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Approaching complexity: a response to Keshavarz, Nutbeam, Rowling and Khavarpour

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In their paper, "Schools as social complex adaptive systems: A new way to understand the challenges of introducing the health promoting schools concept' Keshavarz, Nutbeam, Rowling and Khavarpour (2010) have made a courageous move in attempting to apply complexity theory to the problem of how to better understand why school health programmes have not always been as successful a policy-makers have hoped. Theories of complex adaptive systems (I use complexity theory and theories of complex adaptive systems [CAS] interchangeably) arguably have the potential to examine and articulate many aspects of complex phenomena which have hitherto defied articulation by more conventional means, in both the natural and the social worlds. Working out exactly how this potential may be realised, however, is an enormous challenge.

One of the most difficult aspects of this challenge is working out what a complexity approach might mean in terms of research methodology, given that complexity seems to suggest a different ontology (and therefore arguably a different epistemology) to that which usually underpins conventional approaches to research. Keshavarz *et al* (2010) have understood that issues of ontology and epistemology are at stake, but they have had difficulty in working out a cohesive response to this very difficult issue. At some points in the paper they appear to be taking a predominately realise position, seeking empirical evidence that will justify a claim that schools actually are complex adaptive systems (in the same way that ant colonies or bee hives may be said to be such systems). In other places, they maintain this realist position but express some doubts about the status of complexity as a theory, indicating a dissatisfaction with the lack of experimental studies which attempt to verify it. In other places, however, what is initially taken for granted in these ways becomes much more provisional, and at one point complexity is discussed as being only metaphorical. The authors seem to be unsure as to whether they are seeking realist forms of empirically-based explanation, or more interpretative forms of understanding created out of interview data. In a sense they seem to be trying to have both approaches at once, which may be one of the reasons they have chosen complexity as a set of ideas to work with Keshavarz *et al* (2010). The radical challenges suggested by complexity could include a challenge to this kind of conventional research polarity. To meet such a challenge using complexity, however, arguably suggests that a new kind of coherence has to be created, and I don't think the authors have achieved this.

The discussion of using CAS as 'an approach' seems to imply that certain methodological, conceptual and analytical procedures follow from the theory/ conceptual framework of CAS, but what these procedures might be is not discussed (see Byrne, 2005; Davis & Sumara, 2006; Haggis, 2008 & 2009, for further discussion of these issues). Working out the possible implications of complexity for methodology, methods and research design is no easy task, but arguably one which

was needed if it was intended that the research approach be ‘based on’ theories of complex adaptive systems Keshavarz *et al* (2010).
There seem to be two research questions underpinning this study. The first is:

> Does thinking of schools as CAS help us to understand the failure of health-promoting schools (HPS) policies?’

The second is:

> What do people have to say about their experiences of HPS initiatives?’

The first is a conceptual question, which did not necessarily imply the need for the collection of empirical data (or, at least, perhaps not data in the form of personal narratives). The second question is not a complexity-based question. Comparing interview data with documentary analysis is also still not a procedure directly implied by theories of CAS, though it might begin to move in this direction if an argument was made that a methodological implication of complexity was the need to gather information about a range of systems, across a range of different levels. Complexity arguably implies consideration of issues such as initial conditions, history/movement through time, specificity, and emergence, and, for some writers, also phase shifts, ‘lock-in’, path-dependency etc.

The confusion of aims and the vagueness about the analytical and methodological implications of complexity can also be seen in the assumption that what people say in interview is synonymous with the actual practices and workings of the school (eg. the fact that participants recognise cultural diversity seems to be taken as evidence of diversity in terms of the agents within the school as a CAS), and also perhaps in the assumption that the statements used in plans and reports accurately reflect actions which actually might be carried out. Both interview data and plans/reports are described as giving ‘information’, without acknowledgment of the fact that interview data are self-reported narrative, and that plans and reports have to use rhetorical devices which reflect particular cultural and political contexts and times.

Taking account of these problems in relation to what the authors seem to be interested in, it seems to me that their argument would have been stronger if it had run something like this:

> We set out to explore the perspectives of relevant actors across a range of contexts in order to try to get a sense of why people felt HPS policies had failed. Both actor narratives and institutional plans suggested strong context-dependency in relation to expressed views and strategies for policy implementation. This diversity of narratives and institutional responses led us to consider some of the implicit ontological and epistemological assumptions underpinning the research. For example, the idea that collecting a range of individual views and examining texts from different contexts might identify recurrent problems or themes, which would enable us to understand the more general mechanisms which are at work when schools try to implement policies. We were forced to reconsider these assumptions (which are the assumptions which underpin a great deal of research in many fields) and instead to consider how we might conceptualise the diversity and context-

> specificity which we found. This led us to wonder how our interest in understanding the failure of policy might change if we conceptualised schools, and the multiple contexts within which they are embedded, as complex adaptive systems. If we were to redesign the research with hindsight, our research questions would be:
>
> How are we conceptualising the schools that we apply the health promoting school policy to?
>
> Can theories of CAS improve on this conceptualisation/offer a new conceptualisation that might shed more, or different, light on the failure of the policy?

If the researchers had been able to make an argument that a complexity-based ontology applied to schools suggested the use of interviews with some of the agents within the schools being investigated, a new research question might then have arisen:

> Do human agents understand themselves to be part of something that might be conceptualised as a complex adaptive system?

This is not the same question as whether or not observation of a school's functioning might or might not provide evidence that schools fit the criteria of CAS. It also points towards the difficult problem of how the conscious awareness of agents in a CAS might affect the workings of an otherwise 'unconscious' system which is operating in response to distributed forms of control.

Keshavarz *et al* (2010) in one sense seem to want complexity to be a 'hard science' kind of theory, in the sense of something that is clear, cohesive, and, at least hypothetically, paving the way for the discovery of laws and regularities. Their desire to *unify* the diversity of theories, and the discussion of the lack of experimental studies which attempt to verify the theory support this idea. Their views of complexity theories, in this regard, seem to be that such theories are not yet sufficiently developed, and that this is why they are difficult to apply. But theories of complex adaptive systems and complexity are well developed in the hard sciences already, and function as well mathematically as they do metaphorically (see Richardson & Cilliers, 2001, and Byrne, 2005, for discussion of different kinds of complexity theory). Keshavarz *et al* (2010) seem to be suggesting that they have invented the idea of a social complex adaptive system, but researchers have also been using complexity theories in the social sciences for some time. For example, Byrne (2005) in Sociology, Davis & Sumara (2006) in Education, and Valsiner (1998) and Fogel (1993) in Psychology. Sawyer's (2005) book 'Social Emergence: Societies as complex systems' gives an overview of recent work in this area.

Complexity theory is not a monolithic, unidimensional theory. Aspects of these ideas can be found in Margaret Archer's (2000) morphogenetic theory, Hillier's (1998) analysis of urban architecture, Buchanan's (1998) discussion of research into patterns of crime, and Kevin Kelly's (1994) analysis of 'the new biology of machines'. Complexity ideas underpin popular books such as Gribbin's (2004) *Deep Simplicity*, and Ball's (2004) *Critical Mass*, and are the basis of ideas such as 'the tipping point' which have entered popular vocabulary.

Using complexity ideas and theories is challenging, but not because 'the theory' itself is 'too complex' or 'poorly defined'. A recognition of both uncertainty and imprecision are key structural elements of these types of thinking. Complexity theories could be seen as one way of attempting to articulate some of the limits of human understanding in relation to both natural and social phenomena. Rather than trying to be 'complete', to offer explanations which it is hoped, over time, will become more 'accurate', at least some interpretations of complexity theories suggest that there are aspects of natural and social phenomena which will *always be out of reach.* The multiple interactions within and beyond whatever complex adaptive system is the focus of analysis are too numerous, too recursive, too dynamic and too responsive to ever be tracked or predicted beyond certain limits (to say nothing of trying to understand the role of emergence within such processes…).

The principles of uncertainty, multiplicity, specificity, and continuing change challenge many conventional assumptions about carrying out research. Bringing in the importance of initial conditions, history and time, theories of complex adaptive systems challenge the Newtonian idea that effects are straightforwardly predictable and proportional in relation to causes. Small differences in initial conditions can result in widely divergent emergent effects through time, and predictability is limited. The importance of history suggests that phenomena have to be studied over time; the idea of 'sensitive dependence on initial conditions' implies singularity (rather than generality), which might be seen as implying that there are serious limits to what can be learnt about complex adaptive systems if they are only studied cross-sectionally (see Haggis, 2008, for further discussion of this). If the entities which are of interest to educators (eg. people, groups, departments, institutions, societies) are seen as being dynamic, continually emerging through time, and specific to local constellations of conditions (ie. irreducibly particular, incapable of being meaningfully compressed into a model or reduced to underlying principles)[1], then complexity presents researchers with the challenge of working out what it means to say that 'knowledge must be contextual' (Byrne, 2005; Haggis, 2008).

Keshavarz *et al* (2010) seem to come to this conclusion from the analysis of their data. Their study, conceptualised slightly differently, could be seen as presenting interesting data in support of the idea that it is necessary to formally acknowledge diversity and context-specificity. Indeed, if their main research question was 'Why do HPS policies fail?' it seems to me that they could have argued convincingly, on the basis of this data, that one possible answer is 'because of context-dependency'. This may not be the answer that researchers want, because it presents them with the somewhat desperate dilemma of how they are supposed to respond to such an idea. It is not, of course, a new dilemma. Researchers, at least in the social sciences, have been forced to confront empirical evidence suggesting this answer time and time again, but it is almost impossible to make a case for such an answer within the epistemological and ontological constraints of conventional approaches to research. The failure of conventional research to move beyond the limits of the kinds of answers it has been generating for decades (eg. 'Sorry, we still can't tell you why so many kids fail, but we're starting an extra large study right now which will soon bring

[1] Note, however, that 'local' can apply to large social systems, as well as to the smaller systems which may be embedded within larger ones

you this answer') is arguably because, without complexity, or something similar, (and there are various other theories which might also do this job) it is not possible to answer some of the most recalcitrant of educational (or social) questions.

I said at the beginning of this paper that theories of complex adaptive systems and complexity arguably have the potential to examine and articulate many aspects of complex phenomena which have hitherto defied articulation by more conventional means. There are good reasons, however, why aspects of social complexity have resisted clear articulation for so long. The embedded nature of social systems; the sheer number of components involved, and the even greater number of connections between them; the fact that they are dynamic, in constant formation, constantly adjusting themselves to movements and historical effects both within and external to themselves; the permeable nature of boundaries between systems; and the fact that human elements of larger systems have consciousness, and can thus act intentionally upon such systems (as well as unconsciously carrying out actions in response to biological and social rules of which they are quite unaware) – these are all aspects of social reality which researchers already know exist. The challenge of attempting to acknowledge these issues formally, in terms of theory, is enormous, even before coming to the problem of how phenomena conceptualised in this way might be studied.

In attempting to use complexity to consider the failure of HSP policies in schools, Keshavarz *et al* (2010) have taken an important step in a direction which, although not altogether new, is nonetheless underdeveloped and much needed in their field. If researchers are serious about the implications of complexity, however, I would suggest that there is still a great deal of work to be done in terms of articulating a coherent response to complexity's challenge to the ontological and epistemological assumptions which underpin most approaches to empirical research k.

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