einstein. New York: Ocean Press: pp. 52.
- SD has to deal with very complex, interacting dilemmas - Probably requires quite drastic transformation & changes
- Focus in planning & management theory - how to adapt to complexity, ‘wicked’ problems & for postmodern Age and on exploring role of learning-
- Use of Triple Loop Learning explored to help revolutionise our thinking or help to think ‘outside the box’
- Explore different types of learning (behaviour-based, cognitive, social constructivist and gestalt approaches)
- Examine learning needed for SD - Fields of Education for SD (ESD) (bolt-on); Education for Sustainability (EfS) (built-in) & Sustainable Education (SE) (transformation & integrated) (UNESCO, 2006; Thomas, 2009)
- Exploring what this means for helping to understand learning for sustainable transitions and planning
Many sustainability challenges: Poverty, inequality, population growth; urbanisation; biodiversity loss; levels of resource use; social and justice issues such as poor people without access to land and resources; laws & policies criminalising practices of the poor


But seen as fuzzy, fluid or illusive; many possible meanings with continuum between polar opposites (Ex. Top-down, autocratic & expert-driven; bottom-up; co-created; broad vs narrow, etc)

Some inherent fundamental issues (long-term thinking; integration; some form of equity; Human Rights; Right to Development)

Planning important to achieve SD – although not necessarily in its present form
Conflicting ideas on what is needed to achieve SD

We can’t solve problems by using the same kind of thinking we used when we created them (Einstein)

<table>
<thead>
<tr>
<th>Ecological modernisation</th>
<th>Risk society</th>
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</thead>
<tbody>
<tr>
<td>• optimistic approach</td>
<td>• sceptical approach</td>
</tr>
<tr>
<td>• sees no conflict between economy and environment</td>
<td>• sees irreconcilable conflict between current mode of production and environment</td>
</tr>
<tr>
<td>• relies on science and technology to ‘refine production’ for improving environmental performance</td>
<td>• sees modern technology as the cause of risk to ecological system and survival</td>
</tr>
<tr>
<td>• sustainability concept is marketised and utilitarian, can be priced and traded off with other goods</td>
<td>• sustainability concept is radical and moral with protection of ecosystems having the highest priority</td>
</tr>
<tr>
<td>• relies on elitist, techno-corporatist approach to policy-making</td>
<td>• calls for greater participation in policy-making at the local level</td>
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<tr>
<td>• state as enabler, facilitating market forces within a regulatory framework</td>
<td>• interventionist state based on power of collective action asserting its will on private interest</td>
</tr>
<tr>
<td>• accepts the status quo</td>
<td>• calls for social transformation</td>
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Figure 6.2 The twin discourses of sustainability

Source: Davoudi, 2001: 89
PARADOXES OF SUSTAINABILITY

• Complex, never-before experienced problems
• Interlinked challenges, with unexpected interactions between Technology and Nature (example of Fukushima nuclear disaster)
• Paradoxes of economic system built on Model of Infinite Growth in a world with Finite Resources
• Jevon’s Paradox (rebound effect) where resource & energy efficiencies actually in the medium/long term leads to increased use of the resource and not less
• Tragedy of the Commons
• Trade-offs between efficiency (for example in agriculture) at cost of diversity (mono-cultures), independence (heavily dependant on external fertilisers & GMO), sustainability (pollution), resilience (less adaptibale to change) & equity (livelihoods)
• Competing/conflicting rationalities & governmentalities (practices & techniques, ways of thinking)
People’s view so fundamentally different, they can never understand each other (Watson, 2003)

Massey (2013) explored the example of the technocratic, standards-driven, neo-liberal & economic-accounting governmentalities of the Cape Town municipality when upgrading informal areas vs the organic, flexible, tradition-based, informal, survivalist & socially-driven governmentalities of women’s groups – outcome did not meet needs of the poor

These conflicting rationalities/ governmentalities lead to the paradox where more information can actually make debates and political conflict more intractable and difficult to solve – example of climate change debates (Sarewitz, 2010)

These paradoxes all examples of ‘wicked’ problems or complexity
‘WICKED’ PROBLEMS & COMPLEXITY THINKING

- ‘Wicked’ problems (Rittel & Weber, 1973) - problems of organised complexity
  That cannot be solved through rational planning or 1st generation systems thinking, but through 2nd generation “planning as argumentative process…”
- Ambiguity, uncertainty, complexity, interconnectivity, conflict & societal constraints (Mason & Mitroff, 1981)
- Paul Cilliers characteristics of complex systems- many elements; multiple non-linear interactions; open; distributed memory; history; self-organisation & emergent behaviour
- Knowledge of complex systems always limited & depends on framework used to study system (what we leave out, may change system)
RITTER & WEBBER’S 9 CHARACTERISTICS OF ‘WICKED’ PROBLEMS (1973)

- No one definite formulation for wicked problems
- Formulating or understanding is synonymous to solving it
- No right or wrong solutions- only good or bad according to value system within which applied
- No way of knowing when it is solved- need constant monitoring and improvement of solution
- Possible range of methods that can be used to solve problems are unlimited
- Many explanations and depending on one chosen, so solution differs
- Never clear if addressed at right level, as they have no identifiable root cause- often symptoms of other problems
- Once a solution has been attempted, it cannot be reversed
- Every wicked problem is unique
Large number of components – may be simple
Components interact dynamically
Interactions quite rich
Interactions non-linear (no relation between cause & effect)
No direct link necessary to interact
Abundance of feedback routes
Open system
Operate under far from equilibrium conditions
History of system important
Subcomponents can only act on local info - do not have access to all info of system
• Complexity **Thinking** versus Complexity **Theory** or Complexity **Science Science**

• Complexity concepts: order/disorder, chaos, on the edge of chaos, inertia, entropy, equilibrium/disequilibrium, lock-in, path-dependence, triggers, thresholds, critical levels, attractors, fractals, feedback loops, becoming, virtuality, emergence, self-organisation, co-evolution,

• **Two different streams** of viewing complex systems in planning
  • Complex quantitative modelling (belief in control, order, rationality) versus
  • Complexity thinking as an **alternative** to / critique of modernist, rational views of science & belief in control, based on Complex, Adaptive Systems – focus on the qualitative

• Modernism versus Postmodernism with
  **complexity as bridge** between these views (Geyer, 2010)
<table>
<thead>
<tr>
<th>Modern</th>
<th>Complexity</th>
<th>Postmodern</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order</td>
<td>Partial order</td>
<td>Relational</td>
</tr>
<tr>
<td>Rationality</td>
<td>Bounded rationality</td>
<td>Relational rationality</td>
</tr>
<tr>
<td>Predictability</td>
<td>Predictability and uncertainty</td>
<td>Unpredictable</td>
</tr>
<tr>
<td>Reductionism</td>
<td>Reductionism and holism</td>
<td>Irreducible</td>
</tr>
<tr>
<td>Determinism</td>
<td>Probabilistic and emergent</td>
<td>Indeterminate</td>
</tr>
<tr>
<td>Non-interpretive</td>
<td>Interpretive</td>
<td>Relational interpretation</td>
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</tbody>
</table>

**Relation of physical and social sciences**

- Subservient/inferiority relationship. Social science must strive to duplicate methods and results of physical science.
- Integrative relationship. No necessary separation between physical and social sciences.
- No clear relationship exists. Relational and interpretative nature of humanity makes clear relationship difficult.

**Relation of humanity to nature**

- Expanding human dominance over nature
- Holistic interpretation of human and natural symbiotic co-evolution
- Unclear relational distinction between humans and nature

**Methodological implications**

- Experimentation, quantification and search for fundamental laws
- Integration of experimentation and interpretation. Fundamental laws and distinctive outcomes
- Relational interpretations and undermining truth claims

**Vision of Progress**

- There are no inherent limits to human knowledge and progress.
- Significant limits to knowledge and progress due to complexity and uncertainty.
- No fundamental order. Pure knowledge creation and progress is impossible to know.

- History may progress and display fundamental patterns, but it is also uncertain and tortuous.
- History is relational hence it does not universally progress.

**Range of outcomes for Complexity Theory**

- Order
- Stifling Order
- Creative Complexity
- Destructive Disorder
- Chaos

**Positions of Modern, Complexity and Post-Modern Science (Geyer, 2003: 10)**
Chettiparamb (2006) - Complexity as Metaphor – used in Theory Transfer
Metaphors can illuminate or blind (Norgaard, 2010)
Innes and Booher (2010) – Participative processes
Healey (2007) Questions role of spatial planners
Evolutionary planning (Bertolini, 2010) – Between Bargaining & Experimenting (adaptive management & governance; Strategic Choice Approach; etc)
Hillier (2011) – Deleuze & Guattari ‘s view of Assemblage theory - creative transformation and new ways of seeing
McFarlane in ‘Learning the City’– urban learning assemblages & more socially just forms of learning
Exploring multiplicity of ways of seeing the world - good for understanding complexity
MEANING FOR MANAGEMENT?

- Complexity and organisational learning (Mitleton-Kelly & Ramalingam, 2011)
- Complexity and innovation (Andriani, 2011)
- Complexity and policy exploration (Bankes, 2011)
- Complexity more than a metaphor: New Rules of Management (Hazey, 2011)
  - Managing for resilience and not design for stability - design assumes stability, control, predictability, absolute knowledge, an endpoint
  - Evolutionary mindset promotes resilience – requires transparency, open communication channels, distributed control systems, experimentation, forward-looking
  - Frozen accidents – present institutions and system based on arbitrarily and chance decisions of the past

Transition Management (Rotmans & Kemp, 2008)

- Transition towards Sustainability
- Complex-adaptive system
- Evolutionary, experimenting process
- Promoting a diversity of approaches and projects
- No top-down control
- Create synergies between these with visioning
- Changing mental frameworks

The essentials of transition management

Transition management is a model of coevolutionary management of transformative change in societal systems through a process of searching, learning, and experimenting. Managing here means adjusting, adapting, and influencing rather than the command-and-control mode (Loorbach, 2007; Rotmans et al, 2004; 2001b). The rationale behind transition management is that there are persistent problems for which there are no immediate solutions. By transforming the persistent problem into a visionary challenge, transition management explores a range of possible options and pathways, by carrying out a diversity of small-scale experiments. Based on what is learned from the transition experiments, the vision, agenda, and pathways are adjusted, if needed. Successful experiments are continued and can be scaled up; failed experiments are abandoned. Another round starts until some kind of convergence is reached. Transition management is thus a cyclical process of envisioning, agenda building, instrumenting, experimenting, and learning. Rather than focusing on a single, available solution, transition management explores various options and is aimed at guiding variation-selection processes into more sustainable directions, with the long-term aim of selecting the most sustainable option(s) and paths based on learning experiences.
<table>
<thead>
<tr>
<th>TYPE</th>
<th>DESCRIPTION</th>
<th>EXAMPLES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Behaviour-based</td>
<td>Stimulus-response conditioning through sanctions and incentives – only in stable mature environments</td>
<td>Single-loop learning</td>
</tr>
<tr>
<td>Cognitive</td>
<td>Mental processes- thoughts, beliefs, perception &amp; interpretations</td>
<td>Argyris &amp; Schön (1972) Double-loop learning; Kolb; Triple-loop learning</td>
</tr>
<tr>
<td>Social constructivist</td>
<td>Learning emerges from social interactions – build collective understandings &amp; shared problem-solving</td>
<td>Transdisciplinary literature</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>TRANSDISCIPLINARY TRIPLE-LOOP LEARNING</strong></td>
</tr>
<tr>
<td>Gestalt approaches</td>
<td>Integrated, holistic, whole-body learning (cognitive, physical, emotional, spiritual)</td>
<td>Peter Senge (1990) Fifth Discipline Nonaka &amp; Takeuchi</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>HOLISTIC TRANSDISCIPLINARY TRIPLE-LOOP LEARNING</strong></td>
</tr>
</tbody>
</table>
SINGLE, DOUBLE & TRIPLE LOOP LEARNING

- Argyris & Schön (1972) Single Loop (Error-Correction) & Double Loop Learning (Reflective) and Model I (Inhibits Double Loop Learning) & Model II learning
- Gregory Bateson (1974) Deutero learning and 5 levels of learning
- Flood & Romm (1996) Diversity Management: Triple loop learning
- Triple loop learning described as as ‘collective mindfulness’, ‘generative dialogue’, enacting the blind spot, enabling system to see itself...
triple loop learning about revolutionising our way thinking & learning, our mental models, with focus on role of power.
SD is hard to define and hard to teach - Even more challenging to re-orientate entire system to achieve sustainability (UNESCO, 2006)

Need for critical reflection on learning to help change mental frameworks

Thomas (2009) – 4 stages – Denial – ESD (Bolt-on) – EfS (Built-in) - SE (Wholly integrated, transformative, critical and self-reflection leads to revision, redefining and reframing of assumptions, problems, values, habitual ways of doing)

Planning systems, cities, communities are complex adaptive systems – rational planning not always very useful, but communicative planning with social and transformative learning – inbuilt critique and reflexive & critical capacity
Sustainability problems cross disciplinary boundaries and **transdisciplinary** (TD) approaches needed, where all parties learn, not just experts.

Need to bring excluded knowledge of the poor to policy debates (McFarlane).

Sustainability discourse should not be seen as top-down or totalitarian, but as open to be **co-created** to suit the context.

TD approaches need to be **part of way planners are trained**.

SA systems promote **compliance** rather than **creativity** – we need to explore the characteristics of **systems that stimulate creativity & innovation**.

Every problem and city **unique** – no **universal pathways** to sustainability.

**Need to explore** skills needed to promote Triple Loop Learning - group work; understanding power and politics; power in discourses, working with diversity; engage critically beyond narrow ideological views.
CONCLUSION

• World getting more unequal, unsustainable & unjust
• Many elements of present systems probably ‘frozen accidents’ that contribute to unsustainability
• Requires drastic changes and for us to revolutionise our way of thinking, learning and relating to each other
• ‘Wicked’ and complex problems require revolutionised ‘outside the box’ thinking and thinking outside present discourses
• New ways of seeing the world such as Complexity Thinking, assemblages & Triple Loop Learning can help us do this
• Knowledge of many different disciplines, and perspectives needed
• Especially important is knowledge of the marginalised
THANK YOU