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Abstract

System thinkers and practitioners are trying to help society understand better the interconnectedness between issues that we previously tended to explore in isolation. Because of this, they have an important role to play in dealing with environmental issues. Indeed, the need to tackle those in holistic ways is now recognised and systems approaches are now complementing academic approaches such as ecological economics (Neumayer, E.(2003), Faber et. al. (1996)), which analyse ecological-human interactions.

This paper explores how new forms of 'environmental education' could constitute particularly relevant vehicles for systems thinking and practice by building on messages and practices initiated in ecological art. Ecological art, it argues, has provided, for centuries, a practical form of holistic, interdisciplinary, problem-solving environmental management model - a particularly insightful illustration of how 'systems thinking and practice' can be used to deal with environmental problems. The paper suggests that art-based pedagogic forms could help put sustainability into practice by providing an educational tool that respects the systemicity of environmental issues and by encouraging systemic learning processes that are based on improved communication, sharing of perspectives, and stakeholders' empowerment through participation and experience.

Key words: creative system thinking and practice, ecological art, action research and environmental education.

Introduction

Environmental problems are attracting more and more attention. Beside, the general public is now also appreciating better the fact that they are systemic in nature. Issues such as climate change need to be explored in all their dimensions: identifying which economic activities generate which greenhouse gas, in which quantity, and in which proportion complements one's exploration of how these greenhouse gases impact on the atmosphere and in turn natural habitats and species on Earth. Equally importantly is the examination of psychological and social factors influencing the creation of lifestyles that demand such intense and dirty production processes in the first place. *Appreciating* the interconnectedness between these various dimensions is, however, different from *understanding* these complex links. For some environmental issues, researchers have found that hard systems methods, relying on data and models, have been helpful. Thus, for instance, climate change models have been generated to help understand this phenomenon better, predict what it would lead to in the future, and attempt to attenuate its effect by initiating various actions now. For some others, may be more localised, some softer systems approaches have been developed, such as soft systems methodologies (Checkland, 1999), that helped communities of stakeholders identify necessary sets of environmental actions. Although some examples of 'systemic environmental analyses' followed by 'systemic environmental actions' have been developed (SLIM project, (2005)[2]), they are few - as few as the examples of systemic environmental education that can be found[3] . More often than not, practical or educational approaches to environmental issues are 'partial' instead of holistic, and orientated towards one discipline and perspective rather than numerous all at once.

[2] http://slim.open.ac.uk/page.cfm?pageid=aimshome

[3] The Systems Department of the Open University, for instance, offers courses such as 'Environmental decision-making, a systems approach' or 'systems approaches to environmental ethics' - see http://systems.open.ac.uk/page.cfm

The more and more frequent call for action to attempt to deal better with environmental problems for which we really do need remedies is accompanied by a call for educational systems that put more value on environmental systems. Unsurprisingly, initiatives such as the Decade for Education for Sustainable Development[4] are calling for alternative learning and teaching processes that will help raise environmental awareness and generate effective environmental action: environmental education needs to be pushed beyond the boundaries of the traditional educational system if it is to help contribute to environmental problem solving and the operationalisation of 'sustainability' in the long term.

This paper explores how new forms of 'environmental education' could constitute particularly relevant vehicles for systems thinking and practice by building on messages and practices initiated in ecological art. Ecological art, it argues, has provided, for centuries, a practical form of holistic, interdisciplinary, problem-solving environmental management model - a particularly insightful illustration of how 'systems thinking and practice' can be used to deal with environmental problems.

In Part 1, I will present the educational and practical contribution that ecological art has had in environmental debates and actions. In Part 2, I will then present various ways in which ecological art helps explore the systemicity of environmental issues. And in Part 3, I will explain how it does so by generating learning processes that can, themselves, be characterised as being systemic. I will then conclude on the type of 'creative systemic environmental education' that could be put in place, based on the insights given by ecological art.

[4] UN Decade for Education for Sustainable Development (2005-2014) http://portal.unesco.org/education/en/ev.php-URL_ID=23279&URL_DO=DO_TOPIC&URL_SECTION=201.html

1. The educational and practical impacts of ecological art

The practical impacts that art can have on environmental policies might have been seen for long as highly questionable - notably by those whose approach favours a 'scientific', measurable, explanation of facts and a similar attitude to the formulation of 'solutions'. But things are changing. In the area of environmental evaluation, for instance, quantitative monetary approaches are being criticised and new participatory methods that give high importance to conflicting perspectives and understanding, social learning and deliberative processes, emotions and engagement, now acknowledge that artistic creativity could constitute a platform for convivial communication on environmental issues while many other platforms result in breakdowns of communication. If this is true of many contemporary art projects, it is also true that many art forms contributed to either environmental management or influenced people's understanding of 'environmental problems'.

In this first part, we start exploring why there is a need for new educational processes in the area of 'environmental management' and how the educational and practical contributions that ecological art so far has had suggests that 'ecological art forms and projects' might be a promising avenue for environmental educationalists.

1.1. Why do we need a reformed environmental educational system?

The importance, relevance, gravity, extent of 'environmental problems' have, for a while, animated much controversy and disagreement. However, we have now reached a point where people, even though they don't necessarily agree on how to deal with them, at least acknowledge that they are problems which require being dealt with. What might have disorientated society most, in the context of environmental debates, is the fact that problems at stake do not fit the short-term, monetary based, frame of thoughts and actions that characterise our market economies. Issues such as the

extinction of species, the pollution and destruction of the environment, the depletion of the ozone layer, or the production of wastes generated by modern lifestyle are systemic in nature: they are linked to each other and can only fully be understood when looking at them from an interdisciplinary, multi-agents perspective, over a long term period. Thus, for instance, choosing between different agricultural practices should require taking account of human needs, economic constraints, ecological and biological context, natural habitats alterations… all at once. Dealing with climate change, to take another example, can be done by reducing our greenhouse gases emissions. Developing cleaner industrial processes, driving less cars on the roads, living in buildings that are more energy-efficient… can all contribute to doing so, we are told. But such lifestyles changes seem costly and, whilst encouraged, paradoxically not facilitated. Why aren't governments putting in place incentives to use renewable energies? Why does using less pesticides and fertilisers make organic food more expensive? Why do some politicians still refuse to believe that climate change is a real phenomenon?

Climate change, like many environmental issues, can be characterised by its complexity. Like most environmental issues, it has also been dealt from a scientific and technological perspective mainly. This has been problematic in itself: as Faber et al have stressed (1998:1,2) "*It has been tempting to assume that science and technology, together with political liberalism, the main pillars of the Western world, have been the keys to overcoming the environmental crisis. But this view overlooks the fact that science and technology have been employed by Western humankind to dominate nature in such a way that, on the one hand, human wants could be fulfilled to an ever increasing extent and that, on the other hand, environmental problems were created by the use of the technology. The approach of solely using science and*

technology to solve environmental problems reminds us of someone who tries to fight a fire with an extinguisher in one hand while pouring gasoline on the fire with the other. To overcome this self-defeating attitude, it is necessary to understand the dynamics of modern society. One therefore has to seek the roots of these dynamics. Only thereafter will it be possible truly to find an answer to environmental problems, which is not infected itself by the dynamics which produces such problems".

Understanding this dynamics has been helped by approaches such as ecological economics and systems approaches. These, although still rarely embraced in the environmental educational system - that more often that not tend to dissect environmental problems under a scientific prism -, are being progressively more widely used. But they still need to provide ways in which people interested in learning about and dealing with environmental problems will appreciate their practical meaning at their own scale and in their own context. What Faber et al (1998) describe as the 'hidden social and philosophical questions behind the complex environmental crisis' need to be revealed and understood.

What has been suggested, in order to do so, by institutions such as UNESCO (2000), is that not only the content but also the way in which issues related to environmental systems are being taught are being modified. If educational systems are to respond better to people's needs, educational programmes need to be better adapted to local conditions and pedagogic modes of interactions need to favour better and more genuine exchanges between teachers and learners.

For these reasons, calls for new environmental educational systems have been expressed and encouraged by institutions such as the United Nations, which initiated the Decade for Education for Sustainable Development (2005-2014). Chapter 36 of Agenda 21, written during one of the most important environmental world meeting in

Rio in 1992[5], emphasized that education is critical for promoting sustainable development and improving capacity of the people to address environment and development issues. Such calls for action have been encouraging the search for educational modes that would help improve our understanding of environmental issues and our environmental actions, might they be part of the traditional educational system or not. And thus, examples of continuing long-life education, experiential learning projects, and practical problem-solving experiments have been explored. Research that values cultural diversity in the way in which different groups of people understand the natural environmental, care about it and manage it has attracted my attention (Anderson, 1996; Goulding, 1994). It is in this context that I decided to explore further the contribution that ecological art could make to systemic environmental education.

1.2. Why concentrate on ecological art?

Exploring how ecological art has evolved through time helped me not only realise how much impact it actually had on various types of 'environmental actions' but also how appropriate it actually is when looking at examples of systemic practices. Overall, and interestingly, it seems that it is its systemic characteristics that made the contributions of ecological art particularly effective through:

a) another way of communicating; the use of metaphors

Art was first used as a societal monitoring system to maintain harmonious relations between humans and nature, as long ago as during the cave painting age, some 15,000 years B.C. The Shamans, who were responsible for healing and for maintaining the rituals that foster a group cohesion, were also thought to be the artists who painted these animals and who used these caves as religious sanctuaries where animal images

[5] The UN Conference on Environment and Development in 1992, the Earth Summit, gave high priority in its Agenda 21 to the role of education in pursuing the kind of development that would respect and nurture the natural environment.

represented metaphorically the concept of balance, fertility and regeneration and which therefore served spiritual, social and ecological functions - their aim was to perpetuate the spiritual and physical bond between humans and nature. This ritual veneration of a particular (totemic) animal is still observed in the Australian Aboriginal paintings and songlines. The system of totemic identity is a condition of duality where one's soul is shared by the self and an alter-ego in nature. It therefore encompasses the symbolic identification with nature in the Dreamtime. The Aboriginal Totem acts as a conscience guiding tribal and individual relationship with the natural environment. It is an excellent model of a societal monitoring system built into the culture and collective unconscious.

The use of metaphors and dialogue, so powerful in story telling and other ecological art forms, has helped people learn together and from each other about the environment. As McClintock et al. (in Stowell et al., 1997: 79, 80) explain, "*Researching with people can address issues of social as well as ecological sustainability, as this approach involves relationships between people and their environment at its core. One important element of researching with people includes the use of metaphors and dialogue to create a space for understanding to emerge. (…) Metaphors can be seen as a way to structure our understandings. (…) Different metaphors can lead to different understandings, and these can be revealed through dialogue. Metaphors and distinctions around metaphors also provide a trigger for dialogue about different metaphors*". The use of metaphors has proved very useful in contemporary environmental management. Thus Stowell et al. (1997), for instance, worked on a variety of case studies, including one in NSW, Australia, which provided an alternative to the static debate on whether rangelands had been degraded or not. A century old debate between researchers and pastoralists had only been able to

highlight polarised views and cycles of blame and counter blame. Introducing metaphors and dialogue helped in highlighting the existence of multiple perspectives and in moving the debate from being 'degradation' focused to being 'vegetation management' focused - hence helping in creating new partnerships in the management of the rangelands and non-threatening working environments in which to operate.

b) the emotional engagement of both the artist and the 'public'

Metaphors were also used in ecological art during important periods of environmental stresses to express a loss, or the fact that something important was about to be lost and needed to be managed differently. They constituted a form of emotional engagement and attachment with nature. Thus, in the history of art, the sacred tree appeared in Mesopotamia in 4th Millenium when the introduction of the plough permitted the cultivation of large tracks of land, as well as in Egypt, India and Meso-America, three other areas of the world where deforestation was rampant. Similarly, the introduction of landscape painting (in Rome during the First century B.C.) coincided with the over-cultivation of land and deforestation. In China and Europe, landscape painting evolved in conjunction with growth of cities: it inspired respect for and appreciation for nature's vitality and symbolically reconnected people to the land. Similarly, during the industrial revolution, artists became alarmed by the mechanistic approach to nature. However, landscape painters I particular, chose to revere the beauty of nature rather than illustrate its destruction: viewing these paintings, people were able to transcend the harsh reality of change and progress

This emotional attachment then evolved into emotional curiosity: in the 18th century, painters started observing and drawing the intricate workings of nature in the same way as scientists did (in botany or animal biology, for instance). They also

expressed their curiosity by painting the wonders of nature they discovered while escaping to all corners of the earth through travelogues documenting the life of indigenous people and other types of natural environments.

Overall it is fair to say that ecological artists have been able to emotionally shake their public, be it society in general or even policy makers, both by portraying the beauty of nature and by expressing their outrage concerning the destruction of the environment. The work of photographers such as Ansel Adams in Yosemite Valley provided a direct continuity with landscape painting and played an essential role in the creation of the ‘conservation movement’ and national parks in the USA and elsewhere. Whilst Adams portrayed natural beauty and remoteness, other photographers and painters described the damages generated by economic activities and expansion. Jacob Riis took pictures of urban deplorable lives of newly arrived immigrants and inspired a reform movement that included the passage of sanitary housing regulations and the construction of parks in expanding cities. Photojournalists such as Dorothea Lange or Arthur Rothstein took pictures of the dust bowl - the 23 million acres depleted of 2.5 to 5 inched of topsoil due to very intensive agricultural practices. Others, such as Eugene Smith, documented environmental disasters such as the poisoning of over 1000 people by the mercury wastes generated by a chemical company in the Minamata bay in Japan. Photojournalism still helps in grasping the importance of changing the ways in which we manage and interact with the natural environment and is very much used by institutions such as the United Nation Environmental programme (UNEP). Thus, the way in which ecological art has been emotionally loaded has been significant in making people react towards issues that they would normally feel detached from, un-concerned by.

When a fantastically powerful new media appeared in households, the television, a memorable re-framing of who we are in the context of the Universe was captured in the photo taken of Earth from space by Apollo VIII, in 1968. This picture of our blue planet has been said to have marked the beginning of the environmental movement through generating a new awareness of nature's fragility and limits.

c) the expression of new understandings of environmental processes and interactions with human systems

From the birth of the environmental movement, artists whose interest focused on environmental issues saw their role unfold. 'Earth artists' saw their mission as the creation of a new visual art system of communication. They worked at re-defining and re-understanding the position that humans have in nature (Smithson's 'spiral jetty (1970); Christo's 'Running Fence' (1976)). They therefore expressed the fundamentally missing element to the environmental debates of the time: the need to reflect on the context and boundaries of the issues at stake. Earth artists wanted to stress their position as human beings as being rooted within, and dependent upon, the natural environment, in its geographical and temporal scales as in its dynamic, living processes. The artist (representing human societies) was not an observant of a system of interest (the natural environment) external to himself but, rather, was directly part of it. By being immersed in its object of interest, the artist (or action researcher) started appreciating the dynamic, complex adaptive components of the natural environment processes. Other artists worked on similar contextualisation and integration issues but in urban environments: Sonfist, for instance, did so by researching the natural history of Greenwich Village, New York, in order to reintroduce species that were there before the city was built. He effectively reclaimed an urban wasteland, full of garbage and weeds and created a historical, living art

work, which became a vital part of that community. The artist believed that nature deserves to be resurrected and commemorated in much the same way as heroes and events that have shaped both human and natural history.

One of the roles of 'environmental and ecological artists' also became to help people understand the processes of ecological sustainability and to identify the consequences of political economic development on the environment. They therefore helped framing environmental processes both from ecological and biological perspectives and from more social, economic and political angles. For instance, Haake called the attention of the public to water pollution by constructing an indoor installation similar to a laboratory, his 'Rhinewater purification plant' (1972). In their Portable Orchard, Newton and Helen Harrison in effect, re-enacted the complete cycle of sustenance by building a model of self-sufficiency. Their underlying worry was the recognition that most people in industrial societies are ignorant about food production, and they wanted to remind people that their survival depends upon nature. Outside pieces include the natural sculptures of Andy Goldsworthy, which illustrate the ephemeral characteristics of natural processes, through decay and renewal. In another style, and communicating another type of message, is the work of Agnes Denes who had created what was later described as a 'visual contradiction' of our ecological footprint: a field of wheat planted on a landfill amongst the skyscrapers of downtown Manhattan near what used to be the world Trade Centre. The artist wanted to remind society that what we rely on, primarily, is agriculture and row land.

Thus, artists helped the general public understand better and 'deeper' how the natural environment functions and how we interact with it, either by damaging it or else by managing it in such a way that both natural processes and human needs can be respected.

d) the design of ‘environmental art’ as a practical, ‘solution orientated’, process rather than as a descriptive outcome.

Progressively, by working in interdisciplinary teams, by understanding better environmental problems, environmental artists became interested in expressing their ability to co-exist with nature and to restore it.

Various projects were described as ‘restoration art’. For instance, the *Ocean landmark project* (Betty Beaumont, 1980), an underwater artificial sculpture reef made of 500 tons of recycled coal ash for fish, aimed at countering the damaging effects of over-fishing the oceans and dumping waste into coastal waters. Other artists, such as Lynn Hull, contributed to restoration projects through what they called ‘trans-species art’, which enhances the design of ecological conditions and contribute to restoring sustainable ecological conditions in wildlife habitats.

Artists also explored ecological issues within our own human societies and focused on themes such as ‘life, maintenance, renewal’. Mierle Ukeles, for instance, was the first artist to devote herself primarily to the unglamorous but paramount environmental issue of garbage. Her work demonstrates that recycling and landfill reclamation can offer opportunities to revitalise urban ecology and to educate the public about its role in stemming the tide of waste. As she stresses, 'Unless we maintain, we cannot continue' - a principle long illustrated previously through ‘Recycling art' around the world.

It also became important to the ecological artists community to involve communities as one way of ‘seeking solutions’ to environmental problems. The community became the ‘collective artist’ and learnt while creating. Agnes Denes’ composition called ‘Tree mountain’, for instance, was made out of 10,000 silver fir

trees planted by 10,000 people. Conceived as a living time capsule, this reforestation project bequeaths a natural legacy to succeeding generations.

By working with communities and by containing strong educational components, environmental art had to also unfold as new systems of communication. Through environmental art, people from different disciplines and with different perspectives on an issue, ended up not only creating together but also, while doing so, learning from each other, making sense of the environmental problem they were looking at.

Without being considered as part of the educational system per se, ecological art has, therefore, considerably contributed to improving people's understanding and awareness of environmental issues and problems. In certain cases, it also helped initiate new policies and practical projects, such as the creation of national parks, new environmental regulations, or restoration projects. I believe that the systemic dimensions of the four criteria selected in this fist part (the use of metaphors, the emotional dimensions, the non-linear, dynamic framing of natural and human-environment interactions processes and the participatory action research components of ecological art projects) have played a crucial role in making ecological art more effective than more traditional forms of 'environmental education'. I also believe that the latter could be reformed by drawing two types of lessons from ecological art, as the next two parts explore:

- one is focused on how to teach and learn about the systemicity of environmental issues and
- the other is about how to do in a systemic way.

2. Learning about the systemicity of environmental issues; the insights of ecological art

What do I mean by the 'systemic dimensions' of environmental issues?

Systemic approaches to environmental issues started, academically, with the development of 'ecological science'. People like Eugene Odum (1997) contributed by Explaining how different natural sub-systems function in direct relation with each others - such as in food chains, or carbon or water cycles, or in the formation, destruction, renewal… of ecosystems and habitats. Building on this, ecological economists then worked hard at explaining the dynamic interactions that take place between human and natural systems. It took them a while to make policy makers appreciate the fact that the way in which we use natural resources need to respect natural processes such as renewability if we are to be able to meet our needs in the long term. Within the 'human systems', it became clear that different sub-systems were also at play. The economic one, determining how resources are being used, in which quantity, and at which rate, in order to meet people's needs and wants, is strongly influenced by the 'political system' - which will influence the use of some economic practices rather than others. In turn, the political system might be influenced by the social and/or institutional system - people's preferences, lifestyle choices and values have an important role to play in determining how we want to relate to our natural environment. Trying to understand (in order to may be repair or prevent future ones) an environmental problem therefore requires an exploration of these complex inter-relations between systems of different nature.

Instead of looking at these various systems as different variables of a scientific model, ecological artists have taken holistic approaches based on practical projects and involving real stakeholders, with their values and perspectives.

Through the examples of ecological art pieces that I explored, I concluded that ecological art has dealt particularly well with a variety of systems concepts such as:

2.1. Dynamic interconnectedness

While environmental education has tended to approach this issue from a scientific angle, dissecting the various components of the 'system of systems' into various examinable pieces, ecological artists have illustrated these interconnections between human and natural systems through stories, or evocative images whose analysis would lead to nothing less than a deep and personalised understanding of the connections at stake. Interestingly, through looking at real life stories and problems, ecological artists seem to take account of crucially important dimensions (such as political ones) that scientists seem to systematically neglect in their equations.

2.2. Processes, complexity and non-linearity

Ecological artists also help in representing complexity in ways that enable the general public to be included in the debate rather than excluded from it under the pretext that they are not expert enough to understand the problem.

They also tend to focus on processes rather than outcomes; the artistic dimensions (such as the ones observed in ephemeral sculptures, for instance) being captured through the very fact that life is made of changes, of transformations.

Independently from natural processes, artists such as Haake also focused on examining the human-natural interactions as processes through, for instances, ways in which humans can recycle damaged natural resources and re-input them into the natural environment.

2.3. Perspectives

Ecological artists acknowledge the fact that values attached to the natural environment, as well as understandings of concepts such as 'sustainable management

of natural resources', are subjective. They depend very much on the perspective of the stakeholder who expresses them.

So, even though many of them have been focusing on portraying environmental processes and transformations, many have also focused on representing interpretations of how they view environmental problems. Encouraging creativity and the expression of a multiplicity of perspectives has been helpful in dealing with the complexity of environmental problems. It has also been a way for stakeholders to learn from each other about the multiple facets of environmental problems.

2.4. Unexpected outcomes and emergent properties

Unexpected outcomes, emergent properties and, generally, surprises, are not dealt with very well by natural sciences based forms of environmental education - focused on objectivity, quantitative measurements and calculated outputs. Ecological artists have been trying to break this tradition of exactitude, partly to generate a deeper sense of humility amongst human beings towards the natural environment upon which they depend, but also to highlight the existence of uncertainty and unpredictability as part of life. Forms of ecological arts such as ephemeral sculptures and process art, for instance, have illustrated the phenomenon of un-predictability in natural processes.

2.5. Challenging boundaries.

Ecological artists have also helped in challenging boundaries in various ways. For instance, Haake had to work in multi-disciplinary teams with biologists and engineers to understand processes of water purification as well as ecological health processes. Newman and Helen Harrison realised that, in order to explain the impacts of intensive agriculture on both lands and rivers they needed to extend their horizon from the original region they had focused on to the whole of the catchment - a broader ecological boundary. They also pushed the boundaries of 'communication' in that

they used various art forms as ‘voices’ involved in a same dialogue. Betty Beaumont helped in re-thinking boundaries in terms of the identification and positioning of the artist in nature: her Ocean landmark is hidden, deep into the ocean and hence the usefulness of her projects directly results from her piece of art being ‘hidden’. In the Ocean Landmark installation (where underwater photos and recordings have been taken, the audience witnesses the sculpture being transformed by the animals that live on it and this ‘detachment’ can help them in thinking about the positioning of the artist and of his/her art in nature.

And thus, ecological art explorations and representations of environmental issues and problems have helped in dealing with their systemicity in ways that have enabled people to relate to the environment better in that they help them stop feeling dissociated from it and unable to understand it.

3. Learning about the environment in a systemic way; the insights of ecological art

Learning about the systemicity of environmental issues is not the same as doing so in a systemic way. In this paper, I argue that ecological art could help us find ways of ensuring that reformed forms of environmental education better respect principles of ‘systemic learning’.

3.1. Participatory learning and emergence of understanding

Soft Systems methodologies put great emphasis on multiple perspectives. As has been stressed earlier, ecological art has been used as a terrain for learning in a participatory way - a way in which one perspective is not imposed on other stakeholders but, rather,

presented amongst a set of multiple perspectives that help understand the problem at stake in a fuller, richer, ways.

Ecological art, without being part of the educational institution per se, implements all the 'new favourite' pedagogic principles, such as participatory, experiential and transformational learning principles.

The participatory dimensions are particularly interesting from a social learning perspective: not only we learn from each other but we can also directly learn from the environment itself, by observing it and being immersed in it. "*Whenever we attempt to explain this world conceptually, we seem to forget our active participation within it*" (Abram, 1996:40). The type of participation that most environmental educators refer to, however, focuses on the involvement of a group of learners in a common activity, debate, or inquiry. In ecological art, each person involved in the 'community project' becomes an artist and contributes to making sense of the issue being explored directly by creating a piece of art focused on that issue. This type of participatory learning processes allows one to involve not only people with different perspectives but also people who might not otherwise have a way to express themselves (either because they don't have access to education or are unwelcome in public debates, for instance). Art is a popular terrain, a welcoming platform and a language in itself. As Stephen Spain and Megan Power highlight, "*Art is at its most powerful when it amplifies the whispers of thoughtful people"* (2004: 1). Ecological artists even found ways of ensuring that participatory creativity could take place at a distance: "*By using internet based methods of collaboration, we aim to draw in a wide range of participants and increase the use of technologies such as geographical information systems to devise a multi-disciplinary approach to composition and production*" (Spain and Power, 2004:2).

Other types of participatory approaches involve enhancing communication between cultures. Ecological art projects in this domain have, for instance been carried out y organisations such as 'Crossovers' as its director Tomomi Iguchi explains: "*Crossover UK believes that artists have a responsibility to bear witness to our changing environment and to engender a dialogue directly within the fragmented life in the world and society we live in and share. The organisation exists to promote cultural awareness of the work of individuals from international and minority ethnic communities. By ensuring representatives from a range of cultures take part in our projects, we also aim to encourage greater understanding and tolerance between different cultures*".

Ecological art, whether community or individual- based, often focuses on 'experience' - the educational properties of Mierle Ukeles' projects are very much derived from the fact that the audience is actually present, at the site where garbage is being separated - with the noise, the smells, etc. that this experience entails. To her, it is only by being immersed into the experience that people can genuinely understand what she means by 'unless we maintain we cannot continue'. And this explains why so many 'pieces of contemporary ecological art' are 'live', based on multi-media, and evolving through time: their raison d'être is based on the experience they create and on the learning derived from the audience's experience.

Transformational learning is used here to describe a situation where the learner 'integrates' his/her learning experience into his/her daily life in such a way that his/her (environmental) practice changes as a consequence of his/her learning. In Sonfist's Time landscape, for instance, the way in which the local community of Greenwich New York helped in researching the local natural history of the site

resulted in them also helping plant the site, maintain it throughout time, and 'live it' as an integral and important part of their community.

Numerous ecological art projects generate such transformational learning experiences, not only because of the way in which they are designed but also because the learning processes that emerge while people are actively 'learning through creating' then become an integral part of the learner's person.

3.2. On-going learning about dynamic environments and unexpected outcomes

Traditional teaching and learning methods have been based for long on the transfer of knowledge and information from the teacher to the learner.

Here, I argue that 'systemic learning' about the environment would benefit from being non-linear, iterative and open to new sources of information and knowledge, in the same way as ecological art processes have managed to generate a pool of evolving and never-ending learning. Many pieces of ecological art are indeed alive (e.g. the Sonfist community urban gardens) and they provide a living opportunity to learn not only about environmental functioning but also about the dynamic of human-natural interactions.

3.3. Emotional engagement coupled with action

Ecological art 'teaches', as we saw, by moving, shocking, shaking, questioning… it rarely leaves people indifferent. It triggers people's curiosity and motivation to learn, it engages them early enough and concentrates on their own perspectives and perceptions. It uses symbols and metaphors that can help people by-pass prejudices and misunderstandings sometimes encompassed in language or expert jargon.

The improvement of environmental awareness and the involvement of people in environmental actions seem to be very closely connected to them learning about the environment to a large extent through their perceptions.

In saying so, I align myself with thinkers such as David Abram who, when commenting on the work of Edmund Husserl explains that: "*[i]t was a plea that science, for its own integrity and meaningfulness, must acknowledge that it is rooted in the same world that we all engage in our everyday lives and with our unaided senses - that for all its technological refinements, quantitative science remains an expression of, and hence must be guided by, the qualitative world of our common experience*" (Abram, 1996:43). As Abram carries on explaining, "*The sciences are commonly thought to aim at clear knowledge of a objective world utterly independent of awareness or subjectivity. (…) The 'real world' in which we find ourselves - the very world our sciences strive to fathom - is not a sheer 'object', not a fixed or finished 'datum' from which all subjects and subjective qualities could be pared away, but it is rather an intertwined matrix of sensations and perceptions, a collective field of experience lived through from many angles" (Abram, 1996:39). And so ecological art brings a crucial dimension to 'environmental education' that environmental courses would gain from exploring as much and well as they can: that of phenomenology or 'science of (sensorial) experience*".

Clearly, this (emotional) dimension has been taken into account (through the use of practical illustrative examples and story telling, for instance) but as our learning about learning (and teaching) processes evolve, we might realise that much more can be done, in different temporal and geographical scales, for 'environmental learning' to encompass the emotional dimensions that seem so crucial in helping people not only engage with the subject but also impact on their lifestyle. In addition, if environmental educators are to carry on helping their students understand better the links between human systems and natural systems, they will benefit from being more exposed to the

natural environment themselves and from enhancing their own perceptions of that environment.

Research projects such as those undertaken at the Centre for Eco-literacy by Capra and his colleagues are directly addressing these issues by developing a pedagogy that puts the understanding of life at its very centre; an experience of learning in the real world that overcomes our alienation from nature and rekindles a sense of place (Capra, 2002). They focus, amongst other subjects on eco-design, "*a process in which our human purposes are carefully meshed with the larger patterns and flows of the natural world and introduces an era based not on what we can extract from nature but on what we can learn from her*" (Capra, 2002, 203). The Schumacher College in England, is also an outstanding example of a centre for ecological studies with philosophical and spiritual roots in deep ecology.

Conclusion.

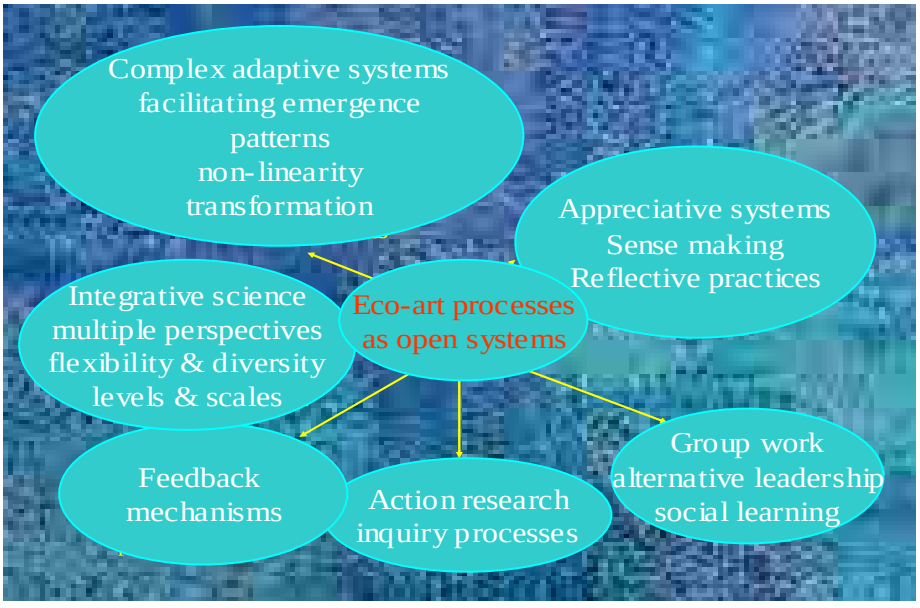
Initiatives such as the launch of the UN Decade on Education for Sustainable Development (2005-2014) are stimulating the search for new forms of environmental learning and teaching processes. The ultimate objective is to ensure that the educational sector contributes to help in improving the way in which society understands its interactions with the natural environment and manages it - and there is a lot of work still to be done. Educational supports (such as those found in the media, for instance) are complementing more traditional forms of 'environmental courses'. U ltimately various educational means could be better integrated in order to ensure that the learning about the environment is carried out in the best possible way.

In this article, I explained why I feel that strong analytical educational supports, such as those based on systems thinking and practice, could be considerably improved by

including creative and practical learning methods observed in ecological art processes. As Matilsky, B. (1992:3) stresses, "*Artists are in a unique position to effect environmental changes because they can synthesise new ideas and communicate connections between many disciplines. They are pioneering a holistic approach to problem solving that transcends the narrow limits of specialisation. Since art embodies freedom of thought, spirit and expression, its creative potential is limitless. Art changes the ways in which people look at reality*".

Examining various examples of ecological art projects highlighted the fact that these are very much based on the respect of systems principles, both in the way in which they describe and analyse environmental issues and problems and in the way in which they do so. Figure 1 below reminds us of these main systemic characteristics.

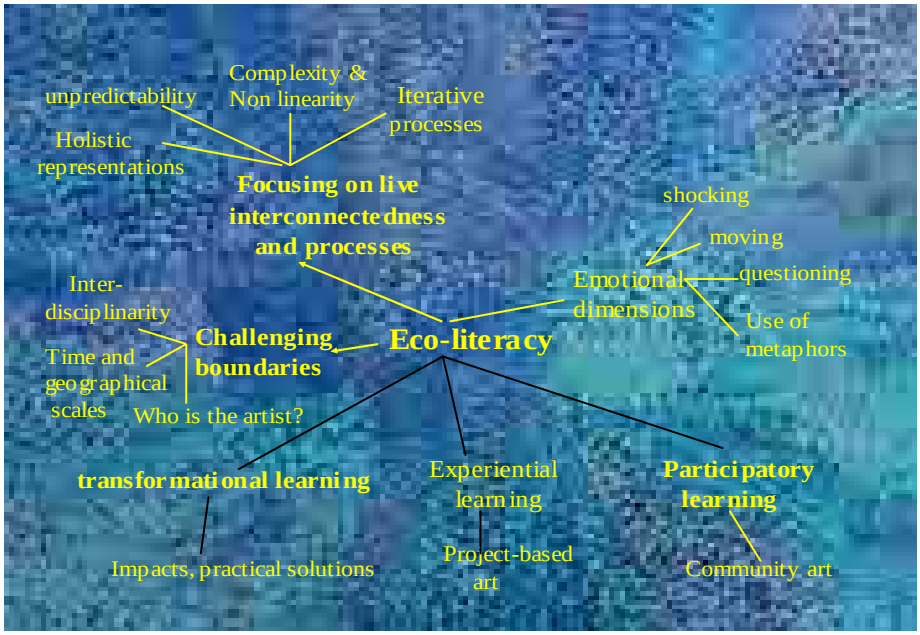
Figure 1: Main systemic characteristics in ecological art processes.



They are entirely compatible with the principles on which systems thinking and practice are based. A better and fuller application of systems principles to environmental issues and problems, in the education systems, would lead to a type of 'environmental education', or 'eco-literacy', whose characteristics are described in

Figure 2. So far, systems thinking and practice, as an academic approach, has been very much focused on communicating the paradigmic principles it is based on.

Figure 2. Characteristics of 'eco-literacy' educational processes based on applying systemic principles to environmental issues, using insights from ecological art.



Having observed the difficulties that similar interdisciplinary approaches such as ecological economics have had in being recognised as relevant, rigorous and useful, one can understand the strategy taken by systems academics. What ecological art projects have shown, though, is that systems principles can be applied to important issues and communicated to the wider public as well as policy makers, by being practical and problem-centred first of all rather than being mainly focused on advocating a systemic method that needs prior academic recognition.

Equally importantly, ecological art has evolved into being more and more participatory and community based and its learning dimensions, both from a conceptual and from a practical perspective, are proving to be effective and useful. If systems academics who are interested in contributing to the reform of environmental education, could gain from using a few insights given by ecological art processes and

projects, what this article also intends to highlight is the fact that the articulation of how ecological art is being thought of and realised in practice is also of crucial importance if ecological art is not to be exclusive and appearing as sterile to the general public, i.e. if it is not to be useful solely to those who take part in its creation.

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