

Community Knowledge Building and Environmental Learning.
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Abstract: With the opening of an environmental community knowledge building centre imminent and ten years in the making, this paper will explore the theoretical context and accompanying framework that underpin such an initiative with particular reference to the knowledge-building principles set out by Scardamalia in 2002 linked to theory regarding environmental learning.

The paper will:

- link theory with actions on the ground.
- suggest how an embedded and integrated knowledge-building approach from architectural design to operation might pre-figure ways of encouraging environmental learning.

Introduction:

With the imminent completion of a purpose built environmental learning centre in my home town of Lewes, England, this paper explores the theoretical connections between the building's design; a datastore linked to its immediate nature reserve environment; the underpinning framework guiding its business plan; the anticipated environmental learning by a variety of users and the potential that knowledge-building and its 12 knowledge-building principles might offer.

Theoretical or conceptual advance:

This paper will explore the synergy between the following three positions.

1. Scott and Vare (2007) postulate that 'sustainable development, if it is going to happen, is going to be a learning process – not a question of rolling out a set of pre-determined behaviours'. They write of ESD 1 as the promotion of 'informed skilled behaviours and ways of thinking in the short term' and ESD 2 as 'building capacity to think critically about what experts say and to test ideas, exploring the dilemmas and contradictions in sustainable living.' Scott and Vare claim that both go hand in hand as too much ESD 1 in isolation 'would reduce our capacity to manage change ourselves and therefore make us less sustainable'.
2. Zhang et al (2009) claim that 'highly structured collaboration within knowledge-building can limit students' engagement in high-level creative discourse'.
3. Scardamalia (2002) writes of creating a classroom culture that is 'not a miniature of the surrounding culture but rather is a model of what that surrounding culture might become – a culture in which the creation and improvement of ideas pervades social life.'

But first a little background:

In 2000, the Railway Land Wildlife Trust, which I founded in 1988 to provide vision and direction for 20 acres of former railway marshalling yards purchased by the local council, embarked on a project to build a community environmental learning centre. Called the 'Linklater Pavilion – *centre for the study of environmental change*', it was to

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stand at the entrance to the former railway sidings which in 1995 had been formally declared a local nature reserve.

Faced by a somewhat ambivalent attitude by Government towards environmental education in English schools, my aim was to eventually use this land and a purpose-built centre to try and break the boundaries of what many believed had become a limited model of education and its implications for teaching and learning about the environment (Hargreaves, 1994; Goodson, 1994; Stoll and Fink, 1996; Smythe and Shacklock 1998; Young, 1998; Sachs, 2003; Goodson, 2003; Hargreaves, 2003).

A second aim was to create a kind of 'community mirror' that reflected back to the community its treatment and attitude to what many might regard as an insignificant piece of so-called 'waste' land.

The third aim was to provide the means for what Bielaczyc has since termed 'intimate ecology' at a very local level within a town – a living outdoor laboratory for the study of a constant but dynamic piece of land in which people could track and respond to local environmental change as a way into preparation for change and future action.

But arguably, the most important and publicly stated aim, is to create 'a community think tank – a place for thinking the unthought.'

Consequently, Scardamalia's 'creation and improvement of ideas' has something important to offer the Linklater Pavilion whose purpose is, indeed, to foster, rather than proselytize, a culture that might one day 'pervade social life.' To that end, it was important to create a centre beyond the boundaries of a classroom or school and to place it within an environmental context of community worth and value. In other words, to set up the physical long-term means for promoting the idea of Scardamalia's eighth knowledge-building principle of *pervasive knowledge building*.

Furthermore, research by Macdonald and Parry (2007) highlighted the problems encountered by school firewall systems that made it difficult for outside, vetted experts to respond creatively to pupils' hypotheses – and area highlighted by Zhang et al (2009) as worthy of further research into the use of 'authoritative sources to advance but not inhibit risk-taking in idea generation and refinement.'

The core drivers of the design for this communal, environmental learning / knowledge space are complexity, flexibility and emergence. Shaped as a hexagon, reflecting natural shapes such as honeycombs and snowflakes, the ground floor is designed not to withstand flooding (which the town suffered very badly in 2000) but to accommodate flooding by letting the water through. It will also serve as a community memory of those devastating floods thereby laying important groundwork for the 5th knowledge-building principle of *community knowledge, collective responsibility*.

The first floor space has been designed to provide both a series of small rooms as well as one large space. In time, this will facilitate flexible, opportunistic-collaboration (Zhang et al, 2009).

For example, a living bee hive will be incorporated into one of the walls. This will be of interest in its own right to visitors and users of the building but carries the prospect of

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stimulating ideas related to self-organisation and foraging – a complex dynamic problem as food resources are constantly changing. Here is the potential for some exciting cognitive ‘leaps’ as constant change...

...is also a problem faced in many network-based human technological systems, such as the functioning of mobile phone networks, in which the positions and activities of handsets are constantly changing, or an electricity distribution system, in which demand and supply must be matched through a network of generators and transmission lines. (Ratnieks, 2006: 101)

Thus the design of the building from the outset, as a constant point of reference, will help, ‘support progressive knowledge-building extended over weeks, months or years...supported through distributed, opportunistic collaboration.’ (Zhang et al, 2009).

Linked to this is the notion of social-ecological systems resilience environmental education in which ‘diversity (biological and forms of knowledge) and self-organisation (plantings leading to eco system services and participation leading to social connectedness)’ will play their part. (Krasny and Tidball, 2009)

Furthermore, in line with Scardamalia’s first two knowledge-building principles of *real ideas, authentic problems and improvable ideas*, information about the building’s construction from sourcing of materials to insulation details and the use of recoverable products will be made available within the building as a tangible record of green thinking in 2009 – 2010. By incorporating a sedum roof, photovoltaic cells, a ground source heat pump and drilling for our own water supply, we have tried to make the building as environmentally friendly as possible but in time, these technologies will be improved upon. This sense of time and advancing ideas and thinking will be shared with the users of the building as a basis for approaching improvable ideas and embedding ‘the psychological safety needed for people to feel safe taking risks’ (Scardamalia, 2002) – as we have done.

The business plan of the Railway Land Wildlife Trust has also been influenced by the notion of emergence. Capra’s (2002) ‘designed’ and ‘emergent’ structures provided a useful framework. Designed structures are the formal structures of an organisation, providing the rules and routines necessary for effective functioning. Emergent structures are created through the organisation’s informal networks and communities of practice. They provide novelty, creativity and flexibility, capable of changing and evolving.

Adult social care, run by East Sussex County Council, has proved to be a committed and trusted designed structure partner willing to provide, for example, accounting advice and supporting criminal record bureau checks. A second designed structure partnership with a county wide conservation trust has already provided useful management templates such as health and safety regulations.

The Railway Land Wildlife Trust, itself a pioneering body, will operate as the emergent structure alongside a third partnership with a local school committed to exploration and innovation over the next three years. The challenge will be to find ‘the right balance between the creativity of emergence and the stability of design’. (Capra, 2002)

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This has important implications in how the building is run and the dangers of what Resnick (1994) calls the 'centralised mindset'.

When people see patterns in the world, they tend to assume centralised control, even if it doesn't exist. And when people try to create structures in the world (such as organisations or technical artefacts) they often impose centralised control even if it is not needed. People have difficulty recognising that objects can arise from simple, decentralised interactions, rather than centralised, top-down control. (Wilensky and Resnick, 1999: 9)

The knowledge building approach resonates with the above as well as Capras' (2002) description of the emergence of novelty which...

...is a property of open systems which means that the organisation needs to be open to new ideas and new knowledge. Facilitating emergence includes creating that openness – a learning culture in which continual questioning is encouraged and rewarded. Organisations with such a culture value diversity and in the words of Arie de Geus, 'tolerate activities in the margin: experiments and eccentricities that stretch their understanding.' (Capra, 2002: 107)

The nature reserve itself, although small, is a diverse site of meadows, former railway sidings and allotments, a former Victorian garden, a chalk stream and a riverine woodland which floods regularly in winter. But it also contains a reed bed designed by land artist Chris Drury who was inspired by the complex relationships of the web of life around us.

As the systems of complexity increase, instead of becoming chaotic, a miracle occurs and they begin to form coherent patterns. So in designing this reed bed, I was looking for a pattern which could link us to this complex web of life. I found the Cardiac Twist, a double vortex of tissue in the apex of a heart.

The formation of this tissue mirrors the way that blood flows in the heart. This pattern of flow is replicated throughout the planet, from the microscopic nerve endings in our fingertips to the way rivers meander, or weather systems move or ocean currents flow, even to the way Galaxies are formed. The vortex is a visual pattern of energy flow. The heart seemed to me to be a good metaphor, as well as practically providing the possibility of many borderlands. Metaphorically it linked people to wildlife on their doorstep and in itself formed an edge between nature and culture, the town and the countryside. (Drury, 2005)

In the same way that the bees within the building will become a learning resource, so too will Heart of Reeds and what Wilensky and Resnick (1999) call, 'the emerging sciences of complexity – on chaos, self-organisation and non-linear dynamics.' There are important links here to Scardamalia's seventh knowledge-building principle of *symmetric knowledge advance* by way of knowledge exchange within and between communities be they public visitors, artists or science professors.

There are many aspects here worthy of further discussion but we should note a continuing trend from the decline in field trips over many years resulting in 12 – 14 year This is copyright material and no content from this paper may be published without proper acknowledgement.

olds from, for example, expecting daisies and wolves to inhabit woodlands near their school (Lock, 1995) to the idea of a 'nature deficit disorder' within children (Louv, 2005) resulting in a call for pre-service and in-service teacher training to help teachers feel comfortable and confident in using outdoor settings. (Lindemann-Matthies, 2006)

The flip side of not knowing can be a feeling of helplessness. Research has shown that more information can lead not only to greater concern but also a greater sense of helplessness which some have argued is the pivotal issue. (Kaplan, 2000) Children who may appear to be disinterested in environmental issues may be doing so to avoid pain.

And yet, to return to knowledge-building principles, they offer the potential of capturing environmental complexity in an interesting and thought-provoking way.

Meaningful projects and working alongside adults and experts provides a complexity that is not common in discipline-bound textbooks. The complexity includes understanding connections between policy and environment, between geology and hydrology, between biodiversity and climate change or between valuing nature and exploiting natural resources.

(Monroe, 2003: 122)

Zhang et al (2007) warn that the use of such adult authoritative sources should be channelled to advance and 'not inhibit risk-taking in idea generation and refinement'.

Knowledge building, through Knowledge Forum, may have a significant contribution to make here in terms of celebrating and exposing complexity that engages the student in ways that neither inhibit (Zhang et al, 2007) nor depress (Kaplan, 2000).

Wilensky and Resnick's (1999) dynamic systems approach to thinking about the world in terms of levels and the use of 'level thinking' encourages us to see the world from many viewpoints. We identify countries and companies and organisations even though the people within them are constantly changing over time. The creatures within a reserve are not the same year after year, some perhaps just surviving for months. Wilensky and Resnick view such a concept of levels as a 'cornerstone to creating a more interdisciplinary approach to science – as a unifying concept to connect different domains of knowledge in the humanities and social sciences as well as the natural sciences.'

Life-worlds (Barab and Roth, 2009) offers another interesting context for knowledge-building by taking great account of the individual and his or her perception of the world and things of which an individual is conscious and the functional network in which he or she engages. This is different from the material world.

As such cats and people for example, can be understood as inhabiting the same physical environment but different life-worlds...similarly a kitchen affords a different kind of life-world to a chef than to a mechanic.' (Barab and Roth, 2009: 7)

The use of knowledge-building to foster these complex ways of thinking about a place is something that we wish to research along with the more traditional approaches to

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outdoor education such as pond dipping and biodiversity education. In this sense, we would be addressing the following challenge:

A core goal of education is how best to support learners in developing personal life worlds that overlap with those socially agreed-upon life-worlds that are engaged by more knowledgeable others. Similarly a core challenge of education is how to develop curricular contexts that extend themselves meaningfully into the personal life-worlds of individuals. (Barab and Roth, 2009: 7)

One tool specially developed for the project is a database solely for recording responses to, and change within, the nature reserve. It is useful in its own right but also as a building block to service knowledge-building principle 6 – *democratising knowledge* as well as principle 3 – *idea diversity*.

Diversity within the project has been strengthened by the contribution of a group of adults with learning disabilities who have been working on the site and contributing to the database for 6 years. This now populated database will be made available to school children, visitors and experts to make their own observations and records in due course but it was striking the way the adults originally responded to the software. They did not view it as something outside themselves that had to be ‘learned’ but as a useful and necessary tool that helped make better sense of the work they had already been doing on the land.

The involvement of adults with learning disabilities manifest itself at several levels: as a direct link with a specific local area; through several public exhibitions that became recognised by civic authorities; and by way of a developing sense of a network growing beyond the everyday actions of the group.

The three types of social capital provided important strands for contextualising the project as well as offering useful insights into ways in which pervasive knowledge-building might be operationalised:

Bonding social capital manifest in close connections between people and characterised by strong bonds of family or friendship. This was necessary for the group to function.

Bridging social capital through more distant connections with what the Economic and Social Data Service describe as more ‘cross-cutting ties such as acquaintances or friends of friends’.

The bonding provided confidence to initiate and make ‘bridging’ public appearances such as putting on and opening an exhibition.

Linking social capital by way of connections with people in positions of power is characterised by relations between those within a hierarchy where there are different levels of power...relations between people who are not on an equal footing.’ (Economic and Social Data Service, 2005). A major UK conservation body commissioned the group to undertake photographic work on its behalf. (see <http://www.railwaylandproject.org/Birling%20Gap%20home>)

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Bates and Davis (2004) helpfully distinguish between social capital and inclusion, drawing attention to the 'softer' elements of social capital compared with the more easily distinguished aims of inclusion.

'Advocates of social inclusion have rightly highlighted the importance of waged employment as a route to income, status and relationships, while social capitalists point the spotlight on informal roles and relationships. In addition to the opportunity to earn a wage, people with learning disabilities may participate in the community via education, volunteering or leisure pursuits.' (Bates and Davis: 198)

Chenoweth and Stehlik (2004) warn that social capital may be in danger of being regarded as just another trend and should not be viewed as a panacea but concede that:

'Social capital has potential for informing policy and practice on community building, social networks and community participation: all areas integral to inclusion.'
(Chenowith and Stehlik: 70)

They argue that all three elements of bonding, bridging and linking should be integrated for inclusion to work and that the focus should be on all three aspects, rather than choosing any easy option. These elements have all been manifest in the work of the adults with learning disabilities within and around the local nature reserve.

Riddell et al (2001) argue for the awareness of a range of social variables and suggest that...

'...social capital may become a useful vehicle for understanding the ways in which civic engagement is not uniform, but is structured differently for different groups, allowing them, in turn, differential access to other social benefits including economic, cultural and political capital.'

This will be an important component of the Linklater Pavilion.

The non uniformity offered by the group is mirrored in the database that has a 'link' facility whereby a user can jump from one record to another that may or may not have coherence, thereby creating the possibility of 'bumping' into unexpected material.

The Linklater Pavilion and its direct information technology link to the land around it will act in several ways as:

- a cognitive anchor and bridge (Brody et al, 2002) on which new information can be linked or built.
- a repository of concepts that are re-visited by children several years later (Hellden, 1995).
- a place where changes to routines can be made in order to challenge and even change behaviours associated with certain routines. (Heimlich and Ardoin, 2008).

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- a stimulant for new or useful ideas to help address the ingenuity gap (Homer-Dixon, 2000).
- a context for fostering collaborative emergence (Sawyer, 2004) where groups can 'learn' as collectives and where knowledge can be the possession of a group not simply of individual participants of a group.

Rickinson et al (2009) emphasise the particular relevance of self in the present and self in the future in relation to environmental learning. Children's past experiences, values, opinions and interests are critical when it comes to environmental learning – something embedded within knowledge-building principle 4 - of *epistemic agency*.

Discussion:

Environmental learning and knowledge-building would appear to be well suited but is there a danger that if confined to schools and curricula, both could become tokenistic and superficial? If the environmental situation is as serious as many experts claim, then is there a case for pre-figuring our approach to environmental learning and social inclusion based on natural community sites and centres designed from the bottom-up to promote knowledge-building?

Conclusion:

I have set out how knowledge-building principles 1- 8 can inform a project, cognisant of ESD 1 and 2 principles, linked to a specific site and a purpose-built centre. I have given examples of how those principles might affect the setting up and running of such a centre as a communal educational resource. Principles 9 -12 are yet to come, once the centre is up and running after October 2010.

Any thoughts and ideas in response to this article will be welcome.

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References:

Barab, S.A and Roth, W.M. (2006) *Curriculum-based ecosystems: supporting knowing from an ecological perspective*. Educational Researcher. 35. 5. 3-13.

Bates, P. and Davis, F. (2004) Social capital, social inclusion and services for people with learning disabilities. *Disability and Society*, Volume 19, Issue 3. 195 – 207

Brody, M and Tomkiewicz, W (2002) *Park visitor's understandings, values and beliefs related to the experience at Midway Geyser Basin, Yellowstone National Park, USA*. International Journal of Science Education. 24. 11.1119 – 1141.

Capra, F (2002) *The Hidden Connections – a science for sustainable living*. London. Harper Collins.

Chenoweth, L. and Stehlik, D. (2004) 'Implications of social capital for the inclusion of people with disabilities and families in community life', *International Journal of Inclusive Education*, 8:1, 59 – 72

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- De Geus, Arie (1997) *The Living Company*. Harvard Business Review. March-April
- Drury, C (2005) <http://www.axisweb.org/pbCOMM.aspx?SID=118>
- Economic and Social Data Service (2005) *Social Capital: introductory user guide*.
- Goodson, I.F. (1994) *Studying Curriculum*. Buckingham. OUP
- Goodson I,F (2003) *Professional Knowledge, Professional Lives*. Buckingham. Open University Press
- Hargreaves, A (1994) *Changing Teachers, Changing Times*. London. Cassell
- Hargreaves, A (2003) *Teaching in the Knowledge Society*. Buckingham. OUP
- Heimlich, J.E. and Ardoin, N.M (2008) *Understanding behaviour to understand behaviour change: a literature review*. Environmental Education Research. 1. 3. 215-237
- Hellden, G (1995) *Environmental Education and Pupils' Conceptions of Matter*. Environmental Education Research, Vol1, No 3. 267-277.
- Homer-Dixon, T,F (2000) *The Ingenuity Gap*. Knopf. Canada.
- Kaplan. S. (2000) *Human Nature and Environmentally Responsible Behaviour*. Journal of Social Issues. Vol 56.3 491 – 508
- Krasny, M (2009) *A response to Scott's concerns about the relevance of environmental education research; applying social – ecological systems thinking and consilience to defining research goals*. Environmental Education Research. 1. 2. 189 198.
- Lindemann- Matthies, P. (2006) *Investigating Nature on the Way to School; responses to an educational programme by teachers and their pupils*. International Journal of Science Education. Vol. 28. 8. 895 - 918
- Macdonald, G and Parry, J. (2007) *Pupils as Scientists; an overview of a research project into new methods of learning and teaching science*. National Endowment for Science, Technology and the Arts.
- Monroe, M.C. (2003) *Two Avenues for Encouraging Conservation Behaviours*. Human Ecology Review. Vol 10, 2.
- Lock, R (1995) *Biology and the Environment – a changing perspective*. Journal of Biological Education. 29. 3-4.
- Louv, R (2005) *Last Child in the Woods*. Atlantic Books. London
- Ratnieks, F.L.W (2006) *Can Humans Learn from Insect Societies?* Nova Acta Leopoldina NF93. Nr.345, 97-116.

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- Resnick, M (1994) *Turtles, Termites and Traffic Jams: Explorations in Massively Parallel Microworlds*. MIT Press. Cambridge, MA.
- Rickinson, M, Lundholm, C and Hopwood, N (2009) *Environmental Learning*. Springer
- Riddel, S., Wilson, A. and Baron, S. (2001) 'Gender, social capital and lifelong learning for people with learning difficulties', *International Studies in Sociology of Education*, 11:1, 3 – 24
- Sachs, J (2003) *The Activist Teaching Profession*. Buckingham. OUP
- Sawyer, R.K (2004) *Creative Teaching: Collaborative Discussion as Disciplined Improvisation*. Educational researcher, Vol 33.No 2, pp12-20.
- Scardamalia, M (2002) *Collective Cognitive Responsibility for the Advancement of Knowledge* in Smith.B (Ed) *Liberal Education in a Knowledge Society*. Chicago. 67-98
- Smythe, J and Shacklock, G (1998) *Re-Making Teaching*. Routledge. London
- Stoll. L and Fink. D (1996) *Changing Our Schools*. Buckingham. OUP.
- Vare. P and Scott. W (2007) *Learning for a Change. Exploring the Relationship between Education and Education for Sustainable Development*. Journal of Education for Sustainable Development. 1:2. 191- 198.
- Wilensky. U and Resnick. M (1999) *Thinking in Levels: A Dynamic Systems Approach to Making Sense of the World*. Journal of science Education and technology. Vol.8. No.1
- Young, M.F.D (1998) *The Curriculum of the Future*. RoutledgeFalmer. London.
- Zhang.J, Scardemalia. M, Lamon, M, Messina, R and Reeve, R (2007) *Socio-cognitive dynamics of knowledge building in the work of 9 and 10 year olds*. Education Technical Research Development. 55. 117-145.
- Zhang. J, Scardemalia. M, Reeve. R and Messina. R (2009) *Designs for Collective Cognitive Responsibility in Knowledge-Building Communities*. Journal of the Learning Sciences. 18. 7- 44.