Is complexity theory useful in describing classrooms?

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In contrast to:

**Classical (Newtonian) Science**

- Input variable related to output: ‘Linear’ relationships
- All other variables isolated
- History of system is not important
What is Complexity?

Nonlinear Science
What is Complexity?

**Nonlinear Science**

- Variables cannot be isolated: ‘nonlinear’ relationships
- Whole system is dynamic and sensitive
- Influenced by environment
- History of system is important
What is Complexity?

Two more examples

**Flocking**  [http://ccl.northwestern.edu/netlogo/models/Flocking](http://ccl.northwestern.edu/netlogo/models/Flocking)
- Birds tend to turn to fly in same direction
- Birds avoid getting too close
- Birds tend to move together

**Ants**  [http://ccl.northwestern.edu/netlogo/models/Ants](http://ccl.northwestern.edu/netlogo/models/Ants)
- Ants move randomly
- When find food, return to nest
- Drop chemical as returning
- Other ants follow chemical
Complexity in Education

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*Figure 1: GCSE capped points and Key Stage 2 points*

Ofsted (2008) Using Data Improving Schools
Complexity in Education

**Complexity Science**

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- Whole system is dynamic and sensitive
- Influenced by environment
- History of system is important
Is complexity a useful framework?

Methodological Framework

A. Richardson & Cilliers (2001) categorisation of complexity science:
   1. Hard Complexity Science
   2. Soft Complexity Science
   3. Complexity thinking

B. What has changed in ‘transfer’ of concepts from physical science to social science:
   1. Additions
   2. Misunderstanding
   3. Reinterpretation

C. Focus on educational literature primarily.
Hard Complexity Science

- Reductionist approach, seeking ‘universal laws’.
- Aligned with modernist positions.

**Status**

- Rarely seen within social sciences, not at all within educational literature.

**Critique**

- Due to sensitivity and interaction of elements any reduction of the system is inaccurate and therefore of limited use.
“I think you should be more explicit here in step two.”
Complexity as a metaphor for social systems.
Social world is intrinsically different from the natural world: language and meaning.

Status
Particularly dominant within management and organisational sciences, used as the basis for description and modelling within education.

Additions
‘Edge of chaos’
Chaos=complexity
Self-aware agents
Metaphor can be easily applied without clear definition. *Metaphor for metaphors sake.*

- Complexity might not add any new insights.
- Needs to be applied to specific systems and terms defined.
- May be useful in explaining sensitivity and unpredictability of classrooms.
Complexity Thinking

- All knowledge of complex systems is limited.
- Researchers/practitioners are complicit in systems.

Status

- Particularly dominant within the USA and seemingly expanding.

Additions

- ‘Emergence’
- ‘Level-jumping’
- Positive action

Davis & Sumara (2006)
Emergent phenomenon might not be what you want to emerge

No mechanism for ‘judging’ descriptions/actions

Epistemology is difficult to pin down

A ‘more positive’ form of postmodernism?
Cautions from the Literature

- Any representation must be a reduction
- Social systems are implicitly different from physical ones
- Don’t apply metaphor for metaphor’s sake
- Need to focus on a specific system and define terms
- Descriptions must be judged on their own value, not by appeal to other systems or assuming good things will happen
Is complexity theory useful in describing classrooms?

Possible uses

1. Recognition that classrooms are sensitive, dynamic and unpredictable. They resist ‘linear’ descriptions.


3. Provide specific insight into dynamics of learning within classrooms.
Next Steps

• Focus on the classroom
• Define terms and mechanisms
• Use computational modelling to investigate interactions in classrooms
• Consider how teachers deal with complex systems

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References


Further Reading


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