Introduction

"No problem can be solved from the same consciousness that created it. We have to learn to see the world anew." —Einstein

Seeing education anew

The key to creating a more sustainable and peaceable world is learning. It is the change of mind on which change towards sustainability depends; the difference of thinking that stands between a sustainable or chaotic future. The qualities, depth and extent of learning that takes place globally in the next ten to twenty years will determine which path is taken: either moving towards or further away from ecological sustainability.

This Schumacher Briefing is concerned with the re-visioning and re-orientation of education, particularly within the contexts of Western and Westernized cultures, given the urgent need for mass social learning 'towards sustainability'. Ever since the UN Conference on the Human Environment of 1972, there have been numerous high-level calls to address the most pressing issues of our age through realigned forms of education. But nearly thirty years later, and on the verge of the second Earth Summit in 2002, most education contributes daily to unsustainability, partly by default. At the same time, it does little to sustain the 'whole person'—spirit, heart, head and hands.

Back in 1973, E.F. Schumacher suggested that education was "our greatest resource" but also warned that unless it clarified "our central convictions" it would ultimately be a destructive force.[1] Yet in the last fifteen years or so, education has been re-structured and repackaged to conform to the philosophy and perceived needs of the market, and the managerial influence may now be seen in most Western and Westernized education systems across the world. This move towards the 'modernization' and globalization of education,

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Box 1: Unsustainability and sustainability

Unsustainability . . .
"Between 1970 and 1995, the world lost 30% of its natural wealth, based on measures of the state of forest, freshwater and marine environments."[2]

"More than 113 million children have no access to primary education, 880 million adults are illiterate, gender discrimination continues to permeate education systems, and the quality of learning and the acquisition of human values and skills fall far short of the aspirations and needs of individuals and societies . . . . Without accelerated progress towards education for all, national and internationally agreed targets for poverty reduction will be missed, and inequalities between countries and within societies will widen."[3]

Sustainability . . .
"A sustainable society is one that can persist over generations, one that is far-seeing enough, flexible enough, and wise enough not to undermine either its physical or social systems of support."[4]

"The sustainability transition is the process of coming to terms with sustainability in all its deeply rich ecological, social, ethical and economic dimensions . . . . It is about new ways of knowing, of being differently human in a threatened but cooperating world . . . ."[5]

for all its belief in being at the forefront of change, is in many senses behind the times. It is:

- still informed by a fundamentally mechanistic view of the world, and hence of learning;
- largely ignorant of the sustainability issues that will increasingly affect all aspects of people's lives as the century progresses;
- blind to the rise of ecological thinking which seeks to foster a more integrative awareness of the needs of people and the environment.

It is an example of what Laszlo calls the attempt "to cope with the conditions of the 21st century with the thinking and practices of the 20th".[6] In short, there is a very poor fit.

Our paradoxical times—of both great danger and opportunity, rapid change and a search for grounding and identity—require new vision in education. In contrast to the quasi-market model of education, we need instead a more intelligent, subtle, whole view of learning and education. One that builds from humanistic educational approaches in the past, but also takes full account of new developments relating to complexity theory, systems theory, learning theory and the pressing imperative of sustainability. One that values and sustains people *and* nature, that recognizes their profound interdependence. Such a view is more holistic, participative, and practical than the narrowly instrumental view that now dominates: in short, it is an *ecological* or relational view of education and learning. And it is a reflexive and postmodern view rather than a modernist view. This more holistic view, I believe, can become the next educational paradigm—but we need to articulate and develop it now if it is to emerge from the margins of educational thought, policy and practice.

This Briefing attempts to outline a democratic and ecological alternative to the dominant discourse which, in recent years and paralleling changes in the economic sphere, has swept all before it as if no alternative were possible. The title of the Briefing is 'sustainable education', to suggest the shift of educational culture that is required. 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 paradigm, then we must find the ideas and language to help create it. The idea of 'sustainable education' is a powerful start.

The term 'sustainable education' implies whole paradigm change, one which asserts both humanistic and ecological values. By contrast, any 'education *for something*', however worthy, such as for 'the environment', or 'citizenship' tends to become both accommodated and marginalized by the mainstream. So while 'education for sustainable development' has in recent years won a small niche, the overall educational paradigm otherwise remains unchanged. Within this paradigm, most mainstream education *sustains unsustainability*—through uncritically reproducing norms, by fragmenting understanding, by sieving winners and losers, by recognizing only a narrow part

of the spectrum of human ability and need, by an inability to explore alternatives, by rewarding dependency and conformity, and by servicing the consumerist machine. In response, we need to *reclaim* an authentic education which recognizes the best of past thinking and practice, but also to *re-vision* education and learning to help assure the future.

Deep learning and change

The possibility of a 'new educational paradigm' is based upon a very important distinction, between 'first order' change and 'second order' change, or between *first order learning* and *second order learning*. First order change and learning takes place within accepted boundaries; it is adaptive learning that leaves basic values unexamined and unchanged. We all experience this from day to day: learning how to settle household budgets, for example, does not require us to examine or change our values and beliefs. Most learning institutions are primarily engaged in this functional, first order learning where the stress is on 'information'.

By contrast, second order change and learning involves critically reflective learning, when we examine the assumptions that influence first-order learning. This is sometimes called 'learning about learning' or 'thinking about our thinking'. At a deeper level still, when *third-order learning* happens we are able to see things differently. It is creative, and involves a deep awareness of alternative worldviews and ways of doing things. It is, as Einstein suggests, a shift of consciousness, and it is this *transformative* level of learning, both at individual and whole society levels, that radical movement towards sustainability requires.

In any crisis situation, people may stay 'stuck' in first order learning, that is keep 'doing more of the same' which is likely to lead to *breakdown*; or alternatively, achieve *breakthrough*, which is dependent on reflective, intentional learning which gives rise to new perspectives.

The key point is this: the crisis/opportunity of sustainability requires second—and where possible—third order learning responses by cultural and educational systems. There is a *double learning process* at issue here: cultural and educational systems need to engage in deep change *in order* to facilitate deep change—that is, need to *transform in order to be transformative*. To give a brief example, in my

experience with WWF-UK's Reaching Out programme of in-service work with teachers on education for sustainability, we found that innovative programmes that encouraged deep personal and professional reflection often changed people's lives.

According to Clark,[7] in the last 2,500 years there have been only two "major periods of *conscious* social change, when societies deliberately 'critiqued' themselves and created new worldviews." From this perspective, 'the learning society' is one that is able to understand and re-direct itself. For us, such social learning will involve taking charge of the evolution of our consciousness at individual and social levels; a deep learning which questions and examines our basic assumptions and values and intentionally speeds the emergence of the *core values* of sustainability such as sufficiency, efficiency, community, locality, health, democracy, equity, justice and diversity. It requires taking charge of our education and learning systems so that they make a positive rather than a negative difference to the human, and indeed, non-human prospect.

An ecological approach

" . . . *the unhealthiness of our world today is in direct proportion to our inability to see it as a whole.*"—Senge[8]

According to the ecological viewpoint, the fundamental problem that links the crises we now face is one of inadequate perception. From our earliest years, we are taught to make distinctions to make sense of the world. But our dominant mechanistic worldview takes this to extremes. We reify borders which blind us to the connective and dynamic reality they demarcate: humans/nature; local/global; present/future, cause/effect are prime examples. Our categorization of 'health', 'environmental', 'political', 'economic', 'social' issues and so on, belies the essentially unbroken nature of reality. As the Brundtland Report[9] recognized: "Compartments have begun to dissolve. This applies in particular to the various global 'crises' that have seized public concern. . . . These are not separate crises: an environmental crisis, a development crisis, an energy crisis. They are all one."

But we still think of them as separate—we often fail to see connections and patterns. By contrast, an ecological view of the world emphasizes *relationship*. Such thinking is systemic rather than linear, integrative rather than fragmentary. It is more concerned with process

than things, with dynamics than linear cause-effect, with pattern rather than detail. It is both descriptive and purposeful, being concerned with both recognizing and realizing wholeness.

As the issues that surround us are fundamentally systemic, we need to think in an integrative way and act accordingly. The new jargon of 'joined up thinking' indicates a realization of this need. In a growing number of areas, ecological thinking and practice is increasingly evident, including in new economics, holistic science, sustainable agriculture, ecological design, community regeneration and Local Agenda 21 work. The irony is that such movements are way ahead of mainstream education in mapping out paths to a more sustainable future, yet it is education that has been repeatedly upheld as the key to securing sustainable development.

My argument, based on many years of involvement in the field, is that Western education, while founded on a mechanistic paradigm and overlaid by a utilitarian market philosophy, cannot much assist us towards sustainable lifestyles. Furthermore, the reorientation of education towards sustainability is frustrated partly because there is an insufficient vision and elaboration of the basis of such reorientation. I believe that ecological or whole systems thinking offers the potential both to critique current educational theory and practice and to provide a basis by which it may be both transformed and transcended.

A personal perspective

It may be of interest to relate a little of my story. It's early morning, and my young children have woken, and they come into my study. What sort of world will they and their peers inherit? Or their children—can we assure them that the world will be safe and sustaining, even just one generation ahead? Whilst there is no doubt that there is a groundswell of thinking and action towards sustainability, the main indicators, as measured say by the annual Worldwatch *State of the World* reports, or even as reflected in our daily papers, remain deeply worrying. I'm not prepared to just hope it gets better. The future is in all our hands. That's why I'm involved in education for sustainability.

It goes back to my own childhood. There are several episodes which drew me to concern for the environment and for education,

including Rachel Carson's seminal *Silent Spring*; an excellent teacher who gave us the seeds of critical awareness; and a television debate between E.F. Schumacher and a status quo economist. Though a child, I had a strong sense that what Schumacher was saying was very important. Skip a few years, and then Paul Ehrlich's *Population, Resources and Environment* made a big impact on me, soon followed by Barbara Ward's *Only One Earth*, written for the 1972 UN Conference on the Human Environment in Stockholm.

Around that time, I came across an American book with an intriguing title, *Teaching for Survival* by Mark Terry. This was one of the first books which not only talked about the need for human ecology in education, but also addressed a second level, which might be termed the ecology of education, meaning seeing the school, its ethos, its curriculum, its community, and so on, as an interrelated whole. It also made the point that all education, whether or not intended as such, is environmental. It is disappointing to have to note that much of what Terry advocated then is still awaiting implementation in the majority of schools. But it was partly through reading that book that I went into education, as I saw it as an essential means by which environmental issues could be addressed.

Over nearly thirty years in environmental education, I've worked in education in many different capacities and in different countries: as a secondary school geography teacher in Sussex; science teacher on a socially-deprived Indian reservation in northern Canada; supply teacher in the prairies; deputy director of the Council for Environmental Education; tutor/course writer for the first MSc in Environment and Development Education in the UK; and freelance consultant to academia, statutory agencies and non-governmental organizations (NGOs) both in the UK and abroad—including recent responsibility for WWF-UK's in-service programme on education for sustainability. During this time I've been fortunate to have worked at all levels, from the classroom to government level, variously as a teacher, writer, researcher and advisor. But I've also been a learner. It is this experience that convinces me that deep change is needed at *all* levels, towards a more whole and integrative view of education and learning.

Over these years, I came to see that the early assumption, shared by most people in environmental education, was a simplistic and

deterministic one: that if people learnt about environmental issues, their behaviour would change. Not only does it not work, but too much environmental knowledge (particularly relating to the various global crises) can be disempowering, without a deeper and broader learning process taking place. I still believe that education and learning are absolutely central—and are qualitatively different from all the 'instruments of change' that governments consider in relation to environmental policy like regulation, tax and financial incentives. But realizing the potential of education means recognizing the richness and subtlety both of the learning process and of sustainability, and the dynamic between education and wider society. Education is not a simple 'instrument for change', although good education always involves change in the learner. Engaging education fully in the transition to sustainability requires critiquing much current thinking and practice, but also visioning and designing a credible and practicable alternative—whether you are a policy-maker, lecturer, teacher, community educator or parent.

At the time of writing, 'education for sustainable development' has been recently recognized in the national curriculum for schools in England. I had a lead role in the lobbying and developmental work which led to this welcome change, but I can't help feeling some disquiet. The inclusion of some sustainability ideas such as 'biodiversity', 'carrying capacity' or 'equity' in a curriculum may be an encouraging start, but if 'education for sustainable development' becomes assimilated within a mainstream which otherwise remains unaffected, we shall have achieved little. The challenge is to make it meaningful, and resist the tendency to put it 'in a box'. Going beyond an accommodatory response requires the deeper understanding that ultimately the argument goes way beyond a simple 'add-on' *about* sustainable development. It requires the elaboration of a lived *sustainable education paradigm* which includes, but goes far beyond curriculum, to embrace and suggest a new participative epistemology.

Learning for responsibility requires educational systems, institutions and educators to acquire *response-ability*—the ability to meet the challenge and opportunity that sustainability presents. It necessitates a deeper, more empathetic response to people and to the non-human world. It means putting heart, soul and spirit back into our thinking and practice. Education is not about realizing production

but realizing potential, not building competitive league tables but building human and social capacity. Not about merely acknowledging the environment, but understanding that we are deeply enmeshed in its quality and prospects. Realizing sustainable education is a huge but immensely important challenge, but the smallest change can be a step in the right direction, and may affect the whole.

Ultimately, the prospect of a more humanistic and ecological form of education and learning depends on how far all concerned reclaim and engage in the education and learning debate wherever they live and work, and help put it into practice for the common good. As a stimulus to thinking, debate and action, I hope the Briefing helps towards this end.

Stephen Sterling
Dorset, February 2001

Keywords

Education—from the Latin *educare*, meaning to rear or foster, and from *educere* which means to draw out or develop. While this developmental and transformative meaning retains currency, it has largely been overshadowed by transmissive ideas relating to instruction and teaching. 'Education' (as a verb) is commonly used to mean a process, and also (as a noun) shorthand for the 'education system' which involves policies, institutions, curricula, actors etc.

Learning—at simple level, the process through which new knowledge, values and skills are acquired. At deeper level, it involves 'a movement of mind' (Senge, 1990).

Chapter One

Towards Sustainable Education

"The volume of education . . . continues to increase, yet so do pollution, exhaustion of resources, and the dangers of ecological catastrophe. If still more education is to save us, it would have to be education of a different kind: an education that takes us into the depth of things."—E.F. Schumacher[1]

Sustainable education

Western education is presently characterized by a number of paradoxes, which raise some profound questions about its role. Firstly, for nearly thirty years education has been identified in international and national policies as the key to addressing environment and development issues, and latterly to achieving a more sustainable society. Yet most education daily reinforces unsustainable values and practices in society. We are educated by and large to 'compete and consume' rather than to 'care and conserve'. Secondly, education is, as never before, subject to unremitting emphasis on inspection and accountability in the name of 'quality'. Yet dysfunction, stress and the pressure to compete are widely compromising the quality of educational experience and of the lives of educators and learners. Thirdly, governments are concerned about the 'socially excluded', drop-outs from schooling and 'failing' schools and higher education institutions; yet policies which force institutions to compete mean that the advantaged ones get better and richer while the disadvantaged ones become further disadvantaged and receive blame for failing.

The first issue relates to a crisis *of* education, its limited present ability to contribute to a better world.[2] The second and third issues relate to a crisis *in* education, its limited ability to assert humanistic and democratic values in the face of quasi-market and managerialist forces. The two crises are of course related. Policy-makers, meanwhile,

mechanistic thinking and promote uniformity. Sustainable education, however, would nurture the human qualities that progressive businesses and organizations interested in social, economic and ecological sustainability, are now seeking.

The most urgent challenge is for educational institutions to make a conscious shift from their guiding metaphor of 'factory', and move to the metaphor of 'living system'; to move from just seeing themselves as 'teaching organizations', to becoming *learning organizations*. Some of the essential differences between these mechanistic and ecological models, in terms of management, are suggested in Table 2.

Table 2.

There are two important dimensions to be added here. Firstly, the question of scale. Arguably, the ecological model of management is only fully possible where the scale of an organization or institution, or of its subnetworks, is conducive to it. The sheer size of many educational institutions, and of the groupings within them, mitigate against human-scale relationships and healthy emergence.

Secondly, the question of context. There is a real danger that educational institutions (and indeed business organizations) embrace *some* of the ideas of complexity and ecological management, yet still remain driven by mechanistic values, and with no sense of the wider context of the need to achieve sustainable lifestyles. Hence, we now look further at the bases of ecological thinking and its implications for education and learning.

Chapter Three

Towards an Ecological Paradigm for Education

"If everything is intimately connected, then the quality and integrity of all kinds of relationships are of paramount importance." —Elgin[1]

The power of paradigms

Arguably, the fundamental tension in our current age is between a *mechanistic* and an *organicist* way of viewing the world. From the ecological perspective, the mechanistic root metaphor is becoming increasingly untenable. But while there is evidence of an emerging cultural paradigm which may broadly be described as ecological and postmodern, there is no certainty that it will prevail, which is why it needs to be better recognized and more widely understood. According to Capra,[2] it reflects a "new perception of reality" which has "profound implications not only for science and philosophy, but also for business, politics, health care, education, and everyday life." Increasing numbers of writers are pointing to the emergence of this ecological worldview, variously called 'participative', 'coevolutionary', 'living systems', or 'New Environmental Paradigm'.

What we are seeing is the emergence of a fundamentally different story about how the world works. Like any paradigm, it can be understood through looking at three key dimensions: a normative aspect (*ethos*) which affirms beliefs and courses of action, a descriptive aspect (*eidos*) which is how we conceive the world, and a practice aspect (*praxis*) which represents manifestation and action. This three-part model applies both to the cultural paradigm, and to the potential educational sub-paradigm which is suggested and outlined below.

The ecological worldview

Ecological thinking entails a shift of emphasis from relationships based on separation, control and manipulation towards those based on participation, empowerment and self-organization. Thus, while

we might look back at the 20th century as the age of fragmentation, witnessed in everything from the splitting of the atom to the atomization of thought and knowledge themselves, this new century might yet be the age of relation. Indeed, some writers believe we will see a shift from the modern age of the 20th century based on the metaphor of the machine or mechanical system, to a postmodern age in the 21st based on the metaphor of the organism or living system, suggesting a changed view of reality.[3, 4]

This participative worldview is based on the idea and intuition that we are deeply enmeshed in a reality which is both real *and* created, and that these are inextricably linked: that how we see the world shapes the world, and this in turn shapes us. This is why it is sometimes called 'co-evolutionary'. Because of this unavoidable dialectic, the quality of our individual and collective perception is critical. We need to discover more adequate ways of thinking about ourselves and our relationship with the world through a new, partly rediscovered epistemology. The 'ecological paradigm' represents the expression of this movement and search.

Evidence of this emergent paradigm can be seen in aspects of ecological thinking; in particular, ecophilosophy and deep ecology, social ecology, ecofeminism, transpersonal and eco-psychology, creation spirituality, and holistic science, as well as more practical expressions in areas such as ecological economics, sustainable agriculture, holistic health, and ecological design and architecture. As mentioned in Chapter 2, it is also increasingly evident in businesses' interest in complexity theory in relation to organizational change. However, the education world is largely unaware of this *zeitgeist*, and of its implications for a new education and learning paradigm.

Educational subparadigms

In educational literature, various paradigms are aired about the nature of education, its purpose, and methodology. But the important question is how far all these views are *subparadigms*, more or less conditioned by the ghosts of mechanism, positivism, and dualism, and the assumptions of modernism within the broader cultural paradigm. 'Deconstructive postmodernism' is supposed to help us here, but it leaves us drifting in a sea of relativism. Thus a number of

voices in the debate about paradigms are searching for a postmodern, ecological alternative that is more adequate and creative—and which gives us a basis for action.[5] This is where we need to ground sustainable education.

The key challenge is to create and articulate an educational *ethos*, *eidos* and *praxis*, based upon the emerging ecological paradigm in wider society. This can be approached through a simple 'whole systems thinking' model, which offers a profound way to help us reorient our worldview, and also our educational thinking and practice.

Vision, image and design

Radical change in education may be seen as depending on developing three related bases,[6] which echo the three dimensions of paradigm outlined above:

• A *vision*, that is, a philosophy and direction;

• An *image* of the desired state in terms of core values and ideas as a basis for discussion; and

• A *design* that allows realization of the image.

Arguably, none of these is sufficient in themselves, but together represent the potential to effect significant change. There is nothing mysterious or in fact ecological about these bases, and the dominance of education by the vision and design of the New Right in recent years perhaps attests to this. But if these three dimensions can be elaborated from an ecological perspective, it gives us a basis from which the dominant and conventional education paradigms can be *evaluated*, and *re-visioned*. This of course must be a debate involving all interested in the future of education.

The constructive vision is one of sustainable education and a sustainable society in mutual and dynamic relationship. This is easily stated, but much harder to elaborate. The philosophical basis of this *vision* is brie⁴ly suggested below in terms of whole systems thinking and what I have called 'the connective pattern'. This basis is then used to *image* a suggested outline of an ecological education paradigm which can applied at any level—from learning institution to national system.

Whole systems thinking

Whole systems thinking is a name given to the quality of thinking and being that appears necessary in order to go beyond the dominant forms of thinking which are analytic, linear, and reductionist. Through drawing on systems and humanistic ideas, it offers a way of making holistic thinking understandable, accessible and practicable. Because of this, it has great (but largely unrealized) educational potential. It identifies three interrelated dimensions of paradigm—perceptual, conceptual and practical—which describe human experience and knowing at any level—personal, group or whole societies.

In the dominant paradigm, there tends to be dis-integration within and between these dimensions. For example, in the Western tradition, intellectual knowledge (*conceptual dimension, or 'eidos'*) has primacy, to the extent that other forms of knowledge such as 'intuitive knowing' (*perceptual dimension, or 'ethos'*) or 'practical knowing' (*practice dimension, or 'praxis'*) are often regarded as having less value.

By contrast, the whole systems model provides a basis for understanding the emerging ecological paradigm, wherein each dimension of knowing is extended, deepened and integrated. The necessary shifts from mechanistic thinking towards ecological or whole systems thinking are represented and summarized in **Box 4.**

The guiding principle here is *wholeness*, in relation to purpose, to description, and to practice. Applied to educational settings, this three-part model is congruent with 'values, knowledge and skills' but it will be appreciated that what is implied here relates to a deeper level of transformative change than is usually meant by these words. From a simple concern with values, education needs to heighten awareness of worldviews. From concern with promoting knowledge (and often factual knowledge at that), the shift needs to be towards developing critical and systemic understanding and pattern recognition. From concern with functional skills we need to develop broader and higher order capabilities. The key assumption in this approach remains that we need to 'see' differently if we are to know and act differently, and that we need learning experiences to facilitate this change of perspective. This, as argued earlier, is second and third order learning—of which policy makers and practitioners need some experience if the education system is to also respond. Before exploring this further, I

Box 4: The necessary shifts from mechanistic thinking to ecological thinking

Perceptual dimension—the need to widen and deepen our boundaries of concern, and recognize broader contexts in time and space (**Extension**).

In an age of individualism and materialism, we are not encouraged to include 'the other' in our thinking and transactions, whether this be neighbour, community or minorities, let alone distant environments, peoples, and non-human species, or 'the needs of future generations'. By contrast, we need an inclusive rather than exclusive view, which recognizes that human and natural systems (and people) are in some way co-dependent and co-determining. As well as the outer dimension of extension, this disposition also requires an inner 'deepening' process, which values all aspects of personhood, particularly intuition, and becomes aware of our individual and shared needs and worldviews. The key quality here is 'empathy'.

Conceptual dimension—the disposition and ability to recognize and understand links and patterns of influence between often seemingly disparate factors in all areas of life, to recognize systemic consequences of actions, and to value different insights and ways of knowing (**Connection**).

The intellectual ability to know the world in a more ecological or relational way is more likely to give rise to respect in understanding and wisdom in action. The key quality here is 'understanding'.

Practice dimension—a purposeful disposition and capability to seek healthy relationships recognizing that the whole is often greater than the sum of the parts; to seek positive synergies and anticipate the systemic consequence of actions (**Integration**).

Emergent properties in any system may always surprise us, but they are more likely to do so in positive rather than negative ways if we think, design, and act integratively and inclusively. The further aspect of integration is the awareness of the need to live within the Earth's physical limits. The key quality here is 'wisdom'.

want to suggest that the view of reality that the ecological paradigm is giving rise to, indicates a 'connective pattern' that links learning, education and sustainability.

The connective pattern

"Break the pattern which connects the items of learning and you necessarily destroy all quality. . . . Why do schools teach almost nothing of the pattern that connects?"—Bateson*

The insights of whole systems thinking allow us to suggest the essence of the 'pattern that connects' education and sustainability. At the heart of it is *wholeness* and *health* (both words having the same semantic root). These are hard words to define because they are qualitative, but they invoke the ideas of integrity, of the unfolding and maintenance of creative potential in a dynamic state, of an aesthetic and of quality.

Complexity theory and our knowledge of living systems is confirming a widely-shared intuition: that healthy, sustainable systems are those which are self-organizing, self-healing, and self-renewing, and that are able to learn in order to maintain and adapt themselves. They exert autonomy, but in relation to and as integrative parts of larger systems. They maintain a dynamic balance between structure and flexibility, between order and chaos. In systems terms, these are known as 'complex adaptive systems' and there are no better illustrations than organisms and living systems.

From a systems point of view, the health of any system—be it a family, a community, a farm, a local economy, a school, or an ecosystem—depends on the health of its subsystems, and they on their subsystems and so on. *Sustainability is the ability of a system to sustain itself in relation to its environment,* given that all systems are made up of subsystems and parts of larger supra-systems. A system that either undermines the health of its own subsystems or of its supra-system is unsustainable (see **Box 1** on page 13).

Sustainability is therefore about encouraging self-sustaining abilities and wholeness between systemic levels. It's to do with appreciating and respecting what is already there, with both conserving and developing inherent creative potential, with assisting self-reliance, self-realization, self-sustaining abilities and resilience. From

this perspective, it is not difficult to see the parallels between, or the integrative pattern that connects, ecologically sustainable development practice and sustainable education—that connects 'becoming more sustainable' and 'becoming more human'.

Instead of an ethos of manipulation, control, and dependence, the ecological paradigm emphasizes the value of 'capacity building' and innovation, that is, facilitating and nurturing self-organization in the individual and community as a necessary basis for 'systems health' and sustainability. There is a dynamic here which applies differently but similarly to the way sustainability works in say, relation to soil or wildlife management, or developing healthy local economies, or educating children in the classroom. Such principles as diversity, relative autonomy, community, and integrity have an echo in both natural and human contexts. It is only a very short jump to see how educational values such as differentiation, empowerment, self-worth, critical thinking, cooperation, creativity and participation are part of this picture.

In sum, whole systems thinking and ecological sustainability give us bases for envisioning an ecological education paradigm. Following the above model we can now briefly look at *imaging—picturing* how this translates in more detail.

Imaging an ecological education paradigm

The first step is to recognize that all educational thinking and practice takes place within different contextual levels. For example, it is possible to distinguish three interrelated levels where whole systems thinking and sustainability insights can be applied. These are interpreted in **Box 5** in relation to the formal sector, and elaborated in **Table 3** below.

A key idea here is *systemic coherence,* whereby development within and between these three levels is as far as possible mutually reinforcing. In other words, in practice, an ecological paradigm shows both vertical and horizontal integration rather than segregation. These levels of change may be applied at any scale: for example, at international or national level in terms of policy change, or at institutional level, or even at group or individual level. Therefore we can envisage macro, meso, or micro change, all of which are concerned in some way with connection, wholeness and synergy.

Box 5: Three contextual levels to apply whole systems thinking

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, research and practice) and its relation with wider society and the biosphere. The perceptual dimension—'how do we perceive this'? Key idea: *extension*.

2. Organization and management of learning environment (Eidos) How whole systems ideas might be reflected in systems change and management, organizational 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, participative learning and teaching styles. The practice dimension—'how do we do this'? Key idea: *integration*.

We are now in a position to 'image' an ecological education paradigm in more detail, and at the same time use this to contrast with a model of the dominant mechanistic view. See **Table 3** on pp 58-9, where the three contextual levels from **Box 5** are revisited. Consider: which paradigm are you or your institution serving?

Such an image provides a basis for discussion and *design* of education and learning at any level of operation, and this is looked at again in more detail in Chapter 5. It also gives a basis for thinking through more detailed qualitative indicators, through which progress towards or away from sustainable education may be evaluated. This is an area which needs far more work, not least as reliable indicators appeal to policy-makers.

Outlining such bases for a more ecological paradigm is important, but we need to recognize that progress towards its realization itself involves a learning process, which may not be easy for many.

The learning response of educational systems to sustainability

The challenge of sustainability, as noted in the Introduction, may be viewed as a major threat/opportunity to existing cultural systems and their education systems, and one that requires a paradigmatic rather than piecemeal response. Any positive response involves learning, but the deeper the change apparently required, the more resistance there is likely to be. If we look at the learning response of society as a whole to sustainability, or of educational systems, it varies from nil (i.e. ignorance or denial) through to transformation, which is a deep response. The same range applies to the response of individuals within these systems.

As reviewed in Chapter 1, there are many movements of education for change, which may be seen as struggles towards realizing a more humanistic and ecological paradigm. It is easy to criticize the short-comings of these movements, but they are mapping paths of transition in often hostile territory. Interestingly, however, they are increasingly converging and agreeing on the importance of transformative learning. Transformative learning "changes who we are by changing our ability to participate, to belong, to negotiate meaning".[8]

The varieties of response by educational thinking and practice to the challenge of sustainability is suggested in the following model (**Box 6**—see pages 60-61) which I've developed from one I first used in the MSc in Environment and Development Education course at South Bank University (see next chapter). These progressive responses, from *accommodation*, through *reformation* to *transformation* may be made at any level—by an individual educator, an institution, or a whole educational system.

The three forms of response seen in **Box 6** can be seen as successive stages of learning in an educational transition paralleling and supporting steps towards sustainability in wider society (this is examined further in chapter 5). Being realistic, the first stage response—'education about sustainability'—is the most likely response in most institutions and countries, and whilst better than no response, it is also the least effective in taking us closer to sustainable living. Critically important in leading and inspiring deeper change are ideas and practices that are working to realize the transition towards sustainable education, and some of these are outlined in the next chapter.

Table 3: Summarizing the contrasting paradigms

MECHANISTIC VIEW	ECOLOGICAL VIEW
——— LEVEL 1: EDUCATIONAL PARADIGM ———	
Core Values	
Preparation for economic life	Participation in all dimensions of the sustainability transition—social, economic, environmental
Selection or exclusion	Inclusion and valuing of all people
Formal education	Learning throughout life
Knowing as instrumental value	Being/becoming (intrinsic/instrumental values)
Competition	Cooperation, collaboration
Specialization	Integrative understanding
Socialization, integrating to fit	Autonomy-in-relation
Developing institutional profiles	Developing learning communities
Effective learning	Transformative learning
Standardization	Diversity with coherence
Accountability	Responsibility
Faith in 'the system'	Faith in people
Modernity	Ecological sustainability
——— LEVEL 2: ORGANIZATION AND MANAGEMENT OF THE LEARNING ENVIRONMENT ———	
Curriculum	
Prescription	Negotiation and consent
Detailed and largely closed	Indicative, open, responsive
Discursive knowledge	Non-discursive knowledge also valued
Decontextualized & abstract knowledge	More emphasis on local, personal, applied and first-hand knowledge
Fixed knowledge and 'truth'	Provisional knowledge recognizing uncertainty and approximation
Confusion of 'data', 'information' and 'knowledge'	Ultimate concern with wisdom
Disciplines and defence of borders	Greater transdisciplinarity/domains of interest
Specialism	Generalism and flexibility
Evaluation and assessment	
External inspection	Self-evaluation, plus critical support
External indicators, narrowly prescribed	Self-generated indicators, broadly drawn
Quantitative measures	Qualitative as well as quantitative measures
Management	
Synergies & emergence not considered	Positive synergies sought
Architecture, energy and resource use, and institutional grounds neither managed ecologically nor seen as part of the educational experience	Ecological management, linked to educational curriculum and experience

MECHANISTIC VIEW	ECOLOGICAL VIEW
Management (cont.)	
Scale not considered	Human-scale structures and learning situations
Curriculum control and prescription	Curriculum empowerment and determination
Top-down control	Democratic and participative
Community	
Few or nominal links	Fuzzy borders: local community increasingly part of the learning community
——— LEVEL 3: LEARNING AND PEDAGOGY ———	
View of teaching and learning	
Transmission	Transformation
Product oriented	Process, development and action oriented
Emphasis on teaching	Integrative view: teachers also learners, learners also teachers
Functional competence	Functional, critical and creative competencies valued
View of learner	
As a cognitive being	As a whole person with full range of needs and capacities
Deficiency model	Existing knowledge, beliefs and feelings valued
Learners largely undifferentiated	Differentiated needs recognized
Valuing intellect	Intellect, intuition, and capability valued
Logical and linguistic intelligence	Multiple intelligences
Teachers as technicians	Teachers as reflective practitioners and change agents
Learners as individuals	Groups, organizations and communities also learn
Teaching and learning styles	
Cognitive experience	Also affective, spiritual, manual and physical experience
Passive instruction	Active learning styles
Non-critical inquiry	Critical and creative inquiry
Analytical and individual inquiry	Appreciative and cooperative inquiry
Restricted range of methods	Wide range of methods and tools
View of learning	
Simple learning (first order)	Also critical and epistemic (second/third order)
Non-reflexive, causal	Reflexive, iterative
Meaning is given	Meaning is constructed and negotiated
Needs to be effective	Needs to be meaningful first
No sense of emergence in the learning environment/system	Strong sense of emergence in the learning environment/system

Box 6: Range of educational responses to sustainability

Education about sustainability—This has a content/knowledge bias and can be assimilated quite easily within the existing educational paradigm. This accommodatory response is perhaps exemplified by the newly revised English national curriculum, which takes on board some sustainability concepts. There is an assumption amongst curriculum writers that we know clearly what sustainability is about, that it is uncontested, and that this can be codified and transmitted. Sustainability may be contained as a separate curriculum subject. This is essentially 'learning as maintenance' of the current paradigm because the latter is unchallenged. This is an adaptive response, which equates with first order learning.

Education for sustainability—This includes content, but goes further to include a values and capability bias. This involves some reformation of the existing paradigm to reflect more thoroughly the ideas of sustainability, but otherwise the existing paradigm—even where contradictions are present in espoused or hidden values, for example with respect to unqualified economic growth—remains largely intact. But the emphasis here is 'learning for change', and it is a position that many in the environmental education field advocate. The greening of schools and colleges movement is largely located here. There is often an assumption that we know clearly what values, knowledge and skills 'are needed' but this response does include critical and reflective thinking. This is an adaptive response that equates with second order learning.

Box 6 (continued)

Education as sustainability—This is a transformative, epistemic, learning response by the educational paradigm, which is then increasingly able to facilitate a transformative learning experience. This position subsumes the first two responses, but emphasizes process and the quality of learning, which is seen as an essentially creative, reflexive and participative process. Knowing is seen as approximate, relational and provisional, and learning is continual exploration through practice. The shift here is towards 'learning as change' which engages the whole person and the whole learning institution. 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.

In this dynamic state, the process of sustainable development or sustainable living is essentially one of learning, while the context of learning is essentially that of sustainability. This response is the most difficult to achieve, particularly at institutional level, as it is most in conflict with existing structures, values and methodologies, and cannot be imposed. This is third order learning and change—a creative and paradigmatic response to sustainability. In my experience, the best example of this response is probably Schumacher College in Devon.