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Social Ecology Education and Research

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History of an educational innovation

The roots of social ecology are embedded in the fertile soil that was the Hawkesbury Diploma in Rural Extension, first offered in 1970, at what was then known as Hawkesbury Agricultural College and now the University of Western Sydney. The program changed its title to Graduate Diploma in Extension in 1974, and again in 1982, to Graduate Diploma in Social Communication. During this period the key features of the program remained the same: it was always highly experiential; it overtly fostered the learner's growth in self esteem; and it espoused the goal of measuring learning against a yardstick of social relevance.

The decision to change the title yet again was greatly influenced by the writings of people like Gregory Bateson (1972), Anthony Wilden (1980) and Murray Bookchin (1982). The common ground that these authors were exploring was the co-evolution of any system and its environment. Not only do the players evolve; but so do the patterns of relationships that link them and so does the context in which these players act. Another connecting theme was the pursuit of an improved quality of relating - people to people and people to their natural

environment. Yet another was the dropping of metaphors of power, hierarchy, input and output, and substituting metaphors of complementarity, fit, pattern, aesthetics and elegance. The term *social ecology* seemed to more appropriately signify this evolving understanding and so the formal, and presumably final, change was made in 1987.

The transition from this single postgraduate diploma to the full range of University offerings (undergraduate degree to Ph D) has been a period of rapid growth and has constituted an ongoing evolution of the underlying network of theoretical assumptions and their practical application. It is the aim of this paper to convey some of the flavour of this development.

What is social ecology?

Social ecology is not a term in common use. It has been chosen to express an integrating and contextual focus. The use of the word *social* underlies the belief that it is people who make meaning. Meaning is not out there in nature, or in the events themselves that we participate in. Meaning is understood to be a social construction (cf. Berger & Luckman, 1966).

Ecology, the second word in out title, conveys the community of living and non-living things, and all the intricacies of their coherence and change. Social ecology is then a way of integrating the practice of science, the use of technology, and the expression of human values. It draws from any 'body of knowledge' in its pursuit of designing activities that result in self-respecting, sensitive and social behaviours which show an awareness of social and ecological responsibilities. The context for action and the subsequent critical reflection on the consequences of those actions need to involve the actor's relationship with the physical environment, the cultural setting and its history, organisational aspects, and an understanding of the constraints and possibilities set by an individual's cognitive processes.

The commitment to the fundamental importance of one's day-to-day experience of living, as constituting the raw material for the educational process, has been consistent throughout the development of the various programs that function under the social ecology banner. One's acting in the world is seen to be the primary experience; how this experience is then interpreted and made sense of, flows from this essential experience as the actor reflects upon what has happened. While the act of reflection is not essential to the actual living in the world, it does represent the very heart of the educational process and, when linked with the world of experience, constitutes a very satisfying and stimulating endeavour.

Social ecology is a label that emphasises relationships over events and discrete elements. It was chosen because we rejected the belief in an objective world 'out there', one that is proposed to exist independent of the act of the proposer. Given that we, as observers and proposers, bring into experience the world out there, it is the process of making this happen that is the focus of our attention.

The theoretical underpinnings for this *constructivist* position have come primarily from the field of neurobiology and the researchers that have influenced us most have been the Chilians Humberto Maturana and Francisco Varela (e.g. Matruana & Valela, 1988). Related but somewhat different support has come from other fields, for instance, Niklas Luhmann (1990) in sociology, Ernst von Glasersfeld (1987) in cognitive psychology, and Hans-Georg Gadamer (1975) in philosophy.

Social ecology in action

Social ecology is built on the experiential foundation that an individual constructs the world in which she lives and we share the meaning of these constructions through the process of communication. The common ground which is the basis of our ability to communicate with one another, comes about through the use of the common process of perceiving and conceptualising. What we can't share is information about the world even if we frequently behave as if we could transfer knowledge willy-nilly from one to another.

It is because of this foundation that social ecology is not 'taught'.

If we did believe that knowledge could be transferred from one person to another, in our case from the lecturer to the student - that we could instruct with information - then we would be committed to a situation comparable to that of King Midas of Phrygia who, according to the myth, received from the God Dionysos the gift of the golden touch. Due to this gift whatever King Midas touched became gold, whether he wanted it to be gold or not. King Midas could determine the outcome every time although he soon found that he didn't want to have this gift any more because with it, he has lost the original 'gift' of being an independent but connected, individual.

A large part of our educational tradition has it that useful knowledge lies in the analysis of data and, for practical purposes, we can ignore the thought that this analysis might not be objective, but might depend on our perceptual framework which tends to consist of rather simplistic models such as correlations, time courses and linear cause and effect. That the traditions of our educational practices have had great practical benefits and are workable we would not deny, but we are concerned that there is a crisis of confidence (in some sectors of science for example) arising from some of its undesirable side effects

and its failure to "fix" some pressing human problems. Nor would we wish to disparage rationality because we regard our ability to make scientific explanations as, not the only means, but one important means, of designing a better world. What we seek in social ecology is to enlarge the rational action in education and research - a commitment similar to that expressed by Winograd and Flores (1987) as a "new foundation for design." Design has to do with what our action generates and how this series of inventions influences our future action.

The phenomenon of blindness to everyday cognitive function (when compared with external technology), can make this type of an educational approach appear to some to be rather simplistic or even superfluous. The difficulty in seeing its importance lies in its obvious everydayness. We do not realise that, being only observers, living in actions which can only be described in our language, we bring forth our particular reality. We are not saying that we *create* this reality, but that we bring into operation its objects and properties by the process of making distinctions in our conversation.

The intellectual domains of self-directed and lifelong learning that have developed particularly since the 1960s have also played their part in shaping the practice of social ecology. The formative influences have been the writings of Carl Rogers (1969), Alan Tough (1968), Malcolm Knowles (1975), and David Boud (1981). The strenghts and weaknesses inherent in a commitment to this movement, and which resonate with our experience over the past twenty years, have been detailed in Philip Candy's recent (1991) systematic synthesis of the field.

The educational programs

Given that the stimulus from the staff and from students in interaction with other students, can only ever trigger a response and not determine what will be learned (what will be the nature of the outcome), then what we have tried to do is to create a stimulating and responsible (response-able) environment. As an illustration of our basic premise of not being able to determine an outcome for others, what we espouse doing and what actually happens (the experience as described by the individual) can sometimes be worlds apart.

It is also apparent that staff vary in the manner of their triggering which ranges from considerable prepared material in the form of 'content' and therefore of necessity, less 'process' (the focus here is on what is happening at the moment), to exactly the opposite. Consistent across the staff group however is the expressed view that what is most important is a rich experience and a rigorous reflection.

The experiences fostered by the staff are designed to provide opportunities for the acquisition of skills, skills which are judged to increase the satisfaction derived from the doings of the student in that particular domain which is being worked in at any one time. Under general category headings, these are the domains of:

1. **physical competencies** in which the senses, or extensions of the senses (e.g. microscope, computer), are used to observe and act - the world of empirical knowledge;

2. **conceptual competencies** in which the intellect is used to generate conceptual frameworks and to relate such frameworks (models) to gaining useful understanding in a context where explanations are judged to be important in shaping future experience. It is the world of ideas and the history of ideas; the cultural history of narrated experience; the social contextual grounding which determines how we express our day-to-day world of experience;

3. **psychological competencies** which have as their basis our emotions (our predispositions to act) and which are acknowledged as the driving forces behind our being and doing in the world. This domain of competence is the domain of psychological coherence. In this domain the skills are related to acknowledging the connection between what we do and the enthusiasm (emotion) we have for doing it, and between what we do that is not sourced by enthusiasm but by the dictates of another. In this domain we find the expression of the human struggle to live outside of the domination by the ideas and emotions of other's and to be true to one's own emotions - a struggle which is at the heart of the drama of our daily living in the world.

Whether the social ecology programs are grounded in coursework or research, the general acquisition of the above competencies remains the goal. The programs structured around coursework rely much more heavily on the staff providing the intellectual stimulation (the triggering) for the participants. Here the staff have a predominant role in telling and showing their 'stories': Their stories of how they manifest and make sense of the three general categories of competence. In the case of research degrees, it is the reverse. The students take the dominant role in telling their 'stories' as they relate to their structured doings-in-the-world. The structure for doing research is within the tradition of intellectual enquiry where the categories of data encompass both the empirical (observational data) and hermeneutic (interpretative data) traditions.

Achievement is recognised by being able to demonstrate what can be done across the three domains (physical, conceptual, and

psychological) in accordance with a previously negotiated level of competence. While participants will vary in the degree of competence achieved across the domains, an integration of the three is an espoused goal of all educational programs.

In writing this paper, my main desire is to describe the intellectual foundations of social ecology and illustrate how these foundations find expression in the interchanges between students and staff. Details of how the courses are organised to achieve these ends are best found in the formal course documentation.

The business of engaging with others so as to better trigger an ongoing and satisfying relationship is the most creative of endeavours. In the early days of this challenging pursuit, we (the staff) tended to find ourselves more often in the role of responding to the students' activity than taking an initiating role and expressing our own doings-in-the-world. The rationale at the time was the well-intentioned one of not wanting to interfere with the learning of the other; not wanting to set the agenda for the other's learning. However, with the passage of time and through the process of reflecting on our own experience, we have begun to recognise the importance of offering an invitation to our students to listen to our stories which tell of our strivings to develop and integrate the three general domains in all that we do.

Working within a constructivist framework and fostering the individual nature of learning can mistakenly lead some people to conclude that one's actions and attitudes are independent of the physical and cultural milieu in which they are embedded. Philip Candy gives us a timely reminder that as researchers and educators we must not "lose sight of the wider social and cultural issues that influence, and in many cases determine, how particular individuals see their personal wolds" (*ibid*:p.268). The shared nature of much of human understanding results from a shared history of interaction with the environment, constructed through language, and can result in clearly observable destruction of social and environmental systems. Not all constructions are equally useful for the sustainability of the world that we know. One of the aims of social ecology is to encourage people to *reconstrue* events and ideas in ways that lead to more social and ecologically responsible behaviour.

How the triggering is done

It is my contention that the most exciting and challenging task for an academic is to consciously design a meeting of minds. A meeting in which the introduction is that of an invitation... an invitation to meet with the other and to bring into the meeting the fullness and the richness of each person's world of experience. The notion of an 'invitation' is critical to the desired outcome. An outcome that needs

to express the accepted validity of at least two world views because if one person's conception of the world dominates the other, then it is an occasion for control over another and not an invitation to work together.

How this is done is through the combination of a language of scientific rationality and a language of metaphor and myth.

The language of science is directly related to the domain of empirical knowledge (especially that of the physical/empirical competencies)... how our understanding of living phenomena is constructed and how it is validated (cf. Maturana &Varela, 1988). It is also related to the domain of making sense and conceptualising which is developed out of our biological capacities for cognition and languaging.

The language of metaphor and myth belongs to our psychological realm and acts as a bridge between what is observed and what is imagined. The world of the imaginal is at the heart of any psychological understanding. It, alongside the rational, gives a fuller picture. Either one on their own, can only ever be 'half of the story.'

Scientific explanation and social ecology

The development of the still dominant conception of science during the Enlightenment was based on the notion that reality, including human beings, is a fixed reality and is 'out there'. The logic went like this: By applying rational understanding, we will increasingly gain accurate knowledge of its elements and the laws of its functioning. In this perspective, human existence was considered to be simply one object among others. The researcher remains outside the system being studied and we, the people of this world, are actors in/on our environment.

The belief in an increasingly knowable world, a world which is capable of being understood without the need to take into account our actions as participants in creating that very world we experience, has led to the belief in a number of false gods:

1. that identifiable objects with well-defined properties do exist and that they exist independent of the perceptions and actions of the researcher;

2. that the properties of these objects are quantifiable and that these measurements represent dimensions of a real world;

3. that because of the 'discovery' of general rules that apply to the functioning of these objects, prediction of future events or processes is especially valued.

While this Enlightenment approach to science has enabled scientists to act as if they were dealing with an independent real world and there are enormous technological achievements for them to be rightly proud of, it has not proved to be all that useful in the realm of human experience. It is this realm that is at the heart of social ecology and it is for this reason that we have recognised the need to locate more appropriate criteria for validating what we do when we act as scientists.

Along with Maturana and Varela (1988), we have found it useful to depict a four-step process of doing science which is not dependent on either prediction or quantification for its integrity. Given that we are not accepting the existence of a knowable reality independent of the act of the observer, then science can best be described as follows:

1. *describing* a phenomenon that has been experienced and doing this in a way that allows others to agree or disagree as to its existence;

2. *proposing* an explanation for the existence of this described phenomenon. This explanation functions as a 'generative mechanism' in the sense that, when the mechanism operates, the phenomenon appears;

3. *deducing* from the first experience other experiences, that are coherent with the first, and which would result from the operation of this mechanism that has been proposed as an explanation; and finally,

4. *experiencing* the other phenomena that were deduced in step (3).

While quantification is not essential to this process it is often useful in the deductive phase of step 3.

In essence, I am saying that in using these criteria of what constitutes science, we begin with an experience and end with an experience. We explain experience with experience and the generated explanation always remains secondary to the world of daily living. If I want to offer an explanation of a particular dream - propose a generative mechanism for the actual experience - then I must look at my experience of daily living.

Narrative explanation and social ecology

It would be too restrictive to explore human experience only through the eyes of science, even a science not dependent on objectification and quantification. The process of meaning-making, of generating explanations, is basic to all intellectual life and there needs to be at least two paths that lay comfortably side by side: one based on

material and observational data - the scientific path; and one based on establishing a coherence of actions and events over time - the narrative path.

Narrative understanding, which has the fluidity and wholeness of a story that brings together in a meaningful whole an experiential understanding, is in tune with the pain, aspirations, memories, joys, and longings of the human journey. The path of science is of necessity exact and definite. The path of narrative is intuitive and imaginative. Together, they speak of an appropriate education and a meaningful research.

I have used traditional stories from various cultures as a way of engaging students at both the rational and emotional levels in the learning process. Sometimes the stories are used to illustrate a network of relationships and thus can serve a useful explanatory function (e.g. Russell, 1990; Bird *et al.*, 1990). In a similar way, they can serve to draw forth new stories from the students who then overtly engage in the shared construction of meaning (e.g. Russell, 1986).

Donald Polkinghorn expresses this experience-explanation connection very elegantly when he says: "The simplist of narratives is always more than a chronological series of events: it is a gathering together of events into a meaningful story. The vehicle of explanation in a narrative is a plot. The plot provides a storylike causal nexus; it exhibits a coherence rather than deductively demonstrating it" (Polkinghorne, p.131:1988).

Also, it is the actions of the actors in the narrative that convey their emotional state. It is the action of the narrator of the story that makes the expression of emotion a legitimate experience for the classroom. And it is the unfolding of the plot that relates the necessary responsibility for the action taken, home to the actor. Through the continuous integration of narrative into the experience-explanation-experience relationship, the discussion of ethics becomes an inevitable ingredient of the learning process.

Again Donald Polkinghorn has a nice way of capturing the essence of why stories are important to education and why we use them so often in the 'doing' of social ecology: "Through the action of emplotment, the narrative form constitutes human reality into wholes, manifests human values, and bestows meaning on life"(*ibid*, p.159).

Stories are the meaning-making vehicle *par excellence*. Besides, I happen to love using them because, in some fashion or other, they connect me to my co-learners and I find this experience very satisfying.

The researching educating experience

The process of doing research and the way that the educational programs operate are two manifestations of our common underlying approach to generating useful knowledge and action. The elements of this approach are:

1. An invitation to join in a conversation in which the other's 'story' is respected as legitimate at all times and it is acknowledged that the conversation itself is important. This conversation will include, as much as is practicable, all those who have a stake in the issue that has brought the participants together. The participants (stakeholders) are valued as equal participants, though with varied talents and skills.

2. A sharing of concerns, unresolved questions about what to do next, loose threads or dead-ends in our stories and also hopes and dreams. This is a kind of dialogue through acknowledging different ways of seeing things rather that a striving for consensus. In it there is a space created for talking about the such matters as the vicissitudes of the environment, the underlying ambitions of the people concerned (including those of the researchers/educators), the 'silly' ideas which could not be justified in prudent research or education, and the gems of wisdom contained in stories from far and wide - an opportunity for listening as well as spelling out.

3. An acknowledgement of both the need for managerial distinctions about priorities and goals, in research and in education, and the inherent limitation of adhering to these distinctions - because of the phenomenon of blindness in the cognitive process which can turn a creative spiral into a vicious circle. It is in acknowledging that we-don't-know-because-we can't-see-that-we-don't-know that the space is created for a genuine commitment in language to arise.

4. A commitment in language to the resolution of some of the community-generated issues, or matters of concern - within the network of conversation itself. This involves taking responsibility for characterising the current state of irresolution, e.g. assessment procedures in the case of the educational process; the apparently irreversible land degradation in the case of a research project, *etc*. and designing a stepwise progression towards its resolution, which will have been reached when there is no longer any need for that discussion.

The practice of social ecology entails a personal responsibility based on acknowledging the process of cognition, so that the emphasis is shifted from research and educational priorities and goals *per se* to the nature of the conversation itself. The way of doing social ecology

described here appears to us to offer a better explanation and acknowledgment of what is is that the most successful people actually are doing within our present educational and researching communities.

The researchdevelopment relationship

Social ecology provides the opportunity for a contextual grounding for research and development (R&D). The author is currently involved as a principal researcher in a project [1] which is specifically designed to develop and evaluate a participatory researching model in which the actions and perceptions of the researcher are very much part of the interaction being studied. A criticism that has sometimes been made of the educational processes used in the institutional setting is that they would not be applicable in the *real world* for there you wouldn't have a captive audience. The criticism constituted a serious challenge to the validity of theory and practice espoused by the staff. The intention of including in this paper a practical example of the educational processes expressed as a research project is to illustrate that we have found confirmation in the field, equal to that found in the academic milieu.

This research is located in the semi-arid region of the State of New South Wales, north of the city of Broken Hill. Families of pastoralists are being invited to tell of their day-to-day experience and where possible, their understanding/interpretation of their experience. The aim is not to pursue a 'fact finding' mission but rather, via the medium of 'stories', to tell of their experience. The semi-structured interviews that are used to trigger the accounts are designed to map out patterns of meaning across time: First, the historical context; second, the present-to-hand experience; and third, the anticipated context (the future). This phenomenological data (data based on experience and action) is coupled with the hermeneutic data (how the family members make sense/interpret their experience) to constitute the contextual research focus. Proceeding along a parallel and dynamically interrelated path is the mapping of patterns of analysis constructed from social, ecological, and pastoral events.

From the complementary interaction of these two processes, the participants identify their enthusiasms for taking action in particular domains (social, political, flock management, etc.). Given that these people share a common geographical area, it is anticipated that there will be some groupings formed along the lines of shared enthusiasms. These groups will constitute 'user-initiated R&D groups' response-able for the generation, management, and subsequent evaluation of actions designed to benefit themselves as a pastoralist community.

How the experience and the theory flow together

What follows is an account of how our practice dovetailed with our conceptual modelling in a recent phase of our research work:

Experiential world	Conceptual world
Invitation & semi-structured interviews Stories of experiences (present, past and future)	Through showing 'acceptance' enthusiasms for action are elicited
Analysis & mapping of enthusiasms using pastoralists' own words	Researchers are both catalysts and conceptualisers
Invitation to attend group co-discussion	Invitation to be co-researchers
By becoming pastoralists researchers assert 'ownership'	Presentation & discussion of maps
Invitation to generate afresh co-researchers and share direction of research	Pastoralists act as enthusiasms for action
Pastoralists nominate the issues they want to act on	Participatory research they want design is now in place

It is not within the scope of this paper to add more detail other than to say that this research is an informed (theory-based) attempt to:

- Accept pastoralists (all involved family members) as competent researchers in their own right;
- Integrate their enthusiasm for 'research' with maps (patterns over time, space, decision making) of economic, social, political, ecological, and range management data;

- Reflect back to the pastoral community, the value of their 'traditional' R&D knowledge for the sustenance of this way of life; and
- Articulate the theoretical underpinnings of this research approach for the benefit of the broader scientific community.

As an illustration of how this researching experience constitutes the necessary operations of 'doing science', I will focus on the four critical steps as listed in section 4.1 and flesh them out with some specific details of the research project.

The first step is a description of the phenomenon that seduced me away from an 'accepted' belief and subsequently caught my imagination. The phenomenon was: *People want to take certain*

actions and not others. They do not need to be persuaded to do what they want to do but resist all sorts of persuasions aimed at inducing a change which they don't want to make.

The context for this conclusion, which in itself doesn't sound all that world shattering, was a research project that involved farmers of the Forbes shire in New South Wales. The accepted tradition in agricultural extension is to take research findings, generated by the scientists, and transfer them via extension officers to the farmers who would then adopt them. Over the past decade there has been a growing suspicion that this practice generally didn't work (see Russell *et al.*, 1989, for a critical review of the current theory and practice of agricultural extension). As a consequence, there developed the belief that farmers had 'blocks' (emotional, social, intellectual, educational) to adopting innovations and new technology. What we (the research team) found however, was that farmers were universally 'smart' and innovative around those pursuits which they had enthusiasm for. They appeared to be 'laggards' when it came to those areas around which they had little or no enthusiasm.

The second step is the proposing of an explanation which might account for the presence of this phenomenon. Our proposed 'generative mechanism' is: *It is the emotional state of enthusiasm that determines what category of actions will take place*. We are defining an individual's emotional state as her/his predisposition for action. By bringing people together who shared a common enthusiasm to pursue some objective, the achievement of their objective would be ensured.

Thirdly, from the operation of their enthusiasm-for-action, what other experiences could we deduce that would occur when the expression of enthusiasms are encouraged and shared? We judged that the pastoralists would gradually seek to take 'ownership' of the necessary intermediary tasks that would have to be done in order for the research to progress. These tasks have a clear coherence with the intended objective, namely, the generation of user-initiated R&D groups which would determine, generate, evaluate, and communicate their own research - research which was designed to meet their own needs.

Finally, we need to experience that these anticipated intermediary tasks are actually happening. Well, we have already found that our co-researchers (the members of pastoralist families) have taken the initiative and the responsibility to invite their neighbours to join in the researching process. We have also found they they have begun to translate the 'doings' of the project into their own language and have invited us (the initial researchers) to modify our procedures so as to better meet their needs. Since we are only at the end of the first of three planned phases, this fourth step is as yet very underdeveloped.

On a more personal note, we have found the theory and practice of this participatory approach to be exciting and daunting all at the one time. Making our science self-reflexive and having the social, historical and intellectual contexts openly influencing the construction of our knowledge must be one of the most worthy pursuits available to humankind. As a task for science in today's world it seems to be especially relevant given our need to ask different sorts of questions. Research and development, like every technology, are a vehicle for the transformation of tradition. Being part of a tradition we cannot be objective observers of it. We can however let the potentials for transformation guide our actions in creating and applying research and all that it entails.

Concluding comments

Throughout this paper I have stressed the braiding together of science and daily experience (and the interpretation of experience). In talking about experience I have focused on two modes of explanation, that of scientific and that of narrative. I have felt constrained in giving such a prominent position to the use of narrative in that I would liked to have included other expressions of metaphorical and mythological understanding. I chose not to stay with the more general gestalt of a braiding of science and art simply because of the felt need to give a detailed description of one 'artistic' form rather than a light skipping over of all the possible metaphorical forms. There is no sense of prescription intended by my emphasis on narrative as the staff group encourages the full range of artistic expression and explanation including music, visual art, drama, poetry - the choice is a matter of individual enthusiasm - after all, it is the relationship that really matters, not the individual elements.

Note

1. This was a joint research project between the University of Western Sydney, Hawkesbury, the University of Sydney, and the NSW Department of Agriculture & Fisheries. The main funding body was the Australian Wool Corporation.

References

Bateson, G. (1972), *Steps to an Ecology of Mind*. New York:Ballantine.

Bird, G., Russell, D. & Fell, L. (1990), *The Constructivists' Picnic*, Opening Session of the 5th Australasian Conference on Personal Construct Psychology, Adelaide. Published as a monograph in the series *Social Ecology Treasures*, No. 1, Social Ecology Centre, University of Western Sydney, Hawkesbury.

Berger, P.L. & Luckman, T. (1966), The Social Construction of Reality, New York:Doubleday.

Bookchin, M. (1982), *The Ecology of Freedom: The Emergence and Dissolution of Hierarchy*. California:Cheshire

Boud, D.J. (1981), "Toward Student Responsibility for Learning." In D.J. Boud (ed.), *Developing Student Autonomy in Learning*. London: Kogan Page.

Candy, P. (1991), *Self-Direction for Lifelong Learning*. Oxford: Jossey-Bass.

Gadamer, H-G. (1975), *Truth and Method* (translated and edited by G. Barden and J. Cumming). New York:Seabury Press.

Knowles, M.S. (1975), *Self-Directed Learning: A Guide for Learners and Teachers*. New York: Association Press.

Luhmann, N. (1990), *Essays on Self-Reference*, New York:Columbia University Press.

Maturana, H.R. & Varela, F.J. (1988), *The Tree of Knowledge: The biological roots of human understanding*, Boston: Shambhala.

Polkinghorne, D.E. (1988), *Narrative Knowing and the Human Sciences*. Albany: State Univ. of N.Y.

Rogers, C.R. (1969), *Freedom to Learn: A View of What Education Might Become*. Columbus, Ohio:Merrill.

Russell, D. *Communicating for Change: A lot more doing and a lot less talking.* A paper presented at the Australian Communication Association National Conference, Macquarie University, July, 1986

Russell, D. *Social Ecology and the Greening of the Australian Mind*. A keynote paper presented at the Inaugural Green Seminars, Sydney, February, 1990

Russell, D.B & Ison, R.L. (1991), *The Research-Development Relationship in Ranglands: An Opportunity for Contextual Science*, Plenary Paper for Fourth International Rangelands Congress, Montpellier, France.

Russell, D.B., Ison, R.A., Gamble, D.R. & Williams, R.K. (1989), *A critical Review of Rural Extension Theory and Practice*, Richmond:University of Western Sydney, Hawkesbury.

Tough, A.M. (1968), *Why Adults Learn: A Study of the Major Reasons for Beginning and Continuing a Learning Project*. Toronto:Ontario Institute for Studies in Education.

Von Glasersfeld, E. (1987), *The Construction of Knowledge: Contributions to Conceptual Semantics*. Salinas, CA:Intersystems.

Wilden, A. (1980), *System and Structure: Essays in Communication and Exchange*. (2nd ed.) London:Tavistock.

Winograd, T. & Flores, F. (1987), *Understanding Computers and Cognition - A new foundation for design*. New York:Addison-Wesley.