Complexity and action research: exploring the theoretical and methodological connection

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Complexity and Action Research: Exploring the Theoretical and Methodological Connections

Educational Action Research

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ABSTRACT Complexity theory is essentially a formal attempt to question how coherent and purposive wholes emerge from the interactions of simple and sometimes non-purposive components. Explicit recognition of complexity can provide a fresh and enlightening perspective on action research. Through an expository discussion of the foundational postulates of complexity theory this paper demonstrates the theoretical and methodological connections between complexity and action research, with particular emphasis on the relevance of complexity in educational and workplace contexts.

Complexity is an emerging theoretical perspective, which presents possibilities for revolutionising approaches to action research, as well as strengthening arguments promoting the value of action research in a wide range of contexts. Complexity, it is argued, can provide a valuable theoretical underpinning for action research. Furthermore, action research provides a valid methodological approach to the study of complexity. This paper is primarily theoretical and attempts to demonstrate the application of complexity to a specific action research project will be left to future publication(s). Rather, this paper explores the general applicability of complexity as both theory and metaphor in action research. The paper begins with a brief exploration of the theory, particularly focusing on its application in the social sciences. The theoretical and methodological connections between complexity and action research are discussed through several of the foundational postulates of complexity, how these manifest in action research, and how they add to our understanding of action research itself.

Introduction: What is Complexity?

Complexity theory is essentially a formal attempt to question how coherent and purposive wholes emerge from the interactions of simple and sometimes non-purposive components (Lissack, 1999). At its most humble, it attempts to explain the 'big consequences of little things'.

Complexity has recently begun to influence and challenge the orthodoxy in a broad range of disciplines from evolution, immunology, architecture and economics to education and psychology. The literature varies greatly in its focus, ranging from the highly technical (Kauffman, 1995; Mainzer, 1997), the heavily philosophical (Dillon, 1999; Medd & Haynes, 1998), the narrative and accessible (Bossomaier & Green, 1998; Davies & Gribbin, 1991; Waldrop, 1992) and more recently to the highly applied (here I refer specifically to application in the social sciences) (Brodnick & Krafft, 1997; Davis & Sumara, 1997; Lissack, 1999; McAndrew, 1997; Medd & Haynes, 1998; Rosenhead, 1998; Sumara & Davis, 1997; Zhang & Fowler, 1996).
While the application of complexity in the social sciences is not without its critics (for instance Hunter & Benson, 1997; Medd & Haynes, 1998; Pigliucci, 2000), sufficient literature and empirical research now exists to acknowledge that the complexity 'paradigm' is set to challenge thinking in these disciplines (see, for instance, Eve, Horsfall & Lee, 1997a). According to Underwood (2000), complexity provides three key implications in the social sciences. Firstly, it places an increasing stress on self-organisation and a realistic awareness that sociological phenomena often cannot be forecast. Secondly, the theory recognises that all living organisms are self-steering within certain limits and that their behaviour therefore can be steered from the outside only to a very moderate extent. Thirdly, complexity theory highlights the continuous emergence of new levels of organised complexity within society. ‘The complexity paradigm requires a shift in thinking, although it makes more explicit what many social scientists and practitioners have ‘known’ as they recognized that human institutions are not amenable to prediction and manipulation in simple linear terms’ (Brodnick & Krafft, 1997, p.3).

That there is a growing body of literature applying complexity to management (Brodnick & Krafft, 1997; Gold, 2000; Lissack, 1999; Rosenhead, 1998; Stacey, 2001; Stacey, Griffin & Shaw, 2000; Underwood, 2000) and education (for instance Bloom, 2000; 2001a; 2001b; Davis & Sumara, 1997; 1997-8; Doll, 1986; 1989a; 1989b; 2002; 1998; Iannone, 1995; Jorg, 2000; Mintz & Yun, 1999; Sawada & Caley, 1985; Sumara & Davis, 1997; Zhang & Fowler, 1996) is not surprising given its focus on evolving and changing systems, notions central to learning and teaching, as well as organisational change literature. These contexts are a particular focus of this paper since they are disciplines in which action research has traditionally found a strong position. Brodnick & Krafft (1997, p.10-13), for instance, provide a series of postulates, derived from complexity theory and relevant to organisational contexts. These include such notions as that all institutions are potentially chaotic; that institutions are attracted to identifiable configurations; that institutions move among dynamic states through a process of bifurcation; that functionally accurate forecasting is impossible on a broad scale and for the long term; that cause and effect are not closely related in time and space; that massive interventions may have insignificant results and small interventions may have massive results; and that similar actions taken by institutions will never lead to the same result.

A similarly strong and growing body of literature relates complexity theory to educational contexts. Jorg (2000) utilises complexity to explore the nature of learning, while Bloom (2001a) explores how complexity can inform our understandings of student cognition and student-to-student discourse. Davis & Sumara (1997) have applied complexity theory in their proposal of an ‘enactivist’ model of cognition and make recommendations from this to teacher education. The discussion of a connection between complexity and constructivism has more recently been taken up by Doolittle (2000), and we will return to this connection later in this paper.

**Complexity as a Basis for Action Research**

Few authors have drawn an explicit connection between action research and complexity theory, however recent action research literature provides indications that this might be beginning to occur. The capacity of action research to address complex issues was pointed out, metaphorically, by Kemmis & McTaggart (1988) when they described action research as a “way of managing complex situations critically and practically” (p.7). Only a small handful of authors, however, draw an explicit connection between action research and complexity. The earliest seems to have been Altrichter (1991) who mentions complexity in passing. The principles he speaks of, and the work he cites (that of Nobel prize winner Prigogine), are those which led to the development of complexity theory. In his conclusion, Altrichter argues that action research fits well with these theoretical developments. A second and more recent, but obtuse mention is made by Green (1999) who draws on complexity to help come to terms with the ‘messy’ nature of teaching and her use of literature in her action research. The most explicit connections have most recently been made by Davis & Sumara (1997), who draw on complexity principles to challenge their own teaching practice and to collaboratively change the culture within their school through action research. These writers argue that “action research becomes an instance of ‘complexifying’ the relationship among researchers and research situations so that the boundaries between these are blurred” (Sumara & Davis, 1997).
Following, then, is an exploration of several of the key postulates proposed by complexity theory and a discussion of their theoretical and methodological connection to action research. The postulates which we have utilised to structure our discussion are:

- the notion of open, non-linear systems;
- the emergent nature of change;
- change as self-organised adaptation;
- the role of agent interaction;
- inherent unpredictability and sensitivity to initial conditions;
- feedforward and feedback; and
- self-organisation and system stability.

**Acknowledging the Open, Non-linearity of Social Systems**

Complexity is concerned with open, non-linear systems. An open system is one that needs and receives energy to maintain its order and where this maintenance of order places the system in a state that is far from equilibrium. A non-linear system is unpredictable in that, even if one was familiar with all the components of the system, one would still not be able to determine exactly what would happen next. Such a system is thus greater than the sum of its parts. Complexity theory acknowledges the inability to totally understand the whole through an understanding of the parts but rather aims to understand the whole by understanding the interaction of its parts.

Action researchers, although perhaps not explicitly, do embrace the open and non-linear nature of the social systems in which they work. They acknowledge that there are things outside the practitioner’s control which inhibit their practice (Grundy, 1995). Cook (1998), for instance, recently wrote of the ‘importance of mess in action research’ and her dilemma of “trying to describe practice without fixing it and making it static”. Although Cook herself draws no connection with the theories presented in this paper, her writing highlights many of the issues and constructs which are dealt with below.

Various writers in the field of action research have also drawn strong connections between action research and systems theories (for example Davies, 2001; Dick & Swepson, 1994; Kemmis & McTaggart, 2000; Zuber-Skerritt, 2001). These discussions highlight further the close connections between complexity and action research, connections which are well illustrated in the following extract:

... on the one side participants understand themselves and their practices as formed by system structures and functions that shape and constrain their actions, and that their efforts to change their practices necessarily involve encountering and reconstructing the system aspects of their social world. On the other side, we contend, participants also understand themselves and their practices as formed through the life-world processes of cultural reproduction, social integration and socialization-individuation and that their efforts to change their practices necessarily involved changing the substance of these processes (Kemmis & McTaggart, 2000, p.589).

The following quote further illustrates how existing action research literature has embraced notions of open and non-linear systems; “In action inquiry, the purpose is to make change in dynamic and complex systems. Thus, such excessive control on the part of the researcher oversimplifies the system rather than assists in addressing it in all its complexity (Watkins & Brooks, 1994).

This idea of working with the non-linearity of the research context is central to action research, and so too is the notion of energy input. In fact, the ‘action’ which is inherent in action research is an energy input which actively prompts a state of non-equilibrium as expressed in the following:
A good deal of research is post hoc and involves finding out what has happened rather than what is happening. There are obvious limitations in post hoc designs. Action research provides the opportunity to look at a phenomenon while it is evolving... and to fiddle with it as you test out hypotheses ‘on the run’. It’s a chance to look at the potentially myriad variables that might be coming into play as they occur (Hase, 2000, p.4).

Acknowledging complexity encourages us to anticipate and welcome change and evolution, just as action research has done: “We can look for the new opportunities that states of disequilibrium present to us for evolution (and perhaps revolution)” (Gough, 1999, p.59).

The Emergent Nature of Change

From a complexity perspective development and change is viewed as a natural and evolutionary process which is neither imposed nor random (Doll, 1997-8). Rather, it is the interaction among component parts and the ways that the systems organise which promote change. Emergent structures are not outcomes in themselves but in turn influence future events, making possible the evolution of qualitatively different kinds of systems (Mihata, 1997). Complexity views change as adaptation stemming from the interaction, alignment and organisation of agents into higher levels of complexity (Lee, 1997). Emergent global complex system behaviour thus involves the aggregate behaviour of individual agents.

This last paragraph describing the emergent nature of change will ‘ring true’ to action researchers and conjure images of the Lewinian cycle common to all action research. In fact, Bloom’s work (2001a) highlights and diagrammatically presents this cyclical pattern, drawing a connection between cognitive processes and complexity’s notion of autopeisis which will be detailed in a following section.

In educational contexts, complexity views student thinking and learning as an emergent process where ideas and concepts arise from specific contexts. The emergence of such ideas are inherently non-linear and unpredictable: “Although we may be able to predict that certain types of events or ideas may arise, we cannot predict the specific content or outcome” (Bloom, 2001a, p.23). Under this understanding our conception of teaching is also quite different. As highlighted by Davis & Sumara (1997, p.111), we can present occasions that are rich with learning possibilities and in which we might participate with our students in the unfolding of understandings, however, we can not prescribe what will be learnt. Action research similarly embraces and promotes emergent learning. In fact many action researchers adopt Grounded Theory (Glaser & Strauss, 1967), allowing their theory to emerge from the action and interaction itself. The emergence of that change is an active and intrinsic component of the research process.

Change as Self-Organised Adaptation

Complexity views change as adaptation stemming from the interaction, alignment and organisation of agents into higher levels of complexity (Lee, 1997). Complexity theory posits that agents function through the use of internal models or schemas. These schemas are actively constructed, self-organised, and emergent and are the result of perceived regularities in experience. In other words, complex system behaviour involves adaptation to the environment, based on experience (Doolittle, 2000). Both Davis & Sumara (1997) and Doolittle (2000) draw connections between complexity thinking and constructivism, just as many action researchers have drawn on constructivism in their discussions of action research:

...action researchers accept that transformations to social reality cannot be achieved without engaging the understandings of the social actors involved. They accept that understanding the way people construe their practices and their situations is a crucial element in transforming education, but not that this understanding provides
sufficient basis for achieving such transformations (Carr & Kemmis, 1990, p.181).

Action research is consistent with the notion of adaptation to environment which is fundamental to complexity. As is outlined by Brooks & Watkins (1994), action technologies (taken to refer to the various forms of action inquiry, including research) “reject the idea that one generalisable solution can fit multiple situations and establish a dynamic and ongoing inquiry into the particular. Theory becomes a learning tool for trying out solutions to local problems” (p.8).

The ‘rules’ or internal models of schemas that are spoken of in complexity theory can, amongst other manifestations, be interpreted in action research as ‘assumptions’. Acknowledgment and challenging of assumptions is an integral component of action research. Again, it is not the rules themselves which are seen as governing change through complexity, but rather the interaction of various agents, and their own schemas, within the system. Thus, in action research, participants are encouraged to challenge their assumptions or schemas and to explore and challenge these schemas with other participants (agents). This process, in itself, is introducing ‘noise’ and actively promoting disequilibrium.

Doolittle (2000) sees complexity as an opportunity, within the field of education, to adopt a new model or metaphor for learning; learning as self-organised adaptation. It is valuable here to quote Doolittle at some length:

In complexity theory, as in behaviorism, information processing, and constructivism, component parts are important. However, in complexity theory, what constitutes a “part,” or an agent, depends on the level from which one views the learning process. An agent could be a neuron, a neuronal group, an experience, or even a whole person (in a social situation). What is of importance regarding agents, is not the agents themselves, but rather, the interaction of these agents with each other (Holland, 1995). As with constructivism, a complexity perspective recognizes the difficulty in predicting global behavior from an understanding of the parts (Waldrop, 1992). This complexity-based alternative perspective to understanding the whole, by understanding its parts, is to understand the whole by understanding the interaction of its parts (Lewin, 1992) (Doolittle, 2000, p.1).

The Role of Agent Interaction

Complexity emphasises the importance of acknowledging the whole range of variables impacting on any context and the inability to control such variables while maintaining contextual integrity. These notions are explained by Davis & Sumara (1997, p.114):

...even the most profound knowledge of the subsystems that come together to form a complex system will not help us to predict or to control the behaviors of such systems. The most thorough understandings of hearts, livers, brain stems and skin does not help us much in accounting for the emergence of such complex phenomena as consciousness and identity. Although these ‘components’ all contribute to such phenomena, their interrelation is too complex to understand through a process of fragmented study. It is the relations among them, not the things themselves, that are productive and, as such, of interest.

Expressed more succinctly, complexity acknowledges the inability to totally understand the whole through an understanding of the parts.

Jorg (2000) has explored the nature of learning through complexity, highlighting the active roles played by participating agents in co-constructing knowledge through interaction over time. Bloom (2001a) also highlights the important role of interaction with others and with one’s
environment in cognitive processes, highlighting the influence of variance, encountered through this interaction, as both source and product of cognition.

Action research explicitly embraces participation and the democratisation of knowledge production and use (Onn, 1998). Action research can be seen as a form of social practice which acknowledges that social interactions like teaching, learning and knowledge generation, take place among and between people (Grundy, 1995). In this respect action research is congruent with the idea that systems behaviour involves the aggregate behaviour of agents and that internal schemes are actively constructed through interaction of agents.

Discussion by action researchers regarding generalisability of their research also highlights their implicit recognition of the central role of agent interaction in change processes. As is discussed by Watkins & Brooks (1994), the notion of generalisability is understood in a non-conventional way in action research, where generalisability rests in the hands of those who participate or read about the study, rather than in the study itself.

Action research provides a vehicle for researcher and co-researchers (the participants in the research) to seek and to share meanings constructed from shared experience. “By moving researchers from the role of objective observers into a collaborative relationship with research subjects, they share in rather than control the production of knowledge” (Brooks & Watkins, 1994, p.8). The intended result of action research is, thus, the construction of new knowledge on which new forms of action can be based. This is a cyclical process in which action contributes to knowledge and knowledge alters action, and members of the context are central to the research process. This represents an acknowledgment that both agent interaction and the schemas of these agents are critical in processes of change.

**Inherent Unpredictability and Sensitivity to Initial Conditions**

In some respects it seems somewhat obvious to state that the social world, and learning and teaching processes in particular, are complex. However empirical and positivistic research has gone to great lengths to ‘resist’ this complexity, isolating and investigating specific variables so as to ‘support’ hypotheses, and methodologically discounting ‘outlying’ (and essentially disconfirming) data. Much of this research has been aimed at ‘prediction’, a notion that is based on two assumptions; that the chain of causes is recoverable and that the universe is fundamentally deterministic in nature (Turner, 1997, p.xiii). What such research fails to do is recognise and acknowledge the complexity of the factors at play in any situation, social or otherwise. Action researchers have, however, embraced notions of unpredictability. Wadsworth (1998), for instance, uses the slogan ‘the future is made, not predicted’ and notes that action researchers see this unpredictability as a goal and “the stuff of which ‘real life’ is made or enacted” (Wadsworth, 1998, p.7).

Complexity theory also acknowledges that uncertainty of prediction is inevitable (Eve, Horsfall & Lee, 1997b) and that processes are critically dependent on their initial conditions, conditions that may be unrecoverable or unknowable. This notion of sensitivity to initial conditions is the essential idea behind the well known ‘butterfly effect’. Unpredictability does not, as Turner (1997) states, equate to unintelligibility or inaccessibility to understanding, but it does predicate a different type of understanding.

Drawing this postulate into the study of social systems, particularly educational and workplace contexts, lends further strength to the connection between complexity and action research. According to complexity, the input of a new idea or individual or action into the system at any point can lead to dramatically different outcomes, outcomes which cannot be predicted. Subtle changes in the simple rules by which we interact with one another socially, politically or economically might result in completely different social structures (Eve, Horsfall & Lee, 1997b).

Action researchers are not perturbed by this unpredictability. The notion of ‘noise’ discussed in complexity theory, and the concept of deliberately introducing noise into a system to see what happens (Lissack, 1999) are quite consistent with the action/observation phases of action research. Action research is, in fact, a process of actively producing ‘noise’ as it challenges
individuals to reflect on new ideas, concepts and theories and to engage in action aimed toward change. Again, to quote from literature applying complexity to organisational contexts, “Where traditional managers may have wished to delete the extraneous, the complexity research educated manager may be attempting to cause the deliberate addition of noise at various places along the way” (Lissack, 1999, p.5). This is, of course, what action researchers also do.

**Feedforward and Feedback**

As mentioned earlier, complexity views change as ‘adaptive’ and fed by changes in relationships between component agents. This is explained by Lee (1997):

> Interactive component relationships create hierarchical levels of complexity. Protracted over time, component interactions’ feed forward’ to produce the macroscopic configuration of components that is discernible at any given point; ‘feedbacks’ describe the continual accretion of effects from previous interactions, which may in turn alter lower-level interactions and higher-level configurations at the next point in time.

In complexity theory, feedback assumes a primary role. Turner (1997) sees this as further justification for the importance of history and tradition as important determinates of social processes. “Historical events are not the mere epiphenomena of socioeconomic laws that, once understood, would eliminate the need for detailed research... instead, historical events in all their idiosyncrasy are themselves the irreducible meat of what is going on” (Turner, 1997, p.xx).

This feedback process has also been highlighted in educational applications of complexity. Bloom (2001a), for example, notes that student cognition “manifests as circular feedback loops and as spiral patterns that carry ideas and concepts forward. The result is a nonlinear, self-maintaining argument that generates increasingly complex conceptualisations” (p.11). Bloom takes this discussion one step further, noting the important role of reflection in promoting connections that aid in the construction of more complex and meaningful understandings.

Integral to action research is the notion of reflexivity which might be defined as a mental process in which one thinks about things by going back over them (Tripp, 1998). As Tripp continues, reflexivity leads one to question one's own values and practices, even one's right to be doing whatever research it is one is engaged in. Reflexivity involves mental reaction to perceived issues and inconsistencies and a willingness to challenge assumptions and beliefs, particularly as these are challenged through action. Reflexivity is “an attempt to identify, do something about, and acknowledge the limitation of the research: its location, its subjects, its processes, its theoretical context, its data, its analysis, and how accounts recognize that the construction of knowledge takes place in the world and not apart from it (Shacklock & Smyth, 1998, p.7). As such, reflexivity involves challenging perceived irregularities in experience, with emergent behaviours based on adaptation to non-equilibrium based contexts. The connection between reflexivity and complexity has also been highlighted by Gough (1999), and by Doll’s (1989b) notion of ‘recursive reflection’.

**Self-organisation and System Stability**

Bifurcation, or phase transition, is the term used by complexity theorists to describe the branching of phenomena seen during chaotic episodes (Price, 1997). Bifurcation usually results in new but more complex stabilities. The previous section discussed the importance of feedback and feedforward in the process of self-organisation. An example of how these processes can influence the stability of social systems is provided by Lee (1997) who points to the influence of technology on society. Lee notes that technology can speed up the rate at which relationships between components are changing, producing instability. However human ideologies tend to stabilise and sustain, over time, certain types of relationships, producing aggregation and order. The term autopoiesis is used in complexity theory to refer to the patterns of self-generating, self-amplifying and self-maintaining systems. The notion of autopoiesis may be of value to action researchers in furthering their understandings of the contexts in which they work, and in particular the nature of the change processes they are involved in.
While autopoisis is a critical notion in complexity, it is also important in our discussion of action research to focus on bifurcation itself. As previously outlined, in complexity theory little consequences can evoke significant changes in outcomes, and such changes can occur at bifurcation points. The parallel we would draw is the importance of ‘outliers’ or disconfirming cases. While many research approaches have traditionally discounted outlying data, action research has tended to embrace and focus upon such data. Greenwood & Levin (2000) note that in action research any case that runs counter to a generalisation invalidates it and requires the reformulation of the generalisation. Similarly, Dick (2000) advocates an approach to action research where if sources agree then the researcher searches for exceptions in the next cycle. If they disagree then the researcher searches for explanations. While the language adopted by these authors in some respects runs counter to the new paradigm, the notions they describe are highly consistent. While positivist research has tended to disqualify exceptional cases, action research embraces them.

We would argue that the active acknowledgment and study of dissonant views which action research promotes can assist us to understand bifurcation points. It is the dissonance within systems, and the potential consequence of this dissonance, which holds the clues to understanding change processes.

The Openness of Action Research to Mixed Method Approaches

We would like to make one further point in support of the potential of action research in supporting complexity-based investigation in the social sciences.

Complexity theory, as we have highlighted earlier, carries significant potential in bridging the gap between natural sciences and humanities (Mainzer, 1997) and as such presents an interesting challenge to the ‘paradigm wars’ (Tashakkori & Teddlie, 1998) which have plagued research practice for years. Complexity provides a strange, and as yet not fully explored metaphor, marrying positivists and post-positivists. It is unclear how this theory will settle. What is clear, however, is that complexity has been embraced by scientists and social scientists alike and that a wide range of methods, from mathematical modelling to metaphorical and philosophy theorising, are being used to better understand dynamic, non-linear systems from such a perspective. It would seem that the study of complexity cries out for mixed method approaches. Similarly, Lee (1997) has highlighted that complexity theory can offer a more consistent interpretation of data gathered through mixed methods and presented in differing methodological languages.

Multimethod research has now gained a firmly established body of supporting literature (Brewer & Hunter, 1989; Datta, 1994; Hammersley, 1996; Howe, 1988; Reichardt & Rallis, 1994; Tashakkori & Teddlie, 1998). Tashakkori and Teddlie (1998) differentiate between mixed method and mixed model research. Mixed methods combine quantitative and qualitative approaches in the methodology of the study (such as in data collection) while mixed model studies combine these two approaches across all phases of the research (such as conceptualisation, data collection, data analysis and inference).

Action research is inherently open to mixed methods and mixed models, being neither implicitly positivist nor post-positivist. While many action researchers, particularly those from the critical and emancipatory schools of action research, adopt postpositivist methods, many examples exist of positivist and mixed model approaches to action research. Greenwood and Levin (2000) in fact state that “action research is inherently multimethod research... effective action research cannot accept an a priori limitation to one or another research modality” (p.93).

A strong case can be made for the adoption of mixed methods in complexity-based research. As Hase (2000, p.2) states, “One of the more compelling theories that provides support for thinking about mixing methodologies in research is that of complexity theory”. Various writers (Greene, 1994) have also drawn connections between the complexity of social phenomena and the need for diverse tools and different kinds of methods in order to reach more complete understandings. House (1994), for instance, in his argument for closer integration of research methods and methodologies, notes as an underlying assumption that “the real world is complex and stratified,
so that one is always discovering more complex layers of reality to explain other layers” and that investigation of such complex social reality requires multiple research methods. “Methodological pluralism has the merit of increasing the scope of research questions and preventing premature closure to the investigative process. It also allows the investigator to respond flexibly to the research task at hand” (Hoshmand & Martin, 1995, p.35). It is through the flexibility of mixing methodologies that a greater understanding of complex issues is possible.

Some Final Thoughts

Before consolidating our argument regarding the synergy between action research and complexity we wish to present a somewhat challenging quotation.

The problem with complexity is that it is – well, complex. It is difficult to conceptualize, much less operationalize, emergent phenomena. Thus, as intuitive and even obvious as the idea of emergence may be, it has not advanced much beyond rhetoric, metaphor or disclaimer. If anything, the effect has been to trivialize emergence as either too obvious or trite to be theoretically useful, or too complicated to be practically useful (Mihata, 1997, p.34).

Action research would appear to address both of these concerns. Action research has always, by very virtue of its approach, operationalised emergent processes and it hasn’t shied away from complexity. In so doing it has also encountered criticism that it addresses the ‘trite’ and purely pragmatic. Yet action research has proved its capacity to be both theoretically and practically useful. When Lissack (1999) spoke of the application of complexity theory in organisational contexts he stated that “Organization science for fifty years has focused on controlling uncertainty. Complexity science for the past ten years has focused on how to understand it so as to better ‘go with the flow’ and perhaps to channel that flow” (p.8). Action research, as an approach to inquiry and understanding, of course, does exactly that.

In this paper we have explored the theoretical and metaphorical constructs of complexity in a very brief exposé. We have not attempted to delve into the wealth of ‘scientific’, mathematical or computational literature which describes and supports the work being done in complexity, nor have we endeavoured to be too ‘technical’ in our presentation. Readers who are interested in the ideas presented by complexity would do well to read further from the growing range of very accessible literature in the area. What this paper has attempted to do is to portray the application of complexity to the social sciences as both developing theory and challenging metaphor and to draw attention to the potential methodological connection between complexity and action research.

To conclude this paper we would like to leave you with a simple but powerful metaphor which we believe adequately represents the ideas presented in this paper.

The world is a complex place where even an apparent simple question has subtle overtones. And we find out, too, that in some ways the world is a simpler place than the buzzing of unique experiences: decisions do get made... neither the quantitative hook set for the big fish nor the qualitative net scaled for the little fish adequately captures life in most seas. We need a paradigm to help us become scuba divers (Datta, 1994).

We would argue that complexity is that paradigm and that action research may be an appropriate and powerful vessel in which to conduct such fishing forays.
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