PART C - WHOLE SYSTEMS THINKING IN EDUCATION AND LEARNING

Purpose: to further explore how far whole systems thinking is part of the current education and learning debate, and the implications of whole systems thinking for transformative learning and change towards a more ecological educational paradigm.

Introduction

Part C looks critically at paradigm discourse in education and research from a whole systems thinking viewpoint, and argues for an ecologically based educational paradigm, building on the foundations outlined earlier in Part B, and elaborated in **Appendix I.** In section 1, nesting system models are used to illustrate an ecology of the education/society relationship, and to suggest how a co-evolutionary rather than a simple linear view of this relationship helps explain the maintenance of the dominant educational paradigm - but also indicates the possibility of reorientation towards the sustainability agenda in both social context and in education. Also in section 1, I look at paradigm discourse in research and education, to explore how far a participative paradigm consistent with whole systems thinking is currently emerging as part of a process of collective learning. In section 2, liberal and critical traditions in education are reviewed briefly as antecedents to an ecological paradigm, and systems based critiques and alternatives to the dominant paradigm are also discussed. This sets the scene for an elaboration of the bases and broad implications of the ecological education paradigm. Section 2 concludes with a discussion on learning levels and transformative learning as a key to the realisation of such a paradigm. Lastly, section 3 summarises some implications of recent thinking on complexity and management in relation to change, learning and sustainability.

1 THE EDUCATION PARADIGM DISCOURSE

1.1 Educational paradigm: modelling, maintenance and movement

In this subsection (1.1), a systems view is used to help explore: maintenance of the dominant educational paradigm, ‘systems failure’, and the possibility of movement or deep change.

As noted previously, such movement necessarily takes us beyond focusing on mainstream education as an agent of change towards sustainability (whereby both concepts of education and sustainability stay within existing perceptual boundaries), towards the exploration of how deep or transformative learning can take place in the way that we view and practice education, so that it might become more transformative. This implies, at least, a second order learning process for all involved or interested in education, and beyond this, ideally, experience of third order or epistemic learning amongst at least a significant minority who can act as 'change agents'. These processes involve the realisation both of a *deeper critique* and a *broader vision* than is possible by staying 'in paradigm', and abandonment of assumptions which suggest a linear relationship between education and its social context.

The dominant education paradigm - as any paradigm - is self-referential and self-reinforcing, whilst still flexible and accommodatory. So often, what appears to be innovation and change is still mostly within the existing parameters. As Bawden insightfully remarks:

> It is so much easier, and thus pervasive, to deal with unfamiliar issues in a familiar way than it is to deal with familiar issues in an unfamiliar way. (Bawden, 1991, 2365)

Such maintenance tends to hold despite debate on educational 'reorientation' in relation to sustainability. For example, I have often argued (see for example, Sterling 1996, Sterling 2002), that the achievement of individual or social change *through* education requires change *in* education (see discussion in Part B.3.1). At one level, this argument is often accepted: what is frequently not appreciated is the depth of cultural change that appears necessary both in society and in education, in the light of the sustainability imperative. The response deemed necessary in education tends to be cosmetic, while the main focus of any attention remains an instrumental and behaviourist 'change *through* education', while underlying values and contradictions '*in* education' as a system of interest go largely unexamined and unchallenged.

Predictably, perhaps, the World Summit for Sustainable Development (WSSD) held in 2002, provided more evidence of the lack of substantive progress as regards the 'reorientation' of education agreed at the Rio Earth Summit held ten years earlier (see Part B.3.4 for discussion on this lack of progress). A UNESCO report (2000, 9) prepared for the WSSD notes that "much of current education falls far short of what is required", and calls for a "new vision" (2000, 10) and "a deeper, more ambitious way of

thinking about education" (2002, 8). Yet predictably also, the report does not attempt - in common with much of the 'education for sustainable development' discourse - a deep analysis of why education 'falls far short', or explain why, far from being the vehicle of transformative change advocated at successive international conferences from Stockholm (1972) onwards, education worldwide remains largely a conservative influence. Nor does the report indicate what the basis of a 'new vision' might be.

Often missing from the 'education and sustainability' debate is a deeper appreciation of the culture of education as an expression and manifestation of the wider cultural milieu. Using systems terms, the issue may be interpreted as a lack of perception of education as a subsystem of wider society, and therefore also as a subsystem of the dominant social paradigm or worldview. Partly because of this non-recognition, education (using the word here to connote a paradigm/belief system/practice), lacks what I have called sufficient 'response-ability' (Sterling 2001), that is, the ability to respond fully to the sustainability crisis.

To explore these issues further, in this first subsection I use a systemic view to outline a theory of paradigm maintenance, and of paradigm change and movement. I also introduce the notion of 'systems failure' (Peters 1999, Chapman 2002). To reiterate (as stated at the beginning, in Part A.1.2) throughout the Thesis, and continued here, I am attempting to build a theory that:

- *helps explain the lack of fundamental change in educational paradigm* (that is, the relative inability of the prevailing educational culture as a system of thought to change through learning),
- *helps construct a theory of transformation that might assist such fundamental change* - which would in turn…
- *enable a transformed educational paradigm to support a quality of transformative learning necessary to societal movement towards sustainability.*

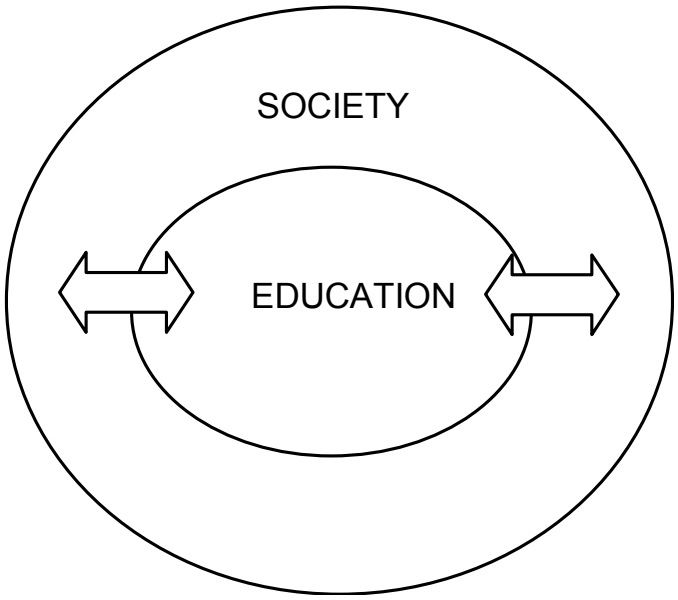
To begin, I re-present my whole system models as tools to assist analysis and discussion in this Part C.

As argued previously, understanding of paradigm is crucial to understanding everything that is influenced by that paradigm - including thinking, policy, and practice. By 'understanding' I mean more than the intellectual comprehension of the concept of 'paradigm': rather, the difficult step of moving beyond the dominant paradigm enabling

us to ‘see’ through it rather than with it: a transformative learning experience. As I have argued above, the nature of such a meta-perspective is some form of whole systems thinking.

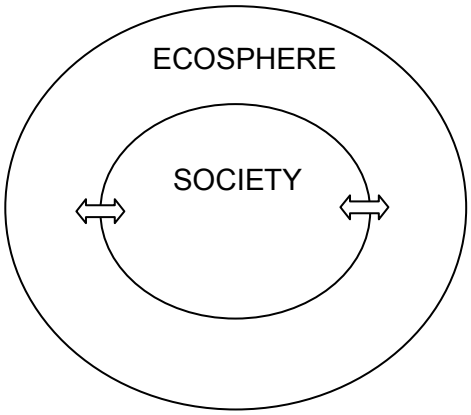
The model and idea of *nesting systemic levels* is important and helpful. Amongst other things, this indicates the importance of being cognisant of the *level* of paradigm that we are considering at any one time (as argued in Part B). Thus, I identify the relationship between a dominant social paradigm and a dominant educational paradigm as a co-evolutionary and nested one, whereby the latter may be seen as a subparadigm of the former (Diagram C.1).

Diagram C.1: Education and society as nesting systems



This simple diagram graphically illustrates the problem: how far current changes - as reviewed in Part B - towards an ecological worldview in the social/cultural sphere, can inform, stimulate and interact with parallel changes in the educational paradigm, or how far the latter are more conditioned by the dominant social paradigm. While this diagram can be read ‘downwards’ to yield more detail at subsystem level (and I do this in section 2.3 below), it can also be read ‘upwards’ and placed in the larger ecospheric context (Diagram C.2):

Diagram C.2: Education and society as nesting systems



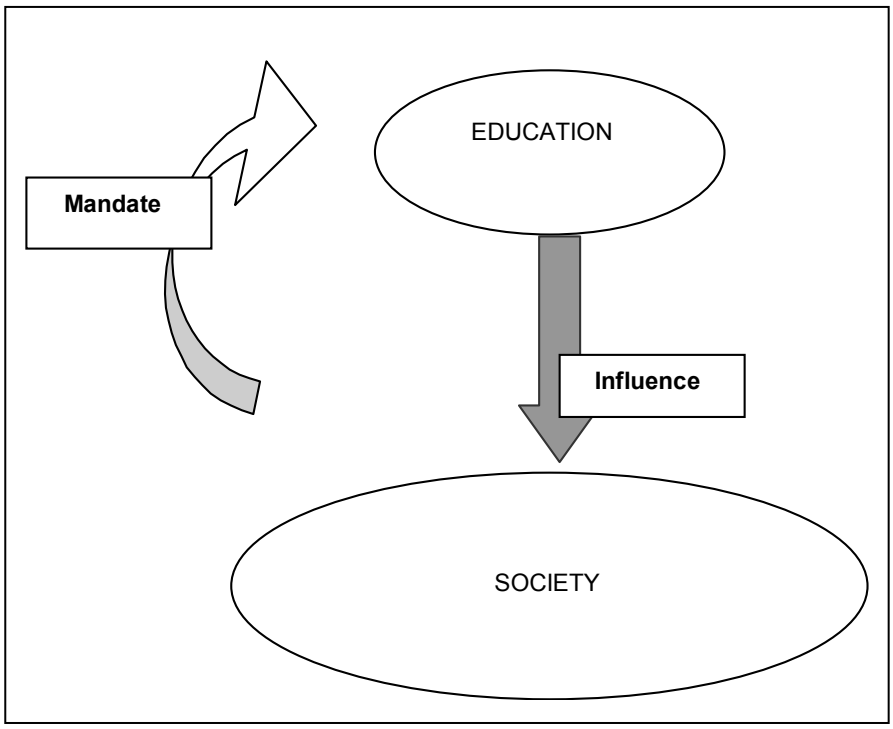
This diagram echoes the critical point (made in Part B.3.2) regarding the lack of integration, 'fit' or congruence between dominant Western socio-economic systems and the ecospheric system (Daly 1996, Brown 2001). These nesting systems relationships suggest a perspective on the status of, and possibility of change in, education. If we read down the hierarchy, education may be seen as a subsystem of the socio-economic system. In recent years, as documented in Part B.3.3, the rise of the managerial, instrumental, marketised view of education in many Western systems has narrowed its function. Therefore:

- Keypoint: the 'vehicle of change' role accorded to education since the 1972 Stockholm conference clashes with its role and status as a servant of an unsustainable socio-economic system at odds with the ecosphere.

We can invoke here the notion of 'systems failure'. According to Peters (1999, 124) failure can be considered to be of four types: objectives not met; undesirable side effects; designed failures; and, inappropriate objectives. Criticism of education - particularly in political debate - often centres on the first meaning, but in terms of the ecology of systems outlined above, education largely 'fails' in terms of the other aspects of failure: the purposes or objectives of education largely fail to take into account sustainability, many participants and actors in the system are disengaged, while undesirable side-effects include widespread ecological illiteracy and its consequences (Orr 1992, Jucker 2002). Using this notion further, we can distinguish 'nesting failures' - of educational systems failing society in terms of 'falling short' (UNESCO 2002), and of society/economy failing to 'fit' the ecosphere in the sense that Daly and Brown have argued.

These problems are compounded by a prevailing modernist/mechanist view of education that is essentially instrumental, and that views the relationship between education and its social and political context as linear. This is represented by the following diagram (C.3):

Diagram C.3: Linear perception of the education-society relationship

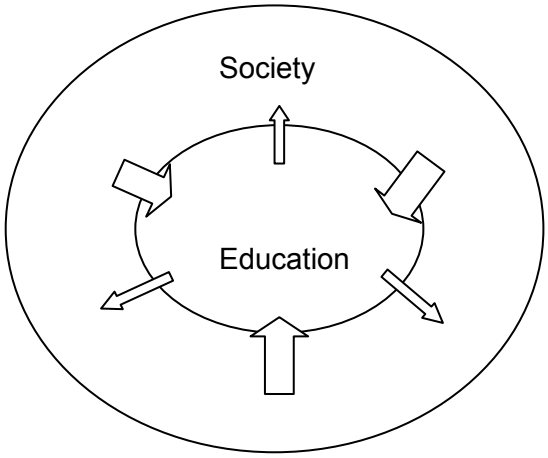


In this view, education and society are considered as parallel and separate systems. While society provides a mandate for and influences the values and purposes reflected in education, there is a general assumption that education directly or indirectly affects the kind of society that emerges over time almost irrespective of the social context that education operates in. In its strongest form, this instrumentalism is behaviouristic and positivistic, whilst often in a milder form, it may be seen in government and NGO initiatives and campaigns to educate *for* something (environment, citizenship, international understanding, etc) or *against* something (drugs, racism, sexism etc): often with rather disappointing results, particularly when such education is 'delivered' through instructive rather than participative strategies (Sterling 1996b).

From a systemic point of view, (as so often) this dominant view appears not so much 'wrong' as limited. Education is unlikely to have a transformative effect on society in this instrumental sense, whilst (if better seen as a subsystem of that society) it has an

adaptive relationship with it. The nesting systems diagram C.1, suggests that the larger social system, its values, culture, norms and expectations have a greater effect both on people (and young people) than formal education systems do, and also on the nature of education systems, than education has on the nature of emerging society. This does not deny that education affects people, and that transformative change can take place at the micro level, but holds that the overall effect is limited by the values, purposes, and expectations that society (and politicians in particular) places on education. There are also different time scales at work: society has a 'fast' effect on change in education, for example as regards policy change, whereas education has a long-term effect on society as individuals and groups change. As related in Part B, the recent restructuring of education systems towards the market paradigm in many Western democracies is illustrative of this relationship. This unequal dialectical relationship might be represented as follows (Diagram C.4):

C.4: Systemic and dialectical view of the education-society relationship



The tendency of the dominant social paradigm to be self-sustaining, and the subordinate relationship of education does not augur well for positive movement towards sustainability in either education or society. Yet, there are progressive elements within both systems, and moreover, as outlined in Part B, there is at least evidence of social learning towards sustainability even within mainstream debate. Further, the recursive (rather than linear) relationship between systemic levels or layers indicates the possibility of an intentional co-evolutionary and transformative relationship between progressive movements both in education and wider society (as noted in B.3.2), and I will look at this further in C.2.4 below.

Something of this possibility is revealed by an examination of the shifting ground and thinking in discourse about education and research paradigms. According to the nesting systems model, the overall socio-cultural paradigm influences the subparadigms of social science research and education, which also in turn influence the 'subsub' paradigms of environmental education - and, incidentally, limits the possibility of the development and expression of radical paradigms in environmental education and similar education for change movements. Yet there is some evidence of the emergence of what might be termed ecological/whole systems thinking in paradigm discourse, which appears to echo the stirrings of the postmodern ecological worldview in wider society. This is the next topic, where I attempt to discern pattern and movement towards a participative research paradigm.

1.2 A brief review of paradigm discourse in research and education

A number of writers have analysed education by providing models which make distinctions between sets of philosophies, theories and practices (i.e. paradigms). As Fien (1993,18) points out, a number of such models are bi-polar (e.g. authoritarian/democratic, or traditional/progressive) but there is a stronger trend amongst writers towards a tripartite paradigm model, indicating some consensus about the range of possible paradigmatic positions. Other writers, however, distinguish four- or five-part categorisations, and I look at these later. The point of doing so is to query how far thinking about education and research may be constrained by our categorisations, and to examine recent trends that challenge their seeming orthodoxy. Hence, I argue that the 'participative paradigm' can be seen as a necessary extension to mainstream models.

Lawton (1989) offers a three-part model distinguishing between 'classical humanism', 'progressivism', and 'reconstructionism' in education, whereas Kemmis, Cole and Suggett (1983) discern 'vocational/neo-classical', 'liberal/progressive' and 'socially critical' orientations in education, and Popkewitz (1984) proposes 'empirical-analytic', 'symbolic', and 'critical' paradigms. All these may be seen as broadly similar categorisations - and I have written the three parts in the same order above to indicate a common pattern of analysis. Such tripartite models have echoes elsewhere. Thus, in widely accepted models of research paradigms (positivist, interpretive, and critical), in sociological theory (particularly the three ways of knowing identified by Habermas, being the *empirical-analytic* or technical interest, *historical-hermeneutic* or practical interest, and *critical* or emancipatory interest) (Grundy 1987), and the very widely

quoted model of environmental education forms (education *about*, education *in,* and education *for* the environment) first outlined by Lucas (1972).

Each of the identified orientations within these models has differing views on the nature of education, its purpose, and methodology. They appear to be very different, and have been and are the bases of so called 'paradigm wars' (Mrazek 1993). But if we move our attention to the more fundamental meta-level of cultural paradigm, an important question is how far all these orientations are more or less influenced by the ghosts of mechanism, positivism, reductivism and dualism and the assumptions of modernism in the broader cultural paradigm, even where these ghosts are thought to be banished. A similar question can be addressed to the wider sphere of social science research, and I will now review discourse here.

According to Denzin and Lincoln (2000, 19), "all research is interpretive; it is guided by a set of beliefs and feelings about the world and how it should be understood and studied". This interpretive framework, they say, is the researcher's paradigm. In the field of social science qualitative research, the work of Lincoln and Guba (1994) has been particularly influential. They have elaborated four inquiry paradigms, being positivism, postpositivism, critical theory and constructivism, and identified their own position as lying within the latter. In a later essay, they state:

> Our own position is that of the constructionist camp, loosely defined. We do not believe that criteria for judging either "reality" or validity are absolutist but rather derived from community consensus regarding what is "real", what is useful, and what has meaning…
> (Lincoln and Guba, 2000, 164)

They go on to say that meaning making is of central interest to constructionists as this shapes action, or inaction. Further, they state that meaning making activities can be changed when they are found to be incomplete, faulty e.g. discriminatory, oppressive or non-liberatory.

Constructivism is attractive to the liberal mind, and seems almost self-evidently valid. Indeed, according to Heron (1996, 10), a good deal of qualitative research follows Lincoln and Guba's lead and as such, is presented as interpretive science within a constructivist paradigm. But there are problems with constructivism. For example, Heron's critique of this stance rests on the problem that this paradigm presents itself as idealist - i.e. where reality is seen as primarily an internal construct - and does not

properly acknowledge an independent reality yet at the same time denying relativism. Heron says that Lincoln and Guba are equivocal about whether or not reality is a mental construct and that their "explicit idealist stance seems to rest on an implicit realism, and leaves the paradigm in a state of wobble" (1996, 10).

Constructivism can be seen as an attempt to go beyond positivism and modernism, and one that partly succeeds. But from a whole systems perspective, constructivism seems to be insufficient, and in strong forms, too rooted in the idealist camp, too close to philosophy of the postmodern deconstructionist (see Part B). It is therefore vulnerable to charges of relativism, and taking insufficient account of the 'real world', or cosmos 'as is'. This argument indicates the need for something beyond Lincoln and Guba's four orientations, a fifth paradigm which is postmodern, postpositivist, and ecological, one which is able to marry and transcend the idealist and realist positions - and able to accommodate but also extend the breadth and depth of the sense-making that is the concern of constructivists. Taking again Lincoln and Guba's view that meaning making activities can be changed when they are found to be incomplete, we might say that this time has come. Indeed, taking Denzin and Lincoln's panoramic view of historical 'moments' in qualitative research, we can suggest the ecological moment is now.

Before moving on, I want to comment briefly on the critical theory position associated with writers as Marcuse, Habermas, and in education, Giroux and Freire. This reconstructivist and 'emancipatory interest' position is infuential in my own field of environmental and sustainability education and is often referred to as 'socially critical education'. (I discuss this further in Part D.1.1). I recognise the important contribution of this position and am sympathetic to it, but at the same time, it is important to mention some differences between this view and the ecological, participative view. In critical theory, there is an assumption of conflict and struggle in the world and therefore the need to align with 'counter-hegemonic social movements' (Lather 1991, 3). The ecological view begins, rather, with an assumption of the necessity of co-existence. For example, Bawden (2000a) quotes Maturana and Varela's work on the biology of cognition, saying they claim that "conflict is mutual negation, which can only be resolved...if we adopt another position where we can 're-establish a relationship from which we can 'bring forth a world together'" (Bawden 2000a, 10). This position, say Maturana and Varela (1987) is one of love as the basis of ethics - which echoes my discussion of the 'I-Thou' relationship earlier. Hence, the ecological paradigm supports a participatory view which sees appreciation and inclusivity as necessarily *preceding*

any analysis of power and adoption of an empowerment or emancipatory purpose. Transformation begins with ourselves, rather than with 'the other', and stresses 'emergence' rather than any predetermined 'agenda'. The empowerment orientation can at times assume a degree of certainty, and carry an "openly emancipatory intent" (Lather 1991, 51) which may or may not not be shared by the apparently disempowered. It may imply a degree of prejudging which can ignore the subtleties of the actual situation or of other views. The counter-hegemonic orientation may perpetuate anger against and fear of the 'oppressor', and hence support a dualistic and ideological 'us and them' mindset which is fragmentary rather than healing. Whilst 'empowerment' is often critically important, in conditions of uncertainty and complexity it is very important *first* to try to 'appreciate' and understand 'what is'; to recognise context and the nature of relationships. There is an important difference here, between *intervention and a problem-based orientation* on the one hand (which is consistent with the whole mechanistic ethos, and indeed is also seen in mechanistic schools of systems approaches), and *appreciation, suspension of judgement and valuing on* the other. This latter orientation is reflected in the systemic research tradition of 'appreciative inquiry' (Ludema, Cooperrider and Barrett 2001, 189). As they suggest:

> If we devote our attention to what is wrong with organisations and communities, we lose the ability to see and understand what gives life to (them) and to discover ways to sustain and enhance that life-giving potential.

This important difference of approach applies as much to the way we might treat and understand a landscape, as it might the way we treat and understand an organisation or individual in an educational setting. Whilst critical theory has played a major role in exposing the limitations of positivism and instrumental rationality, and illuminating the power-knowledge relationship, it is arguably still too fundamentally rationalistic itself. I see critical theory as subsumed within the larger framework that the ecological worldview offers.

Hence, Heron and Reason offer a 'fifth paradigm' which they call participative. This may be seen as a manifestation in the area of research paradigms of the ecological worldview that is the subject of this Thesis. Their work is recognised in the second edition of Lincoln and Denzin's tome on qualitative research (2000). Thus, a four-part paradigm table carried in Lincoln and Guba's chapter in the 1994 first edition, becomes a five-part paradigm table in their chapter in the second edition of 2000. Interestingly, it appears that recent literature - including Reason and Heron's work - led Lincoln and Guba to reassess the importance of axiology, ethics, and spirituality, and to their

expressed wish to include this area as “part of the basic philosophy of paradigm proposal” (Lincoln and Guba 2000, 163). This expansion and inclusion would bring constructivists, critical theorists and participative inquirers much closer together, they suggest. This is entirely consistent with my argument about the need for extension in the perceptual or ‘Seeing’ domain of knowing.

I now want to look to look further at limits and learning in paradigm discourse.

1.3 Limits and learning in paradigm discourse

There is a logic to the idea that the main recognised paradigms in paradigm discourse are limited. This stems from the notion of nesting paradigms, whereby the subparadigms of social science inquiry or of education have roots in or are heavily influenced by the underlying dominant cultural paradigm. Thus, if this metalevel is insufficient in some sense, then its related subparadigms are likely to be as well. Fien and Hillcoat, for example, suggest that research methodologies are “very much a puppet of their underlying assumptions” (1996, 26). So we can make a distinction between the subparadigmatic level of research methodology, and the underlying cultural paradigm and its assumptions.

Clearly the discourse has changed over time, and oppositional movements such as the reconstructionist and critical schools of theory and research seek to critique the limits of the empirical-positivist and interpretivist positions, whilst the latter critique the former in turn. The arguments employed by the non-positivist schools point towards or imply a more whole and even ecological position, yet often still fall short. There are still commonalities, such as a basic dualistic foundation as regards people-nature, shared between ostensibly opposing subparadigms which suggest they have more in common with each other, than they do with the ecological and co-evolutionary view that is explored in this Thesis. Yet, at the same time, the latter draws from and builds on aspects of the commonly recognised paradigms - it does not and cannot arise in an intellectual vacuum. As Heron and Reason note, the participative paradigm requires not a brand new and separate epistemology but an extended epistemology, through which - I would add - the paradigm antecedents become integrated and transformed.

Thinking again of Bateson’s notion of a fundamental epistemological error or inadequacy that characterises the Western worldview (see Part A.3.1), one has to wonder how far this runs like a deep vein throughout our attempts to climb out of the modernist view, however ‘postmodern’ we attempt to be. This reminds me of

Spretnak's observation (1997, 66) that postmodernism "stays comfortably within the essential parameters of the modern worldview" (see B.1.5 for more on this). Or as Reason (1994b, 9) unequivocally suggests:

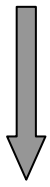
> Despite systems thinking, the 'new' physics, the metaphors of catastrophe and chaos, the reported emergence of a post-positivist paradigm, and the postmodern movement, the common epistemology of the Western mind remains crudely positivist.

Yet, as outlined in Part B, there is much evidence of movement and change, pushing against and beyond the constraints of this 'common epistemology'. It is possible, then, to acknowledge and view the development of research paradigms over time (positivist, post-positivist, critical, and constructionist) as a deep learning process, a type of second order 'learning about learning', where we have come to know and recognise the limits and partial validity of the preceding paradigm and attempted to transcend them by constructing the new.

- Keypoint: In this sense the shift across and development of the spectrum of research paradigms and philosophies is an evolutionary process, which still continues.

Whilst not denying the complexity of the field of qualitative research (as mapped for example by Denzin and Lincoln 2000), the *barebones* of the shift can be represented as follows (Table C.1 read downwards):

Table C.1: The essence of the shift in research paradigms

Positivism	Modernism	Foundationalism	
Constructivism	Deconstructive postmodernism	Relativism	
Participativism	Constructive postmodernism	Relationalism	

It's worth requoting Wilber here (1996, 67) (see B.1.5), who suggests that worldviews (paradigms) succeed each other as 'higher consciousness' emerges, and that the new emerging worldview transcends and includes the old. Because the new is more inclusive, it is more adequate. The old is not totally wrong, the new not totally right: "The old one was adequate, the new one is more adequate".

Thus each main research paradigm has a partial and specific value, but appears inadequate. Using the systems terms ‘purpose’ and ‘boundaries’ now, the main research paradigms, as systems of knowledge, reflect certain limitations:
Purpose - there can be a ‘poverty of purpose’, and therefore also often a diminished ethical sensibility, particularly as regards positivistic research. As Reason and Bradbury (2001, 2) suggest, “the purpose of knowledge-making is so rarely debated”. Purpose is often caught somewhere between a supposed value-free ‘knowledge for its own sake’ and a narrow instrumentalism allied, for example, to commercial or interests.

Boundaries - while the positivists attempt to rule out subjectivity, the constructionists attempt to rule out conceptual and material certainty. At the same time, all main research paradigms have tended to be anthropocentric, and the ecological state of the planet has usually been a secondary concern.

Using the five tests of progress towards an ecological worldview outlined in Part A, we can ask how far the main research paradigms are *sufficiently* aware of :

1) their own value bases at deep level - in relation to dominant worldview - and of the influence of the dualistic epistemological ‘error’
2) learning levels and the need for epistemic learning
3) the postmodern ecological worldview
4) whole systems thinking
5) sustainability in relation to complexity theory.

Again, echoing Wilber’s (1996) interpretation, it is reasonable to view the participatory research paradigm - allied to and stemming from the emerging postmodern ecological worldview - as the next evolutionary stage in the emergence of research paradigms. The postmodern ecological worldview accepts the materialists’ ‘realness’ – the ‘given cosmos’ or ‘resurgence of the real’ argued for by Heron and by Spretnak respectively, but also accepts the constructionist’s argument that any interpretation and articulation of that realness and of our relationship with it is inevitably mediated through language, culture and heuristics. In this sense, the participatory view is more whole. It heals an historical but unnecessary and damaging schism, and puts ‘subject’ and ‘object’ into relationship. It is not a bid for what Lincoln and Guba call “intellectual and paradigmatic hegemony” (2000, 163) because it is inclusive and subsuming rather than replacing.

I would argue that the participative paradigm is not just 'another position' on the research spectrum but represents a significant and historic qualitative change. Denzin and Lincoln are right when they suggest that there is a flux of research paradigms, subparadigms, and methodologies, a 'bricolage' (their term) which can be chosen from, mixed, applied and adapted as circumstances require and as the researcher or 'bricoleur' judges is appropriate (2000, 6). This suggests, (and Lincoln and Guba's chapter 'Paradigmatic Controversies' in the same book bears this out), that there is the possibility now of more interplay and commensurability between methods and even philosophies than earlier literature based on 'paradigm wars' suggests. Thus, while Lincoln and Guba's 1994 chapter in Denzin and Lincoln's book includes the term 'competing paradigms', the title of their 2000 chapter includes 'emerging confluences'. Yet I would argue that this overview of an apparent 'bricolage' occupies a middle space in a broader spectrum of argument, which at one end, needs more cognisance of the currency of mechanistic paradigm roots in our collective psyche, and at the other, a greater sense of the postmodern ecological worldview.

The participative paradigm derives from a 'bigger' ecological or relational worldview and cosmology that seeks - as we have seen in the earlier part of the Thesis - to transcend the still-present grip of modernism and mechanism, and acknowledge the contribution and limitations of postmodern deconstructionism. Applying again the idea of learning levels, I suggest that the emergence of the participative paradigm and ecological view is evidence of a degree of (continuing) epistemic learning at both individual and social levels, a deeper level of learning which recognises the nature and limits of the epistemological roots of the dominant paradigm. Something of this is sensed in Lincoln and Guba's open conclusion that:

> We may be entering an age of greater spirituality within research efforts. The emphasis on inquiry that reflects ecological values, on inquiry that respects communal forms of living that are not Western, on inquiry involving intense reflexivity regarding how our inquiries are shaped by our own historical and gendered locations, and an inquiry into 'human flourishing'….may yet integrate the sacred with the secular in ways that promote freedom and self-determination…and promote others' being as whole human beings.
> (2000, 185)

It is further reflected in Denzin and Lincoln's concluding chapter 'The Seventh Moment' which, drawing on Bateson, anticipates a form of inquiry in the 21st century, that "seeks a sacred espistemology that recognizes the essential ethical unity of mind and nature"

(2000, 1052). Yet in this chapter, with its embracing of postmodern plurality, bricolage and uncertainty, and anticipation of a ‘New Story’, lacks full cognisance of the grounding of such a sacred epistemology, in a paradigm of revisionary postmodernism and ecological thought that I have sought to review in this Thesis. This lends weight to my argument, perhaps, that both the research community and wider society is engaged in a lengthy second order learning period, leading towards perhaps, epistemic learning (which a growing minority now spearheads).

Interestingly - as far as I am aware - literature explicitly on the ecological/participatory paradigm is far more extensive in the areas of research, particularly in social science research, action research and cooperative inquiry, than it is specifically in education, including environmental education. The influence of paradigms in environmental education discourse is explored in Part D.

In sum, in section 1 of Part C, I have looked at the possibility of movement towards an ecological educational paradigm through learning, and illustrated this through discussion of current movement towards a participative paradigm in research discourse. Section 2 below now looks at the manifestation and implications of an ecological paradigm in education and learning, beginning with a brief resume of sympathetic antecedents.

2 EVIDENCE OF AND ARGUMENTS FOR A MORE SYSTEMIC EDUCATIONAL PARADIGM

In subsection 2.1, I look briefly at liberal and emancipatory traditions in education. Whilst sustainable education may be seen as a successor to the traditions of holistic education, the contribution of emancipatory traditions is acknowledged despite the difference in underlying assumptions informing these two approaches. This is followed in 2.2 by a look at some challenges to the dominant educational paradigm from a systems perspective and some ideas and iniitiatives which seek to articulate an alternative framework. In 2.3, I return to and employ the triadic model to elaborate a ‘vision’ of sustainable education. I then suggest some descriptors which elaborate an ‘image’ of sustainable education, and discuss in some detail one aspect - curriculum - from this viewpoint, before discussing the term ‘sustainable education’ in more depth. In subsection 2.4, I investigate the meaning and possibility of transformative learning in more depth, and employ staged learning levels to compare learning journeys towards strong sustainability in society and sustainable education in the education community.

2.1 Antecedents

As I have argued above, the ecological view in cultural or educational contexts is not arising in isolation but links to antecedent movements and philosophies. It is not of particular value to recount here the detail of these movements, but it is important to acknowledge the precursors of ecological thought in education. The most obvious link is with educational thinking that in one way or another has reflected an ethos of the learner as a 'whole person'. Typically, this meant regard for all aspects of human-ness, including spiritual, ethical, intuitive, intellectual, and physical aspects, as well as (to a lesser extent) interactions with others including environmental, social, community, and political aspects.

This lineage can be traced far back, at least to Locke and Rousseau. According to Randle (1989), much later work on child-centred, liberal, experiential and holistic education had its roots in Rousseau's thinking. Rousseau was followed notably by the work of Pestalozzi, Froebel, Montessori, Steiner and Dewey, putting emphasis on the learner and the learning environment, on learning by doing and participation, and on differentiated learning needs and styles. While it does no justice to summarise their extensive work in such short space, these educators broadly shared a non-materialist and holistic rather than mechanistic approach to curriculum and pedagogy, and a belief in human potential and community. These thinkers gave rise to the progressive education movement, beginning in the nineteen-twenties and continuing strongly through the sixties (before suffering from increasing attack from conservative forces in the seventies). In progressivism, the emphasis was (and is) on the quality of learner's experience, giving rise to educational values to do with liberalism, learners' autonomy, self-realisation, and self-esteem. Meanwhile, from another direction, arose another radical liberal education movement, this time emphasising empowerment, 'conscientization', liberation, participation, democratisation and social action, summed up in the term 'critical pedagogy'. This movement was given impetus particularly by Freire's (1972) work in adult education in Brazil and his subsequent writing, and echoed by writers such as Giroux advocating the role of the 'transformative intellectual' and Fals-Borda (1991) and Chambers (1997) emphasising participatory action research methodology (PAR). One key difference is that holistic education has tended to focus primarily on the original meanings of education *educare* (to rear or foster) and *educere* (to draw out or develop) in relation to the individual, and thereby has stressed intrinsic values in education. The Freirian legacy, meanwhile, has focussed on emancipation and social change in a community and political context, and thereby seen

education more in instrumental terms: education for change. In terms of links with research and inquiry paradigms - reviewed briefly above - progressivism links with liberal humanism, interpretivism, and constructivism, whilst Freirian traditions resonate with critical theory and reconstructionism.

In the evolution of environmental education since the 1960s, the influence of progressivism is strongly represented in the nature studies and experiential learning aspects of the field. The Freirian tradition is echoed more strongly in the socially critical emphases in environmental education, and also has been particularly seminal in the parallel evolution of development education (which has a shorter evolutionary history than environmental education, having arisen with NGO involvement in the early seventies).

It may be reasonable to suppose that a whole systems view of education and learning might be little more than an updated view of the traditions of ‘holistic education’, but I would argue that this is only part of the story. The holistic education tradition has undoubted strengths. It has, unsurprisingly, a whole view of the learner, and his/her needs and potential. It is concerned with meaning making that transcends utilitarianism and is often spiritually oriented. It favours a broad curriculum with balance between affective, cognitive and conative aspects, and the curriculum may be differentiated and partly negotiated according to the needs of the learner. It is aware of the importance of the learning environment; and places value on experiential, participative learning and process.

At the same time, I would argue that much holistic education has limitations. With an emphasis on the individual, it can lack sufficient attention to social and political contexts, and transformative engagement in those contexts. With an emphasis on negotiated curriculum and process, it can lack sufficient structure and collective agreement about what is important in terms of common curriculum. With an emphasis on developing individual autonomy, it may give insufficient attention to integration in the group or wider community. And like most educational approaches, it has in the past given little attention to ecological or sustainability issues.

The critical pedagogy tradition addresses some of these weaknesses, shares others, and carries new problems, viewed from an ecological stance. The main problem is that it remains dualistic, and grounded in an anthropocentric view of the world, and is often overtly ideologically bound. Bowers (1991, 1995, 2001), a significant writer on

ecological education and culture, is critical of all liberal education traditions, whether technocratic, neo-romantic, or emancipatory (although he has strongest words for the latter) on the grounds that fundamentally they share an Enlightenment-based view of change and progress through rational discourse. Quoting Bateson's views of mind, he argues instead (1995, 15) for a view of mind and "larger sense of community" that is, in his view, deeply ecological and systemic. We need to adopt a view of the individual, he writes, "as an interactive member of the larger and more complex mental ecology that characterises the culture/environment relationship". Philosophically, I have much sympathy with Bowers' view, but at the same time am less dismissive of both holistic and emancipatory education. Whilst I remain concerned about the rationalism, dualism and ideological aspects of critical pedagogy, I still find some sympathy with O'Sullivan's (1999) view which suggests that holistic education and critical pedagogy are complementary. Both are concerned with developing and changing the quality of interrelationships in a dynamic learning situation. To this extent, they are purposeful systemic traditions, and both have a contribution to conceiving an ecological educational paradigm and practice. It is not surprising that educational movements should reflect their times, and liberal movements are no exception. Yet in the shift from modernity to, one hopes, a more ecological postmodern future, there is still much of value in these movements to carry through.

Liberal education movements have largely been ignored and to some extent disparaged in the political rise of neo-conservative and neo-liberal thinking on education which is now in the ascendancy (see B.3.3). In elaborating an ecological, whole systems view of education, we need to reclaim some of the best values and practices of holistic and emancipatory education and liberal humanism. The argument is the same as that quoted above regarding research paradigms: elaborating an ecological view of education is more a matter of building on and subsuming, rather than replacing, earlier traditions.

I now look at some challenges to the educational mainstream from systems-based research, and systemic views of a transformed educational thinking and practice which is more able to be transformative in effect.

2.2 Systemic views of a transformed and transforming education

At the broadest level, there is an argument that postmodern conditions such as complexity, unsustainability, uncertainty, and economic and cultural globalisation require a very different view of education and learning than that which has prevailed for

a century or more. As argued throughout this Thesis, the foundational issue here is the root metaphor. In Part B.3.3, I reviewed the mechanistic metaphor that is dominant in shaping educational thinking and practice and, with the rise of managerialism and marketisation, has become stronger in recent years (Hutchinson 1996).

Bentley (1998, 175) takes a systems view of the problems that are ensuing and of the lack of learning in the system as a whole:

> Systems which cannot respond to radical change in their environment will always fail in the end. In the short term, there are always some productivity gains from working the machine harder, reprogramming more often from the top, tightening specifications and quality standards, and setting ambitious targets. But in the end, if the only response to a new environment is to run the machine harder, the result is that its components break down faster.

This appropriately describes the current 'control paradigm' that governs educational thinking, policy and practice, and *within* which, much of the discourse about standards, quality, targets and so on takes place. Bentley goes on to suggest that within other sectors of society, particularly business, organisations are abandoning the mechanistic model and transforming themselves using "new insights from the natural world" being the development of complexity theory and systems thinking, the study of evolution, and breakthroughs in understanding brain functioning (Bentley, 1998, 176).

Such organisations are working with the understanding that people and organisations are *not* machines but living systems. It is this, the living system or organism that is providing a fruitful 'new' metaphor for a blossoming of current thinking about education and learning, research, management, organisation, health, design, and sustainable systems. As discussed earlier, this switch signals a profound change - from a focus on and concern with such things as entities, products, and control to relationship, emergence, and self-organisation.

Bentley argues that the grand organising narratives - whether for example Marxism, Christianity or the market - have provided an imposed, definitive, closed account of what matters and what it means for our lives, but that these need to be replaced with a far more open and flexible view, where solutions are not preordained but generated, based on "our capacity to behave intelligently and to learn" (Bentley 1998, 172). In brief, conditions of complexity and connectivity require adaptive and generative learning to be our common currency. This reminds me of Ison *et al.*'s (Ison, Maiteny

and Carr 1997, 261) very useful distinction between ‘system-determined problems’ and ‘problem-determined systems’. The mechanistic paradigm determined (and still determines) what the educational and learning problems are, and how to tackle them, according to the constructions and worldview of this system of knowledge. What Bentley is suggesting instead is that a new awareness of complexity and living systems presents us with a matrix which should be shaping our organisations and institutions. The emergence of the ecological worldview (or system of knowledge), is part of our learning response to the newly recognised conditions. But it is not a unidirectional process: rather, the new fluid ‘social-economic-ecological conditions’ and ‘responsive educational systems’ are, or would be, in co-evolutionary relationship. (I return to this theme in section 2.4 below).

The question arises what to do with, or within, existing education and learning systems, in order to realise such a positive co-evolutionary state. Some writers argue for change at a number of levels simultaneously; for whole system change in the orientation and philosophic grounding of education and learning systems, and in more detail, towards manifestation of systemic approaches in ethos, management, curriculum, pedagogy and the whole learning environment.

Banathy (1991, 1992, 1999) has been a leading writer in a field characterised by a fairly thin literature. Banathy is more influenced by systems thinking than by ecological thought. However his argument proceeds from the assumption that we need to move beyond the traditional paradigm, through which - he says - our inquiry is still dominated by reductionism, ‘objectivity’ and determinism. This approach cannot, he says, “possibly cope with the complexity, mutual causality, purpose, intention, uncertainty, ambiguity, and ever accelerating dynamic changes that characterise our systems and larger society environment” (1991, 10). His work makes a series of useful distinctions that function in two ways: they clarify the nature of what he terms the ‘design journey’ towards a more systemic conception of education, and second, they give intellectual credence to the idea that indeed, there is a necessary difference of paradigmatic perspective here, rather than a tinkering within existing boundaries. These distinctions include the difference between:

Improving/reforming educational systems	AND	Transforming educational systems
Making adjustments in existing system		Redesigning educational systems
Piecemeal change		Whole system/systemic change
Planning process		Design process
Designing for the future		Designing the future
Adaptive learning		Transformative learning

Hence for example, Banathy distinguishes between *systemic change* which is contemplated with a view to the whole system, its environment and emergence, and *piecemeal change* which does not take these interrelationships into account, is often imposed and is therefore often short-lived (Banathy 1991, 149). The difference appears to be the 'intelligence' the designer or manager brings to the situation. Here is the difference then between first order change and second (and possibility of third) order change - as reviewed in B.1.3. Consistent with this, Banathy suggests that the nature of the questions surrounding education and learning undergo a qualitative shift, from such 'in paradigm' questions as:

> How can we improve the system to make it more efficient/effective? How can we improve student and teacher performance? How can we establish better standards, and how can we test for those better standards? *Et cetera.*

to:

> What is the nature and what are the characteristics of the current post-industrial information age? What should be the role and function of education in this new era? *Et cetera.*
> (Banathy 1991, 17)

That is, a shift "working from the larger perspective of a societal and future generation focussed question" (Banathy, 1991, 17). Banathy elaborates a detailed conceptual framework for stimulating and guiding the whole system change he considers necessary, including the useful 'vision-image-in' model which I will return to below. While Banathy's work is very helpful in clarifying the implications of a whole systems approach to systems change, I feel it has some weaknesses too. These include insufficient recognition of participative process in change, of ecological thinking and values, and of the problems and opportunities of complexity and adaptive

management. It also seems to be more based in theory than experience and praxis. There is a danger perhaps, in Banathy's recipes, that such change could still be somewhat quasi-mechanistic, imposed, and unsustainable despite contrary intentions. This concern echoes my previous argument that systems thinking and methodology can, without the complementary influence of an expressed ecological philosophy, become the servant of mechanistic values.

Despite this, I think the main value of Banathy's work is in the empowering idea that educational systems can be re-designed, not according to blueprint but as a future-creating journey in co-evolution with progressive trends in wider society. This theme links with ecological design and adaptive management as continuous reflexive learning processes, which are looked at in **Appendix I.**

Such an approach was exemplified by the experience of Hawkesbury College in Australia, which for some twenty years starting in the late seventies, explored the possibility and problems of systemic change in education and learning. Founded in 1891, the School of Agriculture at Hawkesbury had a long tradition of technical education for farmers and agricultural support professionals. Independence from State control in the early 1970s allowed the College much greater leeway as regards curriculum, pedagogy, recruitment, strategy and freedom of expression.

Its subsequent experience has been well-documented by the faculty team responsible and provides a fascinating insight into the challenges of introducing radical systemic change into a previously conventional institution and educational culture. I will outline more of the Hawkesbury experience in 2.4 below as an example of transformative change, but for now, will briefly look at the Hawkesbury team's ideas on the need for such change. (My own interest in this story began in 1998, when I had the opportunity to work with Roger Packham - one of the Hawkesbury leaders - for one week at Schumacher College.) The journey at Hawkesbury arose from the critical realisation by some of the faculty that agricultural development "was increasingly incongruent with the environments in which it was being pursued, and that this was in large measure a function of the prevailing paradigm of agricultural science" (Bawden and Packham 1993, 7). There was no considered systems design in the sense that Banathy uses (although Banathy is quoted as an influence on Hawkesbury's work), but systems approaches were fundamental to what transpired:

> We intuitively accepted the view that somehow, somewhere, systems thinking and holistic philosophies would be of use to us in dealing with the complexity and seeming deterioration of the agriculture/environment complex.
> (Bawden and Packham, 1993, 7)

Philosophically, the Hawkesbury story is founded on disillusion with the "the inadequacy" of reductionist science in agriculture and other areas of human endeavour, and a determination to explore the nature and implications of a new paradigm:

> The language of reductionism and positivism does not entertain the very complex and dynamic phenomenon associated with sustainable practices…it is clearly time to argue loudly for a shift in thinking from the Age of Productivity to the Age of Persistence…a new research paradigm in the tradition of what has been called the science and praxis of complexity.
> (Bawden 1991, 2363)

Thus the mission at Hawkesbury became to help "people in rural communities … learn their way forward to better futures, in the face of immensely complex, dynamic and slowly degrading environments, socio-economic, politico-cultural, and biophysical, in which they increasingly recognised they were deeply embedded" (Bawden, 1997b, 1). It was recognised that this would necessitate the provision of experience that would encourage a shift in perception. Bawden (1997b, 1) comments:

> Changing the way we collectively construe ourselves means collectively changing the way we think about ourselves, to lead in turn, to changing the way we collectively act.

For the Hawkesbury team, this meant learning to perceive and think more systemically. Their own systemic awareness at that time led to a reperception of the college and a decision to transform its purpose and operation in three fundamental ways:

Table C.2: Transformations of purpose and operation at Hawkesbury College

FROM	TO
production agriculture	'responsible rural development'
teaching/course based approach	learning/project based approach
Reductionist educational paradigm	an holistic educational paradigm

(Based on Bawden, 1997b and Bawden, 2000)

As the experiment evolved over years, it became clear that the learning journey necessitated by these shifts involved second order and third order learning, drawing consciously on soft systems methodology, experiential learning and systemic action research. Bawden writes, “together we would learn how to see the world differently, and in the process, discover just how difficult a transformation this is” (1997b, 1).

The Hawkesbury experience was a far-reaching and bold experiment by any conventional measure of agricultural education, and one which developed an expanded view of curriculum based on process and real-world problems, rather than on prescribed content and set outcomes. It was also influential. Bawden claims that Hawkesbury can claim some credit for transformation from a techno-scientific view of agriculture in Australia to a “culturally acceptable ecologically responsible productive stewardship” (Bawden 2000b, 298). It also appears to have wider influence on thinking in agricultural education in relation to sustainability, where (perhaps not surprisingly given the immediate nature of the human-environment relationship in land based activities) there has been some of the most forward-thinking work in holistic / systemic approaches in education. (See for example Van de Bor, Holen, Wals and Filho, 2000.)

Ray Ison has also been a key writer in this movement. Consistent with the other authors reviewed above, he makes a critical distinction between educational paradigms (Ison 1990). On the one hand, the dominant top-down expert-led ‘teaching paradigm’ giving rise to a ‘teaching system’ which stifles creativity, initiative and critical thought and ignores the multidimensionality of complex problems: on the other, the need for a ‘learning paradigm’ and consequent ‘learning systems’ which encourage and allow such qualities to emerge and encompasses multiple perspectives. There is a need he says, “to re-establish universities as communities of learners…(lecturers) must become involved in learning about learning, facilitating the development of learners, and in exploring new ways of understanding their own and others’ realities” (Ison 1990, 9). The conventional teaching paradigm, says Ison, is so different from the learning paradigm which sustainability requires, that the possibility of sustainable agriculture is threatened. Here again, is an argument not for just for an ‘add-on’ change of method, but for a profound change of epistemology and methodology.

Like the Hawkesbury team, Ison applies the same critique to agricultural extension, rural development and natural resource management (Ison 1993, Ison, Maiteny, and Carr 1997, Ison and Russell 2000). A plea is made for a shift from the dominance of first order change, to second order change, entailing a shift from ‘system-determined’

problems towards ‘problem-determined’ learning systems which take full account of context. This resonates with emerging discourse on the need for participatory adaptive management in relation to realising sustainability (see discussion in **Appendix I** section 3.3). Similarly, Chambers argues strongly for the systemic methods and approaches which are embraced by the term Participatory Rural Appraisal (PRA), and sees the fundamental issue as contestation between two different development and learning paradigms. One is “linear, organised, predictable and converging on equilibrium”, the other “non-linear, chaotic, unpredictable, divergent and non-equilibrium” (Chambers 1997, 12); one is top-down and is based on blueprints, the other bottom-up and emphasises the learning process (1997, 189). This shift is essential, Chambers believes, to realising justice and sustainability. In Ison’s and Chambers’ work, as well as Bawden’s - I would suggest - there is a coming together of the emancipatory and holistic traditions reviewed above.

Another strand in the emergence of systemic views of education and learning is the emphasis on ‘integrative learning’ (Blair and Caine, 1991, Kolb 1991) which has some currency in management education. At a simple level, this is seen as a necessary response to over-specialisation and the fragmentation of knowledge, at another, the expression of a changed education and learning paradigm. Again, echoing the discussion above, integrative learning “is holistic” and “addresses the whole person in the context of his or her total life”, and implies such changes as “re-examination of our role as teachers or trainers” in order to “manage the process of learning” (Kolb *et al.* 1991, 228/230). There seems to be little difference here: ‘integrative learning’ seems very close to any well-developed conception of systemic/holistic learning. Some of those using the term quote developments in brain research as support for their approach. The brain is seen a complex, highly adaptive, self-organising system and this has allowed insight on how people learn. For example, researchers Caine and Caine (2000) - drawing on research in neuroscience, cognitive science, perceptual change and creativity - have elaborated ‘twelve principles of brain-mind learning’ which underpin the principle of learners as active participants in their learning process. Their research supports such systemic ideas as the importance of the learning environment and social context, recognition that the construction of meaning is innate to learning, that sense making occurs through finding pattern, that emotions and cognition are inseparable in the brains and experience of learners, that the brain perceives both separateness and connectedness i.e. parts and wholes, and that learning involves both focussed attention and perception of the peripheral environment, that learning involves the different levels of both conscious and unconscious process which work at different

time-scales, that neural development depends on the quality of the learning environment and experiences especially in the early years, that the brain learns optimally under conditions of high challenge and perceived low threat, and that each person is unique.

Educators who understand such principles, maintain the Caines, will think and act in ways that are profoundly different from those colleagues "who have learned to base decisions on a more behavioural or industrial-age perspective". What would happen, they ask, if educators "asked themselves what it means to think of learners as living systems instead of sequentially programmable machines?" (2000, 52).

Part of the answer to the Caines' question may be seen in the growth of the 'accelerated learning' movement. Whilst this is laudable in some respects in its attempts to escape the machine metaphor in learning, the implications of cognitive research are only part of the story of a whole systems approach to education and learning. Indeed, bereft of any grounding holistic philosophy, accelerated learning may effectively support rather than counter an aggressive individualism within the dominant paradigm. For example, one the most successful books, *The Learning Revolution* (Dryden and Vos 1997), sees accelerated learning as a new technology through which anything is possible. It thus calls for, "a revolution in learning and thinking to match the soaring changes in technology, information and in our ability to produce an abundance of goods and services" (1997, 17). The title of the concluding chapter borrows Nike's slogan 'Just do it!' and starts with a section, "How any country can lead the learning revolution: and so can you". There seems to be no critical awareness in its 500 plus pages, and no understanding of our critical ecological context let alone any sense of ethics and the systemic consequence of action. Accelerated learning and the 'learning skills' movement has had an increasing had increasing influence in formal education in recent years. But:

- Keypoint: Its emphasis on '*learning to learn'* is fundamentally a first order concern with 'effective learning' skills - as opposed to second order, systemic, '*learning about learning'* which involves critical appreciation and questioning of the values involved in the learning system.

With the exception of Dryden and Vos, all the writers briefly reviewed above reflect or touch on in some way an ecological perspective, but I repeat my argument that systemisism does not *necessarily* involve ecologism, and that both schools of thought needs the other to syncretise a greater whole. The lack of fundamental progress with

the ‘reorientation’ of education in the period following the 1992 Rio Earth Summit (reviewed above in Part B.3.4), and the accommodation and containment of environmental education and education for sustainable development by the mainstream (reviewed Part B.4.1) underline the need for the articulation of an alternative and ecologically grounded educational paradigm, which can inform a change of culture. I have called this ‘sustainable education’ (Sterling 2001). After some thirty years working in the field, I am not naïve enough to believe its articulation will ensure its inexorable rise, not least because radical change is inevitably political (with a small ‘p’) and involves democratisation and reclaiming power by practitioners. However, my experience leads me to believe that there is little chance we can transcend mechanism and modernism without some such vision and grounding which can inspire and indicate coherent alternatives. Bednar (2003, 165) believes that current conditions make such an alternative attractive to some in the educational community:

> The dispiriting nature of the (current) educational enterprise and the moral vacuum that accompanies it could be significantly ameliorated by the introduction of an ecologically oriented curriculum.

In the next subsection, I try to explicate the sustainable education paradigm further, through using Banathy’s model of ‘vision, image, and design’.

2.3 The ecological education paradigm

In previous Parts, I have explored the grounding and nature of the dominant education paradigm, and also, the bases and key concepts informing an ecological and systemic view of the world. In the subsections above (in this Part C), I have looked at some evidence of, and antecedents of, the emergence of an ecological education paradigm, as a subparadigm of the ecological worldview. In this next subsection, I want to bring together some key ideas and models to flesh out the implications of this education paradigm, as I see it.

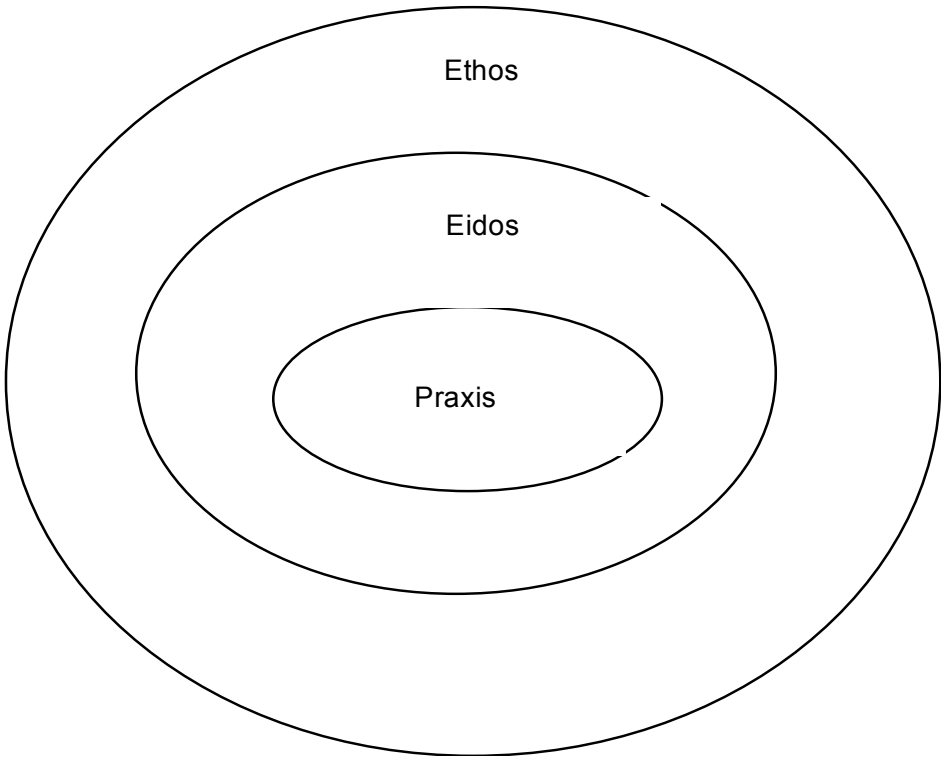
To assist this, I will now reintroduce my suggested model of paradigm and knowing (first outlined in sections A.1.1, and A.3.1, and further elaborated in **Appendix I** section 2.1). To reiterate, any paradigm held at individual or collective level can be usefully understood as a ‘whole system’ in terms of three interrelated ‘dimensions of belief’, being the ethos, the eidos and the praxis. Ethos is the affective, belief and imaginal dimension of paradigm, eidos the dimension of ideas and concepts, and praxis the dimension of reflective intention and action. I have suggested that these *dimensions of paradigm* are in close relationship with the *dimensions of knowing* and of our lived

experience, that is, our epistemology, our ontology and methodology. This model may be summarised as:

Ethos	*relates to*	Epistemology (Seeing domain)
Eidos	*relates to*	Ontology (Knowing domain)
Praxis	*relates to*	Methodology (Doing domain)

Following Bateson's view of epistemology, and earlier discussion on learning levels, I argue that the epistemological dimension of paradigm may be seen as most fundamental, (whilst accepting that it is difficult to separate out epistemology and ontology - see Part A.3.1, and detailed discussion in **Appendix I**). Thus, I suggest in **Appendix I** that it is helpful and valid to represent dimensions of paradigm as nesting systems (Diagram C.5). Whilst these dimensions are systemically interrelated, what we do (praxis) is informed and shaped by our view of reality (eidos), and this is informed by our way of knowing and sense of purpose (ethos). Similarly, what an institution does (provision) is ultimately informed by its dominant view of reality and its operative epistemology (paradigm).

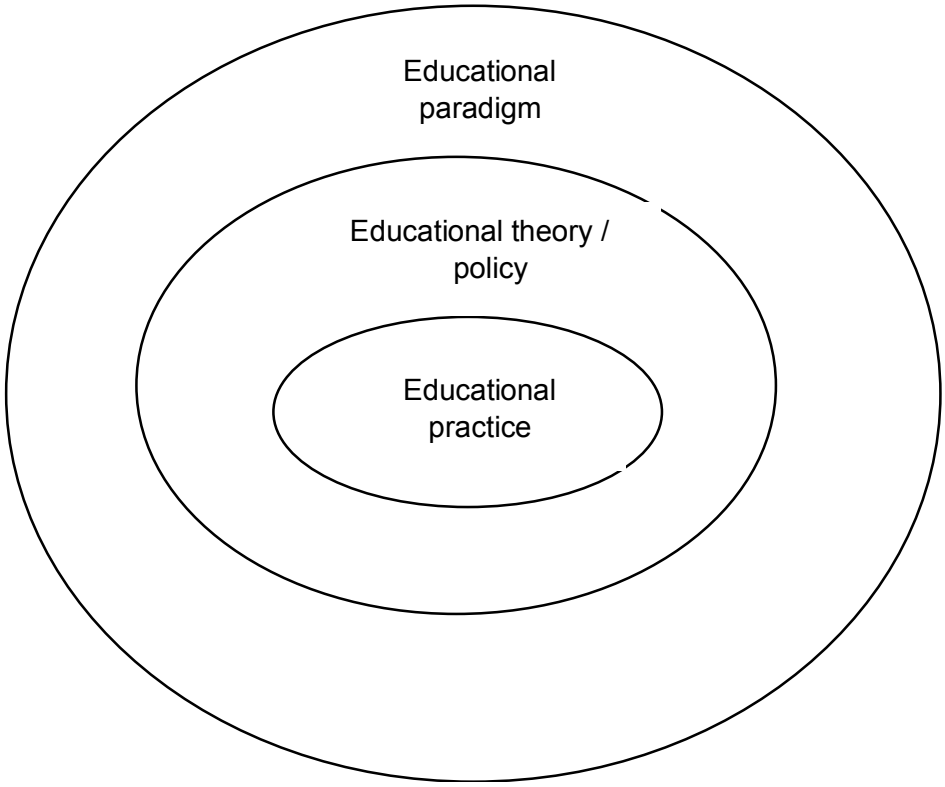
Diagram C.5: Paradigm components as nesting systems



In the educational context, this becomes clearer if we make an association between this model and another 'nesting hierarchy' or ecology of contextual levels (as noted earlier in Parts A and B). These are represented below in Diagram C.6 as:

- the educational paradigm (and purpose)
- the educational policy, theory (and design)
- educational practice.

Diagram C.6: Nesting systems in education paradigms



Hence we can look at education at any system level in terms of this interrelating framework:

Ethos - Epistemology - as reflected in educational paradigm and purpose
Eidos - Ontology - as reflected in educational policy, theory and design
Praxis - Methodology - as reflected in pedagogy and practice

For those practitioners and policymakers interested in transformation, these models give a framework for thinking and discussion about educational currency and change. Morrell and O'Connor suggest "when we speak of transformation, we need to know:

from what to what?" (2002, xvii). I believe these models help us both clarify 'what is' and articulate 'what might be' as regards educational paradigms, but also help clarify the constraints on, and opportunities for, deep learning and transition.

The models do not in themselves, of course, yield an ecological paradigm: they just as usefully represent dimensions of a mechanistic orientation. However, they give us a whole system model through which transformation towards an ecological paradigm can be conceived. To approach this, I want to use the systems writer Banathy's (1991) useful distinction between another triad, which is consistent with those above, thus:

(Ethos)	Vision
(Eidos)	Image
(Praxis)	Design

Banathy used the latter terms to carry meaning as follows:

- A *vision,* that is, a philosophy, inspiration and direction that guides imaging;
- An *image* of the desired state in terms of elaborated core values and ideas as a basis for discussion; and
- A *design* or 'model of the future system' that allows realisation of the image.

(After Banathy, 1991, 27)

These simple models allow us to better understand and evaluate the dominant paradigm (as I have sought to do in this Thesis) and envision an ecological alternative. In Part A, and particularly Part B.1.6 I suggested that the shifts towards such an alternative could be summarised through the keywords *extension, connection,* and *integration,* within and between the three paradigm components. I am now going to look at what this may mean.

Let's take - using Banathy's terms - the ecological *vision* of education first. Following discussion in the Thesis about the nature of the ecological worldview, 'extension' here means at least a change of root metaphor, from mechanism only towards an inclusive metaphor of the living system (which can subsume mechanism where the latter is appropriate). If I now take the bases, values and concepts of the emerging ecological worldview - reviewed in Part B (and elaborated in **Appendix I**) - as a philosophical platform, the following descriptors may be seen as outlining a 'vision' of an ecological educational paradigm. Together, they evoke the distinctive nature of the ecological

education paradigm and characterise the learning systems which manifest it. This is necessary imprecise. As Capra notes (2003, 107):

> A vision is a mental image of what we want to achieve, but visions are much more complex than concrete goals and tend to defy expression in ordinary, rational terms. (While) goals can be measured, vision is qualitative and much more intangible.

Box C.1: Visioning the ecological education paradigm - some descriptive keywords

Participative, democratic, empathetic, collaborative, reflexive, process-oriented, dialogic, systemic, integrative, connective, creative, holistic, synergetic, transformative, purposeful, ethical, epistemic, sustainable, and wisdom-seeking.

Now I want to move onto 'imaging' (in Banathy's sense) the ecological education paradigm. If we view the three educational dimensions presented above as nested subsystems (see Diagrams C.5, C.6 above), *and* indeed the other sets of triads as nesting and interrelated systems, we can begin to set out an image of an ecological educational paradigm (Box C.2). This paradigm answers the three key questions below - 'How do we perceive this? How do we conceive this? How do we do this?' - very differently compared to the dominant educational paradigm.

Box C.2: Beginning to image an ecological education paradigm

1.Educational paradigm (Ethos) The implications of ecological thinking as a basis for an overall educational paradigm which revisions and reorients the purpose of education (theory, policy, research and practice) and its relation with wider society and the ecosphere, and embraces intuitive, inspirational, affective and practical knowing as well as cognitive knowing. The perceptual dimension – 'how do we perceive this'? Key idea: *extension.*

2. Policy, organisation and management of learning environment (Eidos) How whole systems ideas might be reflected in systems change and management, organisational ethos, disciplines and departmental structures, curriculum content/theory and design, hidden curriculum, purchasing policy, and community/social links and

relationships. The conceptual dimension – 'how do we conceive this'? Key idea: *connection.*

3. Learning and pedagogy (Praxis) How whole systems approaches might be reflected in classroom or in community practice, in teaching and learning method, including a systems view of the learner and teacher, participative learning and teaching styles. The practice dimension – 'how do we do this'?. Key idea: *integration.*

Wholeness and synergy are guiding principles here, and the three dimensions should be seen as systemically interrrelated, rather than separate. The critical intelligence or systemic awareness informing an ecological image of education recognises the importance of *healthy emergence* and *systemic coherence* arising from the parts and properties of the system as a whole, whether considered at national, or local levels, and whether in community or institutional contexts.

At this point in the imaging exercise, we can *expand the level of detail* to further suggest a contrast between mechanistic and ecological paradigms in respect of the three system levels suggested above. It is difficult to capture this simply as the implications are far-reaching, and there is by definition no final version or blueprint. To indicate - rather than prescribe - the nature of the change, I will make reference to several interpretations that I have used previously.

- Keypoint: It is not possible to comment here on every suggested shift that is detailed below and shown in **Appendix II**: rather I am claiming that these shifts are consistent with and arise from an understanding of the ecological worldview as outlined in the Thesis, second, that their validity partly rests on their systemic coherence.

In my book (Sterling 2001) I outline 'one image of sustainable education' and this may be found in the **Appendix II** (for reasons of space), in Part C.2.3 and labelled Box C.3 Also in the book, I outline the main differences between mechanistic and ecological paradigms using the three levels of paradigm, organisation and management of the learning environment, and learning and pedagogy. Within this framework I identify nine aspects: core values, curriculum, evaluation and assessment, management, community, view of teaching and learning, view of learner, teaching and learning styles,

and view of learner. This shown as ‘Summarising the contrasting paradigms’ in **Appendix II** in Part C.2.3 and labelled Table C.3.

These frameworks echo a pattern in similar tables from other sources. There is evidence of a growing recognition that sustainability necessarily requires a change of ethos, epistemology, curriculum and practice in education. As there can be no blueprint, it is for each concerned policymaker, institution and practioner to grapple with the difficult transition this implies. One example, is the EU Socrates Thematic Network for Agriculture, Forestry, Aquaculture and the Environment (AFANet), which between 1997 and 2000 explored in some detail - and confirmed that sustainability necessarily implies - a shift from transmissive methodology towards transformative methodology and a fundamental rethink of the academic missions of institutions. (See C.2.4 below for more discussion of this project).

Table C.4: Lessons from the AFANet project (1997-2000)

The integration of sustainability into higher education implies shifts as follows:

From	To
Transmissive learning	Learning through discovery
Teacher-centred approach	Learner-centred approach
Individual learning	Collaborative learning
Learning dominated by theory	Praxis-oriented learning linking theory and experience
Focus on accumulating knowledge and a content orientation	Focus on self-regulative learning and a real issues orientation
Emphasis only on cognitive objectives	Cognitive, affective and skill related objectives
Institutional, staff-based teaching/learning	Learning with and from outsiders
Low level cognitive learning	Higher level cognitive learning

(Based on Van de Bor *et al.* 2000, 309)

Such examples bear out the need for and possibility of a ‘whole system shift’ which can be summarised simply as four ‘P’s (where I have separated out ‘paradigm’ and ‘purpose’):

Box C.4: Basic shifts in the four 'P's

Paradigm: instead of education reflecting a paradigm founded on a mechanistic root metaphor and embracing reductionism, positivism, and objectivism, *it begins* to reflect a paradigm founded on a living systems or ecological metaphor and view of the world, embracing holism, systemisism and critical subjectivity. This gives rise to a change of ethos and *purpose*…

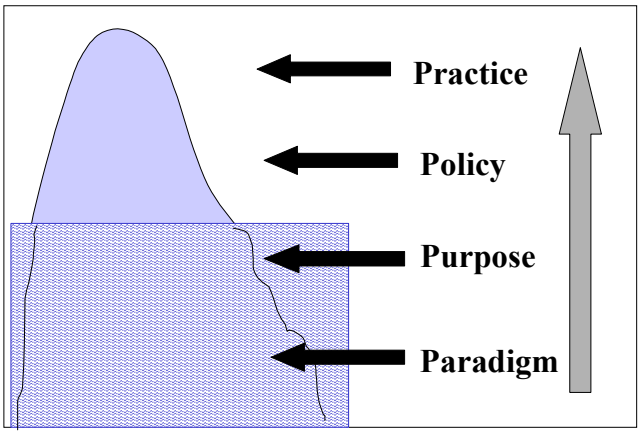
Purpose: instead of education being mostly or only as preparation for economic life, *it becomes*: a broader education for a sustainable society/communities; sustainable economy; sustainable ecology. This *expanded* sense of purpose gives rise to a shift in *policy….*

Policy: instead of education being viewed solely in terms of product (courses/materials/qualifications/educated people) *it becomes*: much more seen as a process of developing potential and capacity through life, at individual and community levels through continuous learning. This *connective* view requires a change in methodology and *practice*…

Practice: instead of education being largely confined to instruction and transmission, *it becomes:* much more a participative, dynamic, active learning process based more on generating knowledge and meaning in context, on real-world problem solving and situation betterment: an *integrative* view of theory, practice and context.

These can be drawn using an iceberg metaphor - reflecting that the deeper levels of paradigm and purpose guiding policy and practice in education tend to be hidden from our immediate consciousness and consequently also, most debate (Diagram C.7).

Diagram C.7: The four 'P's iceberg



Another account, which I have used in different versions (for example Sterling, 1999) is as follows.

Box C.5: Some implications of a systemic view of education and learning

A shift from:

- fixed knowledge *towards* recognising uncertainty and 'other ways of knowing'
- decontextualised and abstract knowledge *towards* applied and local knowledge
- emphasis on cognitive experience *towards* valuing affective, inspirational, intuitive and practical knowing
- valuing intellect *towards* also valuing intuition
- information and data *towards* deeper knowledge and wisdom
- curriculum control *towards* curriculum subsidiarity and negotiation
- teaching *towards* learning
- content *towards* process
- restricted learning styles *towards* multiple learning styles
- passive instruction *towards* participative and critical enquiry
- uncritical learning *towards* reflexive learning

- selection and exclusion *towards* social inclusion
- formal education *towards* learning for life
- specialists *towards* generalists in teachers and learners
- individualism *towards* organisational, community and social learning
- institutional isolation *towards* social and community engagement
- single and separate disciplines *towards* more inter- and transdisciplinarity
- instrumental values *towards* a new integrative sense of social/ecological ethics and responsibility
- competitive values *towards* cooperative values
- placelessness *towards* celebration of place
- valuing 'knowing' *towards* valuing 'being'

With all these tables, the choice is not between binary opposites, but a change of weighting that moves away from the dominance of the old paradigm, and transforms and conserves some of its characteristics rather than jettisoning them in their entirety. Again, what we are seeking here is a more adequate, encompassing, paradigm and one that can evolve from where things stand now.

Clearly, with such imaging exercises, we can focus 'in' or 'out' at any system level - from on the one hand, the paradigm in broad philosophic terms, down to a specific institution and a specific dimension of its operation - and suggest and seek coherence throughout. Organisational change and management is discussed in more detail in Part D, but for the purposes of illustrating basic shifts that paradigm change implies in an educational institution as a whole, Table C.5 provides one summary:

Table C.5: Towards the sustainable education institution

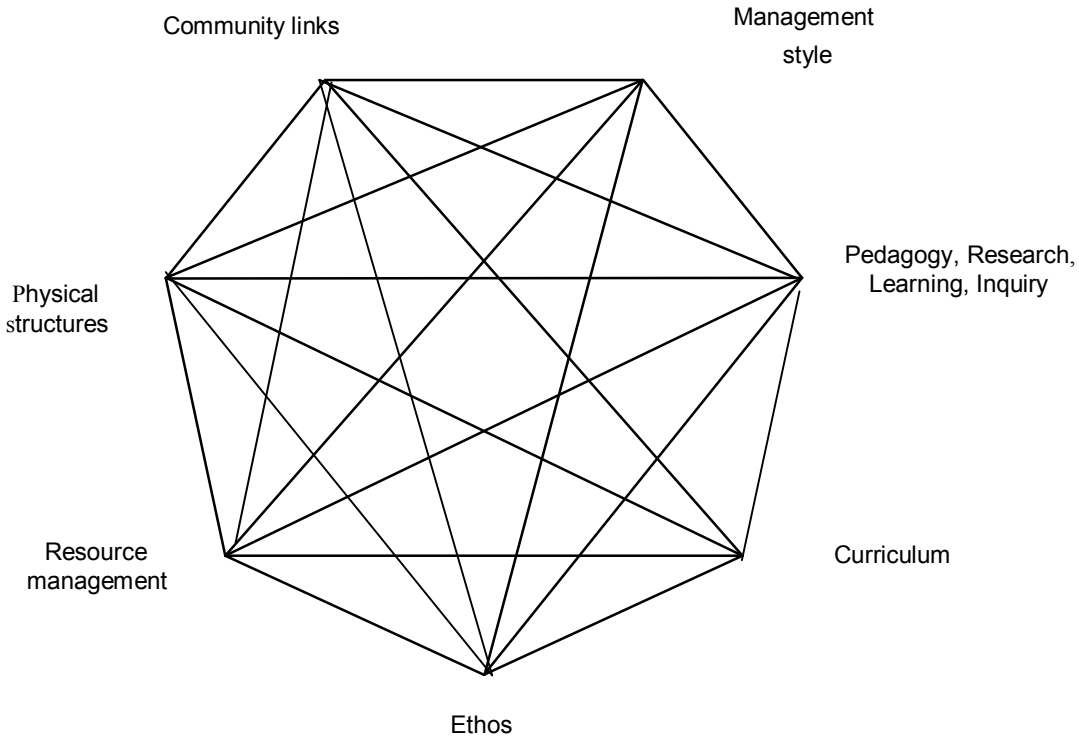
From	Towards
Incoherence and fragmentation	Systemic coherence and positive synergy
Large scale, loss of connectivity	Human scale, high connectivity
Closed community	Open, 'permeable' community
Teaching organisation	Learning organisation
Microcosm of unsustainable society	Microcosm (as far as possible) of sustainable society

Within any particular educational institution, we might identify at least seven dimensions of its operational life:

- ethos
- curriculum
- pedagogy, research, learning and inquiry
- organisation/management style
- resource management and use
- physical structures/architecture
- community links and relationships

These can be represented in relationship as follows (Diagram C.8):

Diagram C.8 Seven operational dimensions of an educational institution



Hence, any dimension has at least six relational paths. The systemic view recognises that the existing relationships in the system may be characterised by dysfunctionality, lack of synergy or by negative and unintended emergent properties, conflict and

contradiction, not least in terms of effects on people. To help move towards a more sustainable state, a whole systems view will pose such inclusive questions as:

- how far are these seven dimensions regarded as a systemic whole?
- how far are the relationships within and between these dimensions characterised by systemic coherence and healthy emergence, or by fragmentation and contradiction?
- how far is planning and change systemic and collaborative - keeping the effects on the whole system and emergence in mind - or piecemeal and imposed?

Focussing down from this whole institution perspective, we can look at any one dimension, not of course in isolation, but in relation to the whole. Space does not permit a full discussion of each dimension and such detail would detract from the thrust of the argument. Instead, I will look briefly at *curriculum.*

Looking at curriculum

Curriculum may be seen as a function of its time and circumstances. Thus, as Grundy (1987, 6) writes:

> To understand the meaning of any set of curriculum practices, they must be seen as both arising out of a set of historical circumstances and as being a reflection of a particular social milieu.

These conditions are changing: my (by now familiar) argument in this Thesis is that in most respects we have reached a critical and watershed state whereby a qualitative break with our 'historical circumstances' (modernism) is imminent, either by default or design, and that our social milieu is similarly in a transitional state. New historical and social conditions, particularly in relation to the challenge of sustainability and uncertainty, suggest and require a commensurate change in our view of curriculum (as well as the other dimensions). Following Grundy, I will make a distinction between a *conceptual approach* to curriculum, which looks at the structure and content of any particular curriculum, and a *cultural approach* which is primarily concerned with understanding the foundations and context of any curriculum, as these significantly influence the structure and content.

This distinction illuminates the difference between a mechanistic/modernist/managerial view of curriculum as being little more than an agreed (often imposed) set of educational goals, content and practices - and an ecological view of curriculum as a

multi-faceted expression of an institution's (and perhaps wider society's) ethos and where the total learning experience is the prime focus.

The former view tends to stress curriculum as *product* - that is, specific goals, objectives, pedagogy, assessment and evaluation procedures, which, it is believed, lead to predictable and measurable learning outcomes. It is normally captured in a set of documents to assist uniform implementation and 'delivery' to achieve pre-defined ends, virtually irrespective of the learner's (or teacher's) own qualities, prior disposition, knowledge and needs. By contrast, the latter view looks at curriculum as *process* and praxis, where the emphasis in teaching, learning and research is developing meaning with students through inquiry, and where learning outcomes are approximate, developing and open-ended. In this view, the curriculum is less a predetermined thing, but is itself adaptive and emergent.

- Keypoint: The conceptual approach is a content-led view of curriculum, the cultural approach a view of curriculum as lived experience.

In a consultancy for a land-based college attempting to redefine its role and operation in the light of the sustainability challenge, my colleague and I used this distinction to develop a discussion document on new approaches to curriculum (Baines and Sterling 2001). Not least, this expanded view of curriculum takes into account that the learning experience takes place beyond as well as within the classroom or lecture hall. For example, Fien (2000, 254) comments:

> Students often learn things…that are not necessarily the result of the official curriculum intended in syllabus documents and textbooks…(they) can learn many lessons about social relationships, power, and the environment from the way that decisions are made about what they will, and what they will not have an opportunity to learn. They can also learn important lessons from the social vision that underlies different teaching methods, from the way teachers treat them, and from the way (an institution) treats its environment…the lessons that students take from the 'hidden curriculum' may contradict, and may even undermine, the intended or official curriculum.

Similarly, Hart, Jickling and Kool (1998, 224) point to the 'null curriculum' which is defined by what is not said or included, which "often tells more about a curriculum than what is said". Others point to the educative power of the institutional environment, both inside and outside the lecture room, how far it is cared for, its aesthetics, its

management with regard to resources, and so on. Orr (1994) refers to the ‘pedagogy of architecture’ meaning the psychological, cognitive and physiological effects of educational buildings on the learner, and makes a case for ‘eco-architecture’ that pleases, inspires, interests and is conducive to learning. In a land-based college, this notion might be extended to the ‘pedagogy of land-use’ i.e. what students might learn unofficially from how an institution's own land is cared for and utilised.

This distinction between a conceptual and cultural understanding of curriculum, raises an important question and issue about content. This echoes previous discussion about the dichotomy between ‘content and process’, ‘realism and idealism’, or ‘realism and constructivism’. Again, it seems the participative paradigm helps span and heal this division. Chet Bowers, in a chapter on an ‘ecological view of intelligence’ (1995), suggests that in an entirely constructivist view of learning, process becomes more important than what students actually learn and content is always relativistic. If this is taken too far, he suggests, content becomes irrelevant and questions of ‘what is important’ fall away. But to many constructivists, the valorising of process is a necessary counter to the domination of a positivistic paradigm and a democratising response to top-down curriculum control. In contrast to such constructivism, Bowers argues that an ecological view of curriculum necessitates the inclusion of “patterns exhibited by all ecosystems” and he suggests Capra’s principles of ecology as one such example of important content - including such ideas as networks, nested systems, cycles, flows, development/co-evolution, and dynamic balance. (This is a more up to date version than that quoted by Bowers, see Crabtree, 2000.). My comment on this debate is that, as I have said above, constructivism is a critically important *part* of the picture, but if taken too far, it falls into the relativistic problems associated with deconstructive postmodernism discussed previously. I believe Bowers is wrong to dismiss a constructivist view of learning entirely, but right to affirm an ecological ‘realism’ in curriculum, and to assert the importance of developing ecological understanding and literacy. In my view, Orr’s emphasis (1994) on ecological literacy in relation to *place*, complements Bowers’ view of realism by rooting it in specific, real contexts, a pedagogic strategy which inevitably takes curriculum away from prescriptivism and towards emergence. Far from divorcing content and process, as if they were opposed or unrelated, from an ecological/systemic point of view we need to examine them in interrelationship. I return to this argument in Part D.

From this view then, one cannot talk meaningfully about ‘curriculum as lived experience’ without also bringing in to the ambit of consideration the other dimensions

of the institution's life - ethos, management, organisational change and organisational learning, teaching and learning styles, resource management and so on (and this is discussed further in the case studies in 2.4 below). In brief, sustainability requires an *expanded* and *interrelational* (whole systems) view of 'curriculum'. Instead, the mechanistic 'maintenance of paradigm' response by curriculum planners to sustainability, is typically enacted through the limited add-on of some sustainability concepts into a set and official curriculum which is otherwise unchanged.

It is the virtual inevitability of such a limited adaptive response that has led me to explore and elaborate not just 'education for sustainability' as a worthy adjunct to the conventional wisdom, but the nature and basis of what I call 'sustainable education' (Sterling, 2001), a term used deliberately to signify an alternative and transcending educational culture based on the ecological paradigm. By using this term publicly, I have hoped to try to help people jump the familiar paradigm ship and, though they might be treading water with me in an unfamiliar sea, help them perceive the nature of the ship and its direction in a new way, for perhaps, the first time. I relate some of my experience and feedback on 'sustainable education' in Part E, but finish this subsection with some further explanation of this term.

The problem with existing labels is that they can leave the existing educational norms and values untouched: they almost invite an 'add on' response. In contrast, the notion of 'sustainable education' addresses the nature of education and educational systems (and not just the instrumental outcome as in 'education for sustainable development'). Rather, 'sustainable education' suggests the shift of educational culture that is required. As I have argued:

> Words have power. This is clearly demonstrated in the world of education where managerialist language has almost replaced more traditional educational terminology and led to a narrowed discourse and practice. If we want a more humanistic, democratic and ecological educational paradigm, then we must find the ideas and language to help create it. The idea of 'sustainable education' is a powerful start.
> (Sterling 2001, 14)

'Sustainable education' then, is an idea or heuristic which can be used by anybody, if they choose, to help them think about educational currency and change. I use the word 'sustainable' in this context to imply four descriptors: educational thinking and practice which is sustaining, tenable, healthy and durable.

- *Sustaining* - it helps sustain people, communities and ecosystems
- *Tenable* - it is ethically defensible, working with integrity, justice, respect and inclusiveness
- *Healthy* - it is itself an adaptive, viable system, embodying and nurturing healthy relationships and emergence at different system levels
- *Durable* - it works well enough in practice to be able to keep doing it.

I would suggest that the current system of neo-liberal, managerial, 'marketised' education, at best, measures weakly against all of these descriptors and at worst, is 'unsustainable education'.

In summary, I suggest 'sustainable education' :

- implies a fundamental change of purpose, or at very least, an additional key purpose for education.
- implies embedding, embodying and exploring the nature of sustainability as intrinsic to and emergent within the learning process. This is education 'as' sustainability - nurturing critical, systemic and reflective thinking, creativity, self-organisation and adaptive management - rather than education 'about' sustainability, or education 'for' particular sustainable development outcomes.
- is not prescriptive, but is indicative and purposeful.
- affirms liberal humanist traditions in education, but goes beyond them through synergy with systemic and sustainability core values, concepts and methodologies.
- challenges the limiting effects of characteristics of the dominant mechanistic paradigm such as top-down control, centralisation, managerialism, instrumentalism and the devaluing of humanities and arts.
- is based on 'systemics' rather than 'systematics', that is, the emphasis is on *systemic learning* as change, rather than *systematic control* in response to change.

What I have tried to encapsulate in this subsection is something of the basis and implications of such a change of educational culture (Banathy's 'vision' and 'image') in general terms. This culture would both develop and embody the theory and practice of ecological sustainability and whole systems thinking in way that is critically aware. This would be a transformative practice that values, and seeks to sustain and realise human potential *in relation to* the need to attain and sustain social, economic and ecological

wellbeing, recognising that they are deeply interdependent. (The reader might now want to jump to subsection D.1.2 to find a discussion of this paradigm specifically in relation to environmental and sustainability education.)

What I have not covered so far is a theory of change and learning through which the ecological paradigm and a culture of sustainable education might be realised. This brings us on to the next subsection, on the relationship between transformative learning, systemic change and sustainability.

2.4 Transformative learning, systemic change and sustainability

In this subsection of Part C, I examine further the 'what' and 'how' of transformative learning, at individual, institutional and societal levels to explore how far this view of deep learning is substantiated by theory and evidence. I also look again at learning levels to help generate further insight on the 'response-ability' of individuals and educational systems to the challenge of sustainability. The subsection also includes some account of exemplars of whole systems change. Further, it touches on Banathy's third category of systemic change: 'design' (which is also taken up further in Part D).

In meaning, the term 'transformative learning' is equivalent to other terms used above, being Learning III (pragmatic interpretation), third order change, triple-loop learning, deep learning, and epistemic learning. It is also sometimes referred to as 'higher order' learning. I have argued that such a quality of learning is essential to the realisation of the postmodern ecological paradigm - in individuals, in education systems, and in society as whole. At the same time, I have also argued that, short of social or ecological catastrophe, transformative learning is unlikely to occur beyond a 'significant minority' but this may be sufficient to help generate wider second order learning, a questioning of values, in any particular learning context.

The case for transformative learning is that learning *within* paradigm does not change the paradigm, whereas learning that facilitates a fundamental recognition of paradigm *and* enables paradigmatic reconstruction is by definition transformative. Restating Senge's view (1990, see B.1.3) that learning involves a 'movement of mind' through which we 'recreate ourselves' we can say transformative learning involves deep movement or significant re-creation. Or let's take another view: "learning - whatever form it takes - changes who we are by changing our ability to participate, to belong, to negotiate meaning" (Wenger 1998, 226). Transformative learning does this to an

unusual degree. It engages and involves the whole person (the three dimensions of my whole systems model of paradigm and knowing), and affects change in deep levels of values and belief through a process of re-perception and re-cognition, giving rise to changed actions. It is not then, just a matter of intellectual or conceptual learning, but engages our emotional, intuitive and spiritual selves as well. In learning theory terms, it signifies a move from first order learning to second order learning where values, beliefs and paradigm are critically realised and examined, and for some, third order learning where a new paradigm emerges.

According to the Center for Transformative Learning at OISE at the University of Toronto, transformative learning involves experiencing:

> …a deep structural shift in the basic premises of thought, feelings and actions. It is a shift of consciousness that dramatically and permanently alters our way of being in the world. Such a shift involves our understanding of ourselves and our self-location: our relationships with other humans and with the natural world. (Morrell and O'Connor 2002, xvii)

They go on to say that this involves a changing understanding of power relations, of body awareness, of the possibility of alternative approaches to living, and a "sense of possibilities for social justice, peace and personal joy". This is a big and very significant claim, because it is suggesting that changed awareness will lead not to a feeling that we need say, more discrimination, more competition, more exploitation of resources and so on, but rather, an empathetic opposite. It suggests that an expanded worldview inevitably leads to an embracing of ecology, social justice, and personal development, and that deep learning inevitably leads to such an orientation. It would take someone other than myself to counter this argument, because it reflects my own belief and indeed, experience. This argument also resonates with Reason's view (previously quoted in B.1.3) that Learning III "implies an experience of self much more fully in transaction with others and with the environment, a participatory self or participatory mind" (Reason 1995, 3).

I want now to look again at the idea of 'response-ability' and learning, in order to discuss further the assertion (made in Part B) that sustainability requires 'higher order' learning. From a systems viewpoint, learning can be seen as a response to change in a system's environment. But as discussed in earlier (see Part B.1.3), there are different levels of learning, corresponding with a progressive change of consciousness. Learning I, otherwise known as single-loop learning or adaptive learning, tends towards

stability and maintenance. Such learning is characterised by negative feedback loops between the system and its environment, which dampen change and through which the system adjusts. It is a limited corrective response to a change in the system's environment (which in this case is the whole sustainability imperative). It keeps the system and its 'theory in use' (Argyris and Schon, 1996) stable, whether we are considering the social or educational paradigm.

Higher (sometimes known as deeper) orders of learning however, tend to be characterised by positive feedback loops between the system and its environment, whereby both attain a new state (Banathy, 1992). Thus learning can serve either to keep a system stable or enable it to change to a new state in relation to its environment. While these ideas are often used to describe organisational change, they apply equally to worldview/paradigm change where the worldview is itself seen as a system. Indeed, as regards the human individual, or human activity systems, the dominant paradigm influences the possibility, nature and extent of the response - what I have termed 'response-ability'. We can now apply this view of learning to the deep challenge of sustainability issues.

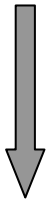
In Part B.1.8, I suggested a correlation between possible learning levels apparent in society, and a four-stage shift in the transition to sustainability from 'very weak sustainability' to 'very strong sustainability' according to O'Riordan and Voisey's (1998) analysis. I suggested that first order learning helps explain why individuals, institutions and society, if they respond at all to the sustainability challenge, tend do so in a way which *accommodates* this change in their environment, leaving assumptions and belief systems largely intact.

Now I want to go a further step and suggest a parallel and link between the *social* learning response and the *educational* response to sustainability, (whilst bearing in mind the idea of education as a subsystem of society).

A model of possible learning responses common to both arenas follows (Table C.6):

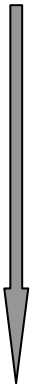
Table C.6: Staged learning responses to the challenge of sustainability

Type of response	Resultant change	Type of learning
1. No response	No change	Denial (no learning)
2. Accommodation	Green gloss	Adaptive
3. Reformation	Serious reform	Critically reflective adaptation
4. Transformation	Whole system redesign	Transformative



This range of learning responses is linked to a range of action responses (Table C.7):

Table C.7: Comparing staged social and educational responses to sustainability



Sustainability transition	Response	State of sustainability	State of education
1. Very weak	Denial, rejection or minimum	No change (or token)	No change (or token)
2. Weak	'Bolt-on'	Cosmetic reform	Education *about* sustainability
3. Strong	'Build-in'	Serious greening	Education *for* sustainability
4. Very strong	Rebuild or redesign	Wholly integrative	Sustainable education

These models beg some explanation.

The first step 'response' is no response (or if there is *some* awareness, minimum response). This may be through ignorance or denial of the sustainability issue.

The second step is accommodation: a 'bolt-on' of sustainability ideas to existing system, which itself remains largely unchanged. This is an adaptive, first order change or 'simple learning'. Through this response, the paradigm maintains its stability.

The third step is reformation: this is a 'build-in' of sustainability ideas to the existing system, through which the system itself experiences significant change. This is critically

reflective, adaptive, second order or ‘metalearning’ response, where paradigmatic assumptions are called into question.

The fourth step is transformation: this is a deep, conscious reordering of assumptions equivalent to epistemic change, leading to change of paradigm.

There are a number of important points to be made about this model (which echo some of the discussion on orders of change and sustainability in Part B.1.7):

- These responses can be seen as *consecutive stages* that learners on the sustainability transition (that is, all of us) need to move through, at least beyond the first and second step levels.
- At the same time, this is not a simple linear progression of discrete stages but is better seen as reflecting the nesting (and therefore subsuming) levels of simple learning, metalearning, and epistemic cognition (Brown and Packham 1999).
- Movement beyond the accommodatory response involves a good deal of learning by all actors - and particularly policymakers, managers, practitioners who shape institutions and organisations - and such learning is inherently difficult.
- Learning is unlikely to progress beyond step 3 (second order change) because of the difficulty of paradigm change and the resistance of any belief system to such profound change.
- ‘Education as a whole’ - seen as a subsystem of society - cannot shift through the transition faster than the shift in ‘society as a whole’ allows without education becoming ‘reined in’. Thus, there needs to be both correspondence and recursion between these shifts.This echoes the argument above in C.1.1 about the relationship between education and society being systemic rather than linear. However, this relationship also indicates that as well as constraint, positive co-evolution through interaction between progressive elements (see below) *is* possible.

A similar model of progressive change is reported by Hicks (2002), drawing on the work of Rogers (1994) whose work with students on global issues suggested a learning cycle over the period of a one-year course. This research, says Hicks, suggests that learning should involve “three awakenings - of the mind, the heart and the soul..(if) truly effective teaching” is to take place (2002, 102). Rogers suggests that learning can involve the *cognitive dimension* (which is traditionally seen as the core of teaching) which involves the intellect; the *affective dimension*, when intellectual knowing moves to a personal and connected knowing involving the emotions; an *existential dimension*

where students are faced with questioning their values and ways of living and with the challenge of the reconstruction of their own sense of self; an *empowerment dimension*, which, if the existential crisis is resolved, involves a sense of responsibility, commitment and direction; and an *action dimension*, which, if the questions raised by the first four dimensions have been resolved, involves the development of informed choices at personal, social and political levels.

Both Hicks, (drawing on Rogers' work, and on his own work with global futures students) and O'Sullivan (2002) point to the nature of denial, despair and grief in relation to coming to terms with the planetary crisis. The mainstream emphasis on cognitive learning, with a little 'values education' thrown in, is simply insufficient to meet this challenge. Indeed, Hicks contends:

> many educators often only make things worse for students by teaching about global issues as this were solely a cognitive endevour.
> (2002, 108)

Rather, Hicks seeks an holistic learning experience, and he quotes Joanna Macy's despair work which allows people to engage with their feelings and pain for the world in order to reconnect with it. A true sense of empowerment, says Hicks, must come from both head and heart, "*but this requires educators who have also worked through these issues for themselves"* (2002, 108). (My italics - this important point is returned to below.)

With this in mind, I now want to focus in on the fourth column of the table above, and outline in more detail the paradigmatic learning response of the education system as a whole, and of institutions and actors within the system (including policymakers, theorists, researchers and practitioners) to sustainability. Whilst teaching on the MSc 'Education for Sustainability' programme at London South Bank University, I developed a model of progressive engagement and change which follows the same logic as the models above. Students have found this model helpful in making sense of their experience in trying to advance education for sustainability in varied contexts.

Beyond 'no response', which is the most common position, there are three levels:

Accommodation: 'Education about sustainability'

This is an adaptive response to the concerns of sustainability whereby the dominant paradigm, its values and *modus operandi* are maintained. In formal education, there is

minimal effect on the institution and on the values and behaviour of teachers/lecturers and students, and take-up of sustainability concepts and values is piecemeal. This is often a cognitive, content-oriented or information-led response, or may be concerned with the greening of the estate, but there is incoherence and conflict between reflected educational values. Sustainability concepts such as 'biodiversity' or 'carrying capacity' may be added into some parts of the curriculum and some subjects, which in other respects carry (consciously or unconsciously) messages supporting or reflecting unsustainability. The response to the challenge of sustainability is 'learning as maintenance' resulting in an accommodative 'education *about* sustainability' in policy and practice which is widely believed to be sufficient. Sustainability is interpreted in terms which are consistent with the worldview. Whilst a long way from leading us to sustainable living, it is 'better than nothing', and can at times open the door to deeper change.

Reformation: 'Education for sustainability'

This is also an adaptive response but involves critical reflection on and meta-learning about on the assumptions and values of the paradigm or 'theory in action', resulting in an attempted 'building-in' of sustainability ideas to and reorientation of existing system. This process involves difficulty and conflict between old ideas and new ideas. Within the institution, there is more coherent coverage of content, an attempt to teach values and skills perceived to be associated with sustainability, and attempts to 'green' some or all aspects of the operation of the institution. The paradigm is modified, and this change is expressed in a reformatory 'education *for* sustainability' in policy and practice. This advocates 'learning *for* change' and there is some assumption that the necessary values, knowledge and skills are known and can be taught. While there is a degree of understanding and acceptance of more radical interpretations of sustainability, there is some incoherence between old and new values within the modified paradigm.

Transformation: 'Sustainable education' (learning as sustainability)

A change of social paradigm amongst educational actors towards the ecological worldview including a strong yet critically open interpretation of sustainability, and giving rise to a transformative education paradigm. Education is re-thought and re-designed - through a continuous learning process - to embody and reflect a whole systems approach and (what is understood of and by) sustainability. This response emphasises process and the quality of learning, which is seen as an essentially creative, reflexive and participative process. Knowing is seen as approximate,

relational and often provisional, and framed in terms of participatory knowing. Learning is continual exploration through practice and is seen in systemic rather than linear terms. The shift here is towards 'learning *as* change' which engages the whole person and the whole learning community, whereby the meaning of sustainable living is continually explored and negotiated through - as far as possible - living it. In this way, *sustainability becomes an emergent property of the sets of relationships that evolve*. There is a keen sense of emergence and ability to work with ambiguity and uncertainty. Space and time are valued, to allow creativity, imagination, and cooperative learning to flourish. There is softening or dissolution of hard distinctions between such dualisms as theory/practice; teacher/learner; researcher/practitioner; institution/community. In this dynamic state, the process of sustainable development or sustainable living is essentially one of learning, while the context of learning is essentially the challenge of the sustainability transition. This response is the most difficult to achieve, particularly at institutional level, as it is most in conflict with existing values, structures, and methodologies, and cannot be imposed. The descriptive term here is 'learning *as* sustainability' or 'sustainable education'.

Let us look now further at the journey through learning levels, building on previous discussion (particularly B.1.3). Whether we are focussing on the individual, or the institution, or society as a whole, progression through the learning levels entails a similar difficult journey. This journey through higher orders of learning involves experience of:

- greater challenge/threat to existing beliefs/ideas - and so more resistance
- greater 'perturbation' required to stimulate learning and the emergence of new order
- greater reconstruction of meaning
- greater engagement and breadth of response in the learner
- achievement of greater flexibility and less rigidity of thought
- higher order of consciousness or mindfulness
- more emergence as a result of learning
- the difference between 'unwitting self-reference' and knowing self-reference and therefore the possibility of transcendence.

At the first order level , 'we don't know that we don't know' - this perhaps is the root of the hubristic Enlightenment belief that 'we do know' or that in principle, everything can

be known and therefore controlled. At the epistemic level 'we do know that we don't know': so at this level:

- Keypoint: systemic understanding gives us more humility and willingness to entertain uncertainty and ambiguity, but also a teleological sense of purpose and participative belonging rather than separateness.

This perhaps helps describe the profound 'movement of mind' that is called for in the earlier quotes from such thinkers as Einstein, Bateson, Laszlo, Bohm and Meadows. Let us now look more closely at the nature of epistemic learning.

There is not a great deal of literature about it - perhaps not surprisingly, as most discourse and most learning are 'within paradigm'. Bawden and Packham, both architects of the Hawkesbury College Centre for Systemic Development, were (as noted above in Part B) influenced by Batesonian learning theory, and particularly by the work of Kitchener (1983) and Salner (1986) on learning levels. Salner drew on research with students' learning by Perry (1968) which suggested, in essence, that during their years at college, students "progress from a simple dualistic view of life and knowledge to a more complex, 'mature' view which is characterised by their increased awareness of the importance of context in defining both truth and value...(but that this journey from) epistemological *dualism*, through a state of *multiplicity*, to eventually reach a state of *contextual relativism*....does not occur without considerable challenge in the learning environment" (Bawden, 2000a, 14). At the last stage, the focus is not just 'thinking about thinking' (Learning II) but evaluating the foundations of thought itself (Learning III) (Bawden and Packham 1993, 6). This, Bawden and Packham state, has very important implications for education, namely:

- it is not possible to 'teach' a systemic/epistemic epistemology to a mind not ready to think in this way
- that a learner cannot 'accept a systemic stance' without epistemic flexibility.

- Keypoint: Systemic thinking in this epistemic sense then, is not simple familiarity with some systems ideas, but "a way of thinking that is independent of the content of systemic concepts" (Brown and Packham 1999, 11).

This important point is borne out, as I have noted previously, by my experience at Schumacher College, where few participants understand or have knowledge of systems concepts as such, but most think systemically.

As noted, transformative/epistemic change is *difficult* - both to facilitate (if you are a teacher/learning situation designer) and as a felt experience (if you are a learner). With

reference to my ‘systemic levels of knowing’ diagram in B.1.3, it is clearly much easier to affect change at the more immediate level, than at the deep level of knowing. Epistemic learning can be deeply uncomfortable, because it involves a restructuring of basic assumptions caused by the recognition of ‘incoherence’ between assumptions and experience (‘incoherence’ is Bohm’s term - see Part B.1.2). This crisis experience can be traumatic - although for some it is inspiring - and can be a lengthy process over time as mental models undergo radical change (Sterling and Baines, 2002). This incidentally, rather counters the simple adage that ‘learning should always be fun’. As Ison and Stowell (2000, 3) suggest, drawing on Prigogine’s theory of dissipative structures:

> …each learner goes through a period of chaos, confusion and being overwhelmed by complexity before new conceptual information brings about a spontaneous restructuring of mental models at a higher level of complexity thereby allowing a learner to understand concepts that were formally opaque.

Similarly, O’Sullivan states (2002, 4):

> The breakdown, or crisis, motivates the system to self-organise in more inclusive ways of knowing, embracing, and integrating data of which it had been previously unconscious.

Such learning gives rise to emergence - the emergence of new order. This is described by Capra (20003, 102) in relation to the learning organisation:

> The system cannot integrate the new information into its existing order; it is forced to abandon some of its structures, behaviours, or beliefs, The result is a state of chaos, confusion, uncertainty and doubt; and out of that chaotic state a new form of order, organised around new meaning, emerges.

A similar idea is reflected in Plato’s allegorical tale of the cave, as told in Plato’s *Republic*. I suggest this process of deep learning can apply also to social learning, involving whole communities and societies, as well as individuals. At all levels, the alternative possible response for a ‘mind not ready’ (see Bawden and Packham’s point above) is, of course, shutdown or denial, through which the existing paradigm is maintained against perceived threat. This raises the important question of methodology: how is transformative learning facilitated? Clearly, there is no mechanistic blueprint which can be simply transferred from one situation to another. As Capra notes (2003, 104):

> Since the process of emergence is thoroughly non-linear, involving multiple feedback loops, it cannot be fully analysed with our conventional, linear ways of reasoning, and hence we tend to experience it with a sense of mystery.

It is clear that a transformative experience may occur without direct design or control of the learning situation. For example, the old byline 'this book will change your life' - despite publishers' hyperbole – is, on occasion, true. Rachel Carson's *Silent Spring*, Robert Pirsig's *Zen and the Art of Motorcycle Maintenance*, and Fritjof Capra's *The Turning Point* are three such books which circumstantial evidence suggests, have had a pivotal influence on many people's thinking (including mine), towards an ecological outlook. Similarly, one of the leaders of the permaculture movement in the UK told me a particular TV programme had helped alter the course of his life. Alternatively, a bodily, aesthetic or spiritual experience may induce profound change (Morrell and O'Connor 2000, xviii). In such situations, the *prior disposition* of the learner is clearly of importance. In more formal learning situations, the occurrence of transformative learning seems partly contingent on the prior awareness of the designers of the learning situation. As Ison and Stowell (2000, 3) comment:

> To understand and deliver a pedagogy which enables and provokes students to move across levels of epistemic competence is in itself challenging. To do so requires an awareness on the part of the curriculum designer and personal tutor so that they can facilitate the emergence of these changes.

- Keypoint: In other words, there has to be an intent on the part of the designers/teachers born of their own learning, to construct a learning system through which they can encourage others to explore epistemic change, as a collaborative inquiry.

This is something I had direct experience of as co-ordinator of WWF's 'Reaching Out' professional development programme for teachers (on education for sustainability), where our tutor team often saw surprising results and - what appeared to be - deep learning in a significant proportion of our participants (Sterling 2000b). This phenomenon can partly be attributed to the learning system that we constructed, through which, after an intensive and challenging stimulus and input, participants were encouraged to reflect on their learning and practice with others, and over an extended period of time. There is then, as indicated previously, a 'two-level' learning process involved: the new 'meaning making' of the designers/teachers facilitates the new 'meaning making' of others. This is what Roling (2000, 52) refers to as 'double

hermeneutics'. Further, as Bawden (1997b, 4) suggests, the evolving learning system is a process which:

> …appreciates and accommodates its own complexity, in addition to that of the main problematic matters to hand (*i.e. the subjects of study – my comment*). The central feature of the approach is therefore the design, establishment, maintenance, and development of self-referential, or critical, learning systems…(which can)…learn about their own learning.

Bawden summarises this praxis neatly, as the "systemic development of systemic development" (1997b, 1). Elsewhere, he suggests that an emergent property - a "great surprise" - of such an inquiry system is the notion of learning as transcendental to what are normally regarded as the prime educational activities such as 'research' and 'education' (1991, 2370). Hence, the Hawkesbury team did not have a clear idea where they were going when they set out to transform the College (see subsection 2.2 above), but entered a deep learning journey themselves. Clearly, others can learn from their twenty years of experience - and the Open University's Centre for Complexity and Change, for example, cites Hawkesbury as a key influence on its own attempts to design for epistemic change - but perhaps another lesson is that a systemic learning community is bound to be involved as a whole in an open-ended inquiry: it cannot be a matter of following a blueprint, however well designed. (This echoes my model of 'sustainable education' above, and the discussion in **Appendix I** on the ecological design of sustainable systems.)

- Keypoint: In brief, transformative learning arises from the interaction between the *state of readiness* of the learner, and the *quality of the learning environment* to yield a particular learning experience as an emergent property of that interaction.

Hawkesbury College approached this by developing what they termed 'methodological pluralism', which was a conscious attempt to transcend "the epistemologies of positivism and reductionism" (Bawden and Packham 1993, 4). Thus, a spiral of 'nested' research methodologies was elaborated, where the methodologies and methods used depended on the context of the research and the participants, (rather than the research problem being moulded to the pre-chosen methodology. The Hawkesbury approach echoes Ison's 'problem-determined system' then). Systems of methods of inquiry were built up in a hierarchy from reductionist methodologies across and up a spectrum towards holistic methodologies, each method being appropriate to the problem in hand. This is shown as Diagram C.9 in the **Appendix II** (Packham 1993, 552). The model seems to have provided a 'ladder' of learning experiences that could

cater to different levels of prior ‘readiness’ in terms of existing knowledge and assumptions, and help lead towards transformative learning experiences within the supportive context of a ‘systemic learning community’.

In terms of both inquiry and pedagogy, the Hawkesbury team saw their work in terms of participatory action research, yet I think their inclusive approach to methodological pluralism perhaps allows for the inclusion of didactic method at one end of their spiral. Whilst it is fashionable to equate didactic pedagogy with ‘old paradigm’ approaches, I think there is room for the inspirational pedagogue to be counted among the routes to transformational learning: it still comes down to the nature of the participative experience of the learner. That said, the quality of participation in learning is key to the possibility of transformative experience, and this is more likely, it seems to me, through designed or intentional participatory action research processes or cooperative inquiry. I now move on to look briefly at these approaches to learning.

Here, it is useful to follow Ison and Russell’s distinction between first order action research, and second order action research. In the first, the researcher sees him/herself as a participant/observer but in practice “the researcher remains ‘outside’ the system being studied” (Ison and Russell 2000, 2). In other words, the old episteme reigns unnoticed. In the second ‘systemic action research’, however, the researcher is “part of the interacting ecology of systems” and is fully aware of this. His/her role is “that of a participant-conceptualiser” and therefore “responsibility replaces objectivity in a whole systems ethic”. This echoes the concept of ‘participatory knowing’ (first introduced in Part A).

I suggest that attainment of participatory knowing, a second order learning state, is necessary to reach a state of transformational or epistemic learning. Further, that the latter is a ‘whole experience’, that is, it engages the three dimensions of paradigm and knowing (outlined in my triadic model), and therefore involves a shift in personal ethos, eidos and praxis. While participatory knowing is one dimension of what is meant by ‘participation’, a second dimension is participation in the sense of social engagement. These two senses are brought together in the methodology of cooperative inquiry and participatory action research, which is predicated on a participatory worldview, and notably, is associated with the work of Reason and Heron amongst others.

According to Heron, cooperative inquiry, “is a form of participative, person-centred inquiry which does research with people, not on them or about them (and) breaks down

the old paradigm separation between the roles of researcher and subject" (1996, 19). This approach values empathy, critical subjectivity, dialogue, respect, knowing in action, co-creation and self-determination: (I have taken these keywords from Heron and Reason's various joint and separate writings). While inquiry may be 'informative about' something, say Heron and Reason, primacy is given to "transformative inquiries that involve action, where people change their way of being and doing and relating in their world - in the direction of greater flourishing" (Heron and Reason 2001, 180). Indeed, I suggest that such inquiry - if, as is argued, it is grounded in a participatory worldview (Reason and Bradbury 2001, 1) - necessarily implies a shift from an information orientation or search for knowledge, which is characteristic of the 'old paradigm' towards transformation. I agree then with Reason and Bradbury (2001, 10) when they suggest:

> Given the condition of our times, a primary purpose of human inquiry is not so much to search for truth but to heal, and above all to *heal* the alienation, the split that characterizes modern experience.

I find myself largely in agreement with the philosophical grounding of Heron and Reason's work and impressed by the practice that has emanated from, and been influenced by, their years of involvement in the field of inquiry and change. At the same time, I feel there are some valid questions to be posed to some examples of cooperative inquiry:

- is the overriding context of the urgent need to enact the sustainability transition sufficiently to the fore in cooperative inquiry with its regard to 'human flourishing'?
- how far is the ecological/participatory/co-evolutionary worldview or ethos explicitly informing praxis?
- is cooperative inquiry and 'research into the human condition' a little too anthropocentric in orientation? Whilst Heron (1996, 11) suggests the participative paradigm is "conceived as interdependent with the flourishing of the planetary ecosystem", the latter concern seems to be at best secondary in most of the literature.
- is there sufficient emphasis on epistemic learning and intention in designing learning experiences that assist such deep change?

As I write this, I am conscious that similar questions can be asked of much systems practice too. I suspect that a good deal of action research might satisfy Reason and Bradbury's five pointers towards quality and validity (see 2001, 454) and yet do rather

little to advance ecological understanding or systemic wisdom in relation to the larger (ecospheric) context beyond the immediate research context. Hence, in reviewing the chapters in their 2001 *Handbook of Action Research* compendium, Reason and Bradbury state (452-453): “we are struck that while all contributors are concerned with addressing questions they believe to be significant, few pay *explicit* attention to inquiring what is worthy of attention” and again, “we see few direct accounts of…transformation” (authors’ italics). This comes back to the issue of ‘purpose’, discussed above in 1.3. Despite Reason’s cogent essays which I believe reflect a similar epistemic ecologism to my own, my impression of some participatory action research is as a *methodology* that is still more informed by the Freirian or Habermasian emancipatory traditions than by ecological or systemic thinking, and that there is still work to do to bring the two (or three) strands together in a more integrated overall ecology of learning that is itself more whole and can therefore more effectively heal “given the conditions of our times” (see Reason and Bradbury quote above).

This said, and in brief, as regards methodology for transformative learning, the work and writing of such as Ison and Russell, Bawden and Packham, Heron and Reason, among others, represents an important and significant breakout and breakthrough from dominant paradigm views of research, education and learning. This thinking and practice is open-ended and tentative, for two reasons. First, that it is relatively new and still developing (witness for example the inclusion of the participatory paradigm in Denzin and Lincoln’s book between the first edition in 1994 and second edition in 2000), and secondly, by definition there is no (and can be no) blueprint. Contextual learning is intrinsic to the process. As Reason (1998, 19) argues:

> It is helpful to regard cooperative inquiry as an essentially emergent process. You can’t just set up a cooperative inquiry group, because cooperative processes have to be negotiated and re-learned by every group in every new circumstance.

This of course, means we have to let go of our mechanistic tendencies to construct and control every detail, and this includes the temptation to impose a ‘sustainability agenda’. It does not mean however, that we cannot try to design for deep learning. Ison *et al.* ask a critical question in relation to complex problem situations, but it applies equally to structuring learning contexts:

> Is it possible to design (non-deterministically) contexts in which improvements, as emergent properties, might be possible?
> (Ison, Maiteny and Carr 1997, 261)

The answer seems to be a cautious ‘yes’, and some of the shifts towards ‘viable’ learning systems that are conducive to engaged and deep learning have been discussed above. For example, Bawden has summarised what he sees - based on the experience at Hawkesbury - as the characteristics of a “self-organising critical learning system”. Without giving the whole description here, such a system will be able to:

- “connect with the environments about it, and learn about and from them
- create meaning both experientially and inspirationally
- design ‘meaning informed’ strategies for desirable and feasible changes
- deal with inherent tensions of difference both within and without
- deal with conflicts, paradoxes, complexity and chaos
- have requisite variety
- have requisite redundancy and
- be self-referential and critically self-reflexive.”
- (Bawden 1997a, 30)

Echoing learning level theory, Bawden (2000a, 20) suggests that such learning systems are self-relfective and adaptive at three levels of learning involvement: “(i) about the matter to hand (ii) about the process through which the matter to hand is being learned, and (iii) about the epistemological and ontological assumptions that frame what is being learned at (i) and (ii).” Bawden does not mention ‘edge of chaos’ conditions, but his learning system seems close to creating this state of ‘bounded instability’ where transformational learning is more likely to occur (Stacey 1996a). (The ‘edge of chaos’ metaphor for management and organisational change comes from complexity theory, and is returned to in section 3 below and Part D).

Bawden’s system is not a blueprint but a low-resolution recipe that might be applied, developed, re-learnt and adapted according to context and participant mix. Such a description or ‘image’ (to reiterate Banathy’s term) seems more appropriate to, or practicable in, non-formal adult learning situations than in formal ones, see for example, the methodologies that go under the title of Participatory Rural Appraisal (PRA) (Chambers 1997) or Participatory Action Research (Fals-Borda 1991). But the conditions for epistemic learning are possible in some more formal situations. A notable example of a systemic learning system is Schumacher College, in Dartington, and this is shown as a case study in the **Appendix II** (for reasons of space) as Box C.7 under Part D.2.4. At the College, there is significant evidence of - and an unusually high

incidence of - transformative learning compared to the quality of the learning experience in most formal mainstream institutions, and that such learning when it occurs has lasting impact. Here are some participants' quotes from an evaluation and review which I carried out in 2002, (and sampled participants on courses running from 1997):

> It made a profound difference in that it has enabled me to clarify my life purpose and begin to put in place structures consistent with this.
>
> One of the most intensive periods of my life, because a huge bounded energy was released in me, which involved a deep transformation.
>
> I am still experiencing the influence of Schumacher College in a deep and profound way.

The evaluation suggests this experience, which by its nature cannot be 'guaranteed', is facilitated by the College's both overt and implicit systemicity as regards most aspects of its operation (Sterling and Baines 2002). Hence a regular facilitator commented:

> The total evolved system of the staff/volunteers/student body/tutors is a truly remarkable presence which has enabled, on all ten of my courses, a life-changing experience for many of those present.

Schumacher College is of course 'not perfect' and in our evaluation we identified some real problem areas to be faced. However, in my own experience, the organisation, management and learning experience operating at the College is the closest exemplar I have known to the third position of 'Education as sustainability/sustainable education' outlined in the three part model above. Indeed, my direct experience of the College over a period of several years helped me elaborate this model.

Schumacher College and Hawkesbury College are, as far as I am aware, unusual exemplars, where in each case a measure of independence as well as visionary leadership allowed the development of innovative systemic learning communities. Certainly, some of their positive characteristics and principles are not unique to them, but the unusual nature of these exemplars raises the question of how far more 'ordinary' institutions and learning communities can facilitate transformative learning.

Here, I want to refer back to the adaptive relationship of education as a human activity system nesting within a wider social human activity system (see Diagram C.1). As noted above, the education system changes in response to change in social and political pressures and expectations. A striking example is the adaptive change that politicians have imposed on educational systems - a change which they have sought in response to their perception of a changing global economy and future skill needs. Yet the co-evolutionary relationship between education and society also suggests the possibility of more progressive change.

As outlined in Part B, there are significant social movements towards sustainability, and also burgeoning (if still peripheral) work and research in a wide range of fields which are seeking more sustainable modes of operation, such as energy, agriculture, design, architecture, production, and transport. Similarly, there is new thinking in relation to sustainability in such areas as politics, policymaking, economics and organisational change, and such change is evidenced in the growing catalogues of key publishers such as Earthscan. At a deeper level, as discussed earlier, there is some evidence of a change of fundamental metaphor and new interest in such concepts as relationship, emergence, and self-organisation. So *alongside* modernism and globalisation, such contrary movement is also part of the wider environment of the education system, and as such it is a force for progressive, more ecologically oriented, change in educational thinking, policymaking and practice. Often, as we have seen, the 'response-ability' and consequent learning response of education and of actors within it is limited; but there are always some individuals, groups and institutions and organisations that are able and willing to respond more deeply to significant change in society. My argument here is that it is the transformative learning of such actors that then can empower them and position them to develop learning situations that can, in turn, encourage transformative learning for their students or 'clients' - particularly where these actors can stimulate radical re-thinking and learning within their policymaking and teaching organisations at the same time. We can envisage then, the possibility of deep learning occurring contemporaneously at several levels (or *layers,* to distinguish between this and learning levels) - students, teachers, policymakers, social movements - (and indeed this was exemplified at Hawkesbury).

This exemplifies a transformative recursive relationship between progressive elements in education and in society - whereby change towards sustainability in wider society supports sustainable education, which in turn supports change in wider society both directly and over time. This brings me back to the critically important question which I

posed in Part A.1.2 and Part B.3.2: ‘how can education and society change together in a *mutually affirming* way, towards more *sustainable patterns* for both?’ Banathy (1991,129) suggests this signals a change from education focusing on maintaining the existing state and operating as a rather closed system, towards helping shape society “through co-evolutionary interactions, as a future-creating, innovative and open system”. This is a vision of on-going re-creation where both education and society are engaged in a relationship of mutual transformation and reflexivity which can explore, develop and manifest sustainability values. This is itself would be a transformative relationship characterised by positive feedback loops which drive the metasystem (society) and subsystem (education) to a new state - something Henderson (1993) would call a ‘breakthrough’ scenario. The initial driving forces in this process are less to do with education (that is, the effects of ‘education for change’), than increasing awareness in society - and therefore also, amongst some actors in education - of deep systemic crisis in the ecological suprasystem (see Diagrams C.1 and C.2).

- Keypoint: The stark argument here is that the need for change in society and education in relation to the challenge of achieving ecological sustainability is so radical that limited ‘adaptive change’, or ‘adjustment for error’ is not sufficient: positive co-evolution by transformation is necessary (Banathy, 1992).

The key to such change, as I have indicated, is sufficient awareness and conscious intent by sufficient actors to initiate and sustain the process. It is growing awareness of systems failure, including recognition of the inadequacy of current assumptions and values that is the current and potential spur to systemic change in education. As Chapman states (2002, 14) people:

> will not change their mode of thinking or operating within the world until their existing modes are proved beyond doubt, through direct experience, to be failing.

This perhaps gives equal grounds for pessimism and optimism as regards the probability of large-scale change in education. Meanwhile, one of the lessons of systems thinking is that small-scale radical change can sometimes affect the whole, and indeed change is more likely to be systemic and durable when it is energised in this way, than when it is imposed from the top.

I have given two examples of transformative change at an institutional level above. Such radical change at the national or international level is of course more difficult and less likely. That said, I have had some association with a remarkably visionary initiative

by an alliance of eleven governments that form part of the Baltic Agenda 21 Education group and which are seeking to reorient their whole educational systems towards sustainability (Baltic 21 2002, Sterling 2002). This can at least be seen as a second order learning shift among some policy-makers, but its impetus may be slowed by its being a top-down project.

At a smaller scale, an example which links change at institutional level and international level and also illustrates many of the points made above, is that of the EU AFANet network (first mentioned in 2.3 above). Between 1997 and 2000, the AFANet European network sought to explore the implications of sustainability by developing a number of projects that sought to integrate sustainability concepts and practices in a number European higher education institutions. An outcome of this project, the book *Integrating Concepts of Sustainability Into Education for Agriculture and Rural Development* (Van de Bor, Holen, Wals and Filho, 2000), indicates that a number of agricultural education institutions have started to re-think their role, curriculum and operation in fundamental ways. The on-going lessons learnt from this work are summarised below:

Box C.6: Six lessons about sustainability and transformative learning from AFANet

1. Integrating sustainability presupposes the re-thinking of institutional missions

"The integration of sustainability will never lead to anything fundamentally new if the institution is not prepared to re-think its academic mission."

2. It is no use crying over vague definitions

"Sustainability is a non-prescriptive concept, which needs to become meaningful in a specific context."

Its non-specific, imprecise nature can be seen as an advantage in stimulating dialogue on meaning and implications for curriculum, pedagogy, and so on.

3. Sustainability is as complex as life itself

"It is related to the social, economic, cultural, ethical and spiritual domain of our existence. It differs over time and space and it can be discussed at different levels of aggregation and viewed through different windows…it does not lend itself to unilateral, linear planning or a reductionist scientific paradigm and thus involves the systemic integration between theory and practice into systemic praxis".

4. Teaching about sustainability requires the transformation of mental models
It "includes deep debate about normative, ethical and spiritual convictions and directly relates to questions about the destination of humankind and human responsibility. In this way, it differs from a modernist and positivistic way of thinking."

5. There is no universal remedy for programmatic reconstruction
The possibility of innovation depends on the cultural and academic context. There is then, "no panacea for curricular reform", no blueprint for change in education towards sustainability. Therefore, change must be based on an inclusive, participative approach.

6. Programming sustainability demands a rethinking of teaching and learning
"Reorientation requires ample opportunity for staff members and students to embark on new ways of teaching and learning…(and).. the opportunity to re-learn their way of teaching and learning, and to re-think their mutual relationships."

(Based on Van de Bor *et al.* 2000, 314, *and* Wals and Bawden, 2000, 20 - which is a re-rendering of the same text. The six summary points in bold, and the accompanying sentences shown in quote marks are direct quotations).

I will summarise some of the key conditions, the recognition of make the design of transformative learning situations more likely:

- the importance of conscious intent and leadership
- assessment of the prior disposition of the learner
- the importance of a participative, inclusive, approach
- the importance of attention to the immediate and wider context
- the need for systemic rather than piecemeal change
- the importance of second order change - learning about learning - as a precursor to epistemic change
- the importance of a co-evolutionary rather than linear view of the relationship between education and society and hence the importance of community and real-world links
- the need for epistemic change towards a more systemic or ecological paradigm

These notions suggest that the fundamental issue is not so much the 'integration of sustainability into education' as the 'integration of education into sustainability', that is, working towards the systemic and co-evolutionary 'fit' discussed above.

This co-evolutionary sense is echoed by Roling's contribution to the AFANet book, which provides an example. He suggests that agricultural institutions in this "new century of the environment" must make a choice between different social/economic directions: either to link evermore closely to the commercial sector and biotechnology companies to become 'technology institutes'; or sell their expertise in agricultural and rural development to the South; OR develop green expertise and a "compelling vision on ways of escaping the human ecological predicament". In Roling's view, institutions have no other choice than take this third option if they want to survive. Thus by engaging in the concerns and processes of sustainability, Roling (2000, 43) believes, institutions are more likely to be sustainable themselves. In this role, he suggests, they will not only be "concerned with food production, but with the sustainable use of ecological services and natural resources in general". Through embracing social learning and collective action, as well as their existing concerns with economics and technology, universities will "help society develop adaptive management of eco-systems, and elaborate the institutional and social implications of this shift".

This is an expression of whole systems thinking which exemplifies the three-part shift that has been central to my argument, involving *extension/reperception, connection/re-cognition* and *integration/realisation.* This is my model of epistemic learning. There is evidence that such learning is taking place to some extent in the field of management and change. In section 3 below, I examine briefly this interesting development, some key ideas arising, and implications for intentioned change in education.

3 CHANGE AND MANAGEMENT

3.1 Theory of systemic management and change

In recent years, there has been a growing literature which seeks to interpret the implications of new paradigm thinking (Ray and Rinzler 1993), of complexity theory (Stacey 1996b), and the living systems metaphor for management and organisational change (Morgan 1982, De Geus 1997, Capra 2003). Such thinking parallels other work on organisational change (Argyris and Schon 1996) and the learning organisation (Senge 1990) and thinking on adaptive management in sustainable development (Carley and Christie 2000). (I look at adaptive management as an alternative to technocentric management in **Appendix I** subsection 3.3.) Whilst there are differences within this emerging field (Stacey, Griffin and Shaw 2000), and aspects remain controversial, it is possible to see this literature as representing an emerging paradigm

in thinking about management and change which, clearly, is relevant to educational change including change in educational institutions.

This is itself a big topic and I will only summarise and discuss some of the key ideas here. My own attempts to show the difference between mechanistic and ecological paradigms in terms of management are shown in the **Appendix II,** Part C, Table C.3 (Sterling 2001). In essence, the difference between 'new' and 'old' paradigm thinking as regards management and change is attention to 'systemics' rather than 'systematics', that is, the emphasis is on *systemic learning* as change, rather than *systematic control* in response to change. In Part B.3.3, I have already discussed the impact of mechanistic and managerialist thinking on education systems, and the growing influence of complexity theory and systemisism in some areas of business thinking and practice. Some of the key differences are outlined below (the terms 'old' and 'new' paradigms are employed for sake of brevity).

Box C.7: The meaning of management

Williams (1984, 1900) points out that the word 'management' comes from the Latin *manus* meaning hand, which is associated with handling, manipulation and direction. However, in the 17th and 18th centuries there was overlap between 'manage' in this sense and *menage* meaning careful housekeeping. Senge (1999, in Webber) has suggested that in current conditions of complexity we need to think less like managers (in the first sense), and more like gardeners (which invokes the second sense). Such a metaphor is perhaps best represented in education through the ideas of the 'nursery' and nurturing, but interestingly, this sense is abandoned after the early years.

Key differences in management paradigm

Metaphor - the foundational metaphor is key to understanding any theory-in-action of change, and its associated lexicon of change and management:

- The *machine* metaphor - applied to organisations, people and learning – tends to support a paradigm of instrumental rationalism, reductionism, control, hierarchy, determinism and predictability, unidirectional cause-effect and linearity, inputs-outputs, problem-orientation and problem-solving, first-order change and reductionism.
- The ecological metaphor of *living system*, by contrast, emphasises whole systems thinking, holism, self-organisation, holarchy and networks, uncertainty, non-

> linearity, feedback and complexity, emergence and synergy, appreciation and situation improvement, creativity, and second- and third-order change. This ecological orientation is deemed to be a more adequate and empathetic metaphor for the world as it appears to be, whilst recognising that mechanistic approaches have validity in specific situations.

The main problem, from the systemic point of view, is the pervasive and universal influence of mechanism beyond the limited situations and applications where it can be appropriate. The simple listing of these sets of keywords belies the very significant difference of ethos, eidos and praxis in these two paradigmatic approaches to change.

Learning levels - old paradigm thinking about learning tends to go no further than first order change, therefore giving rise to single-loop, adaptive learning practice, based on transmissive, information-based learning, within the recognised or formal curriculum. Double-loop learning can take place in organisational change, but this does not necessarily affect the cultural metaparadigm. However, in the ecological paradigm, double-loop learning is seen as a precursor to transformative or epistemic learning.

Learning layers - in the old paradigm, only one 'learning layer' is recognised, this being the formal curriculum and the student body. There may be training for staff, but a dualistic distinction between those who learn (students) and those who teach (teachers, lecturers, facilitators) is still maintained. In the new paradigm, different learning layers are recognised - students, staff, and the whole organisation as a learning ecology or learning system (see next point). Further, the interrelation between learning layers is recognised - for example, the role of students as teachers, and teachers as learners.

Learning organisation - old paradigm thinking tends to take a reductionist view of group learning, putting prime emphasis and focus on individual learning. Any group learning is seen as resulting directly from the learning of individuals in the group ('the whole is the sum of the parts'). New paradigm thinking, particularly since Senge's work (1990), has emphasised the importance of the 'learning organisation' whereby learning as an organisation is seen as an emergent property arising from the interaction between individuals within the organisation and between the organisation and its environment. Thus, the learning organisation can co-evolve a collective intelligence.

Patterns of organisation - in old paradigm approaches, institutions tend to be structured along hierarchical and compartmentalised lines with strong vertical lines of communication, and weak horizontal lines of communication and interaction. This reflects views of power and causality. Thus, control resides at the top and change occurs by a vertical command structure. Second, a fragmented view of knowledge results in separate departments, disciplines, and specialisms, with little or no horizontal integration. In the new paradigm, there is more emphasis on flatter structures, trust, empowerment and subsidiarity, fluid groupings, self-organisation, transdisciplinarity, and encouragement of positive synergies.

Management and intelligence - in the old paradigm, the intelligence of the organisation is seen as arising primarily from goal-seeking direction and vision from the top, and second, from people's response to these goals and outcomes determined from above. Required response to direction is seen in terms of 'performance' and 'delivery', and this 'effectiveness' is measured and monitored and relayed to the top as a feedback loop. Individual initiative may be encouraged where it fits into the ethos and theory-in-action, and negative feedback controls are employed to keep innovation within limits. In the new paradigm, intelligence and innovation is seen as arising from the self-organising learning of individuals and groups within and without the institution or organisation, and this process is 'cradled' and encouraged by the leadership.

View of people - in the old paradigm, people are valued instrumentally and viewed as resources, or operatives, or as outputs. They are there "to process information and obey the rules embodied in hierarchies and bureaucracies, in information and control systems" (Stacey 1996a, 347). There is an emphasis on integration, into the ethos, assumptions, and ways of working of the organisation or institution. Trust in people, whether staff or students or workers tends to be low, and their performance is regulated and controlled by systems of reward, competition and accountability through targets and sanctions. In the new paradigm, the health of the whole is seen as dependent on the well-being of the part, and vice-versa, and a dynamic balance between autonomic and integrative tendencies is sought. It is recognised that creative tension and conflict is part of this process. People are valued intrinsically rather than instrumentally, and there is an assumption of faith and trust in people. Space and time are maintained to encourage and allow self-organisation, self-motivation and creativity to emerge.

Management and complexity

The importance and distinguishing mark of whole systems thinking and approaches in management and change lies in the affirmation of emergence as the primary focus, rather than control. If we define sustainability as a relative emergent property arising from a set of interrelationships, rather than as a predetermined and fixed goal, then clearly, this quality is much more likely to arise from a management paradigm based on systemisism and a conscious aspiration for second and third order change, than one based on mechanism and tied into first order change. The former position is about embedding, embodying and enacting sustainability as a learning process - about 'learning as sustainability' or 'being the change we seek', to borrow Ghandi's phrase. The latter position, where sustainability is acknowledged at all, is likely to seek to contain it, and reduce it to another set of goals and outcomes, which may or may not conflict with existing aims.

My argument here finds support in Ralph Stacey's extensive work on strategy, management and complexity, which I now briefly review. Stacey suggests that "most managers think in terms of linear, unidirectional causality" (1996a, 275). Beyond this, he acknowledges the influence of cybernetic thinking and suggests that many organisations are goal-seeking, the goal being equilibrium adaptation to their environment. This is effected through decisions based on negative feedback which seeks progressive adjustment. In other words, adaptive, first-order learning and change. Such equilibrium behaviour is regular, orderly and predictable (262). Hence, he says, we think of organisational learning "almost always as a tidy process that produces progressive improvement and that somehow we can always be in control of" (309). This is a fundamental belief which is echoed in much simple strategic thinking and management, including in education, but which is often confounded by the nature of complexity. The world is not a tidy place, and managers and policy-makers tend to respond to its baffling complexity by seeking to exert still more control (Stacey 1997, Carley and Christie 2000, Chapman 2002). This has deeply problematic results. Stacey says that managers respond to increasing uncertainty by insisting on more control, output, and accountability, which raises stress and anxiety levels - a positive feedback loop, which puts policy, institutions and people in a classic double bind (1997, 3). So the response to anxiety and system failure is often "clinging even more closely to the inadequate frame of reference that is causing the trouble in the first place" (Stacey 1997, 8). Beyond, this, I would add, is the possibility of double-loop learning which transcends this bind, and the difference between belief and experience is recognised.

Stacey is critical of mechanistic systems approaches that support the myth of control (this echoes my earlier distinction between *mechanistic* and *ecological* systems approaches). Rather, he argues for management thinking based on the sciences of complexity. This is my understanding of some of the key points:

1. most systems - natural and human - are non-linear feedback networks ('complex adaptive systems') operating far from equilibrium
2. such systems exist within other such systems, and therefore it is more accurate to say that they co-evolve, rather than that 'a system adapts to its environment' in a Darwinian sense
3. learning occurs primarily through self-organisation rather than through direction and instruction
4. outcomes occur through emergence rather than through planning, and cannot be known or guaranteed in advance.

Stacey is not saying this is what *should* happen in organisations and institutions, he is saying this is what *does* happen - *but we do not recognise it* (Stacey 1997). Rather, our mechanistic approaches to learning and change, tend to distort a 'natural order'. Although, it turns out, it is not so much a natural 'order' but a dynamic state of order/disorder which has been called the 'edge of chaos' by complexity theorists. This "fertile suggestion" say Reason and Goodwin (1999, 286), "is proving to be a robust insight, despite the difficulty of pinning it down precisely, i.e. mathematically and logically", and despite severe criticism from some quarters.

Complexity theory suggests that non-linear systems can either tend towards the 'attractors' of stable equilibrium (driven by negative feedback) or explosive instability (driven by positive feedback). In addition, however, there is a third state, known as the 'edge of chaos', which is a state of limited or bounded instability far from equilibrium which continually flips between negative and positive feedback. This is achieved through self-organisation and it is the state in which the system is most creative. Complexity sciences have arisen from the study of natural systems, but according to Stacey, the edge of chaos "is a tremendously important analogy to use in thinking about organisational life" (1996a, 314) because it shows that "instability and unpredictability are essential to innovation and creativity" (315). Reason and Goodwin (1999, 297-298) reflect on whether it is reasonable to apply such a metaphor to social life and organisations, and suggest that it is, as: "metaphor is at the basis of all theory….(and) while of course complexity theory is a metaphorical construct…it is

helpful to see social and organisational life as a complex, self-organising process". If this is the case, the implication of this work is that the transformative learning (in individuals, institutions and organisations) that sustainability requires occurs at the 'edge of chaos' conditions, and that according to Stacey (1996a, 348), "the process of transformation is a spontaneously self-organising one".

Clearly, these ideas are extremely important. Most educational organisations or institutions, and particularly since the recent managerial revolution (see Part B), have been run on mechanistic 'control' lines. But as Stacey points out, keeping a system in stable equilibrium through negative feedback controls and 'ordinary management' traps it into endless repetition and destroys its creativity (1996a, 314). The same applies, I would suggest, to the effect on people within the institution too.

- Keypoint: The result of 'ordinary management', says Stacey, may be stability for a long time, but ultimately it will lead to the death of creativity and innovation and therefore ultimately, the system too.

This has huge implications, for the way educational institutions are organised, let alone other human systems. At the other end of the spectrum, characterised by instability and positive feedback, a system will tend towards further instability until it is limited by another factor (negative feedback). This constraint, says Stacey, has to come from outside the system (313). Echoes here then, of ecological limits, though Stacey has very little to say about these. This appears a weakness of his work which focuses on organisations rather than their wider environmental context. Similarly, companies may use complexity theory to help them assure their own sustainability or longevity, but their 'system of interest' remains limited to the company (De Geus 1997) rather than wider sustainability. It is very important to note this, because in our present times of ecological crisis, co-evolution has to be in the direction of overall ecological sustainability or survival of the whole.

In sum, we can say, the extremes of stability and instability are unsustainable states erring towards system breakdown - at one end ossification, at the other disintegration. By contrast, the 'edge of chaos' is a dynamic sustainable state - as long as, I would add, any system in this state is in coherence with (that is, it fits with or does not undermine the viability of) its sub and meta-systems. Sustainability is at the edge of chaos:

> If it is to survive, every human system must return to the edge of chaos, where outcomes are unknowable and no one can be 'in control'…(here, the system) will be controlled through the process of spontaneous self-organisation…unless

> we, in our desperate attempts to stay 'in control' cause it to tip over into the unstable zone.
> (Stacey 1996a, 346).

This is not just a question of organisational management, but - as Stacey argues - "a new frame of reference for understanding the whole world in a different way" (346). What is exciting here is a view of the world and a theory of change and learning that supports the core arguments of the Thesis. Thus, many of the ideas outlined in this Thesis are brought together:

- *Unity and dynamic balance* - the concept of 'edge of chaos' gives grounding to the systemic idea of 'bothness' rather than the 'either/or' of Western dualistic thought. The necessary dynamic *balance* - rather than *conflict* - between such pairs as 'autonomy and integration', 'structure and randomness', 'order and disorder', 'stability and instability', need to be recognised as intrinsic to life. Here, complexity theory echoes the idea of the cosmic dance which has been reflected in ancient mythologies and artistic traditions for millennia (see for example, Wade 1991).
- *Self-organisation* - as the fundamental learning process and key principle of system organisation and system health in both human and non-human systems.
- *Learning* - occurring most strongly in situations characterised by a balance between security and challenge, certainty and anxiety, stability and instability, and a degree of 'mess'. This is where creativity and innovation occur. Transformative learning happens in these conditions.
- *Adaptive management* - management as an iterative learning process, allowing and nurturing self-organisation, rather than goal-seeking behaviour through command and control.
- *Higher order change* - second and third order change (epistemic learning) as necessary to transcend mechanistic approaches and achieve an 'edge of chaos' system state of creativity in management and learners.
- *Sustainability as emergent property* - the quality of sustainability emerging from the learning process, such that it is difficult to distinguish between learning, self-organisation and sustainability, and between these and systemic health.

Stacey's work is powerful and enhances much that has been argued in this Thesis. However, with his focus on organisations and management, he largely misses the importance of epistemic learning and the nature of the postmodern ecological paradigm, and these omissions are also noticeable in other writers working the complexity vein. For example, new paradigm thinking has made significant inroads into

business management thinking, but while some leading companies are looking at the implications of complexity theory for management, they do not necessarily embrace ecologism. Similarly, there is some evidence that these sorts of ideas are beginning to be reflected in educational discourse. For example, Gunter (1997) argues against the burgeoning 'education management industry', using chaos theory and self-organisation as a basis for her proposed alternatives and drawing on Stacey's work. Similarly, Fullan (1999) reconstructs his earlier influential theories of educational change, using complexity theory and drawing particularly on Stacey. Whilst helpful, these books give little heed to the ecological metaparadigm which complexity supports and indicates, or for that matter to the foundational influence of mechanism. To borrow Orr's distinction (1994), Gunter's and Fullan's work address the 'crisis in' education, but not the 'crisis of' education, that is, the wider socio-ecological crisis.

Sustainable education has to look both ways, within and 'without' education, within institutions and without. Complexity theory applied to management and organisation affords insight which gives the notion of 'learning as sustainability' further substance, and this is taken up again in Part D.1.3.

4 SUMMARY

In this Part, I have used systems models, learning level theory and co-evolutionary theory to examine constraints on change in educational paradigm, and the possibility of such change. Antecedent and current movements have been examined - in research paradigms and in systemic critiques of the mainstream - and a framework elaborating an ecological educational paradigm has been outlined. The nature of transformative or epistemic learning as a condition of realising and enacting the ecological paradigm has been discussed with reference to individuals and institutions, and this has been underscored by a review of the implications of complexity for management, learning and sustainability. This sets a context for Part D, where I turn my attention to environmental and sustainability education, and explore further the status and potential of whole systems thinking and the ecological paradigm in this discourse. I address some recurring paradigmatic problems in the discourse, and argue that revisioning environmental and sustainabililty education through a whole systems approach helps it to be more transformative.