Integrating Multiple Knowledge Systems into Environmental Decision-making: Two Case Studies of Participatory Biodiversity Initiatives in Canada and their Implications for Conceptions of Education and Public Involvement

ELIN KELSEY

c/o 222 Laine Street,
Suite 3, Monterey, CA 93940, USA
Email: elin@iname.com

ABSTRACT

Biodiversity initiatives have traditionally operated within a 'science-first' model of environmental decision-making. The model assumes a hierarchical relationship in which scientific knowledge is elevated above other knowledge systems. Consequently, other types of knowledge held by the public, such as traditional or lay knowledges, are undervalued and under-represented in biodiversity projects.

Drawing upon two case studies of biodiversity initiatives in Canada, this paper looks at the role that constructivist conceptions of education play in the integration of alternative knowledge systems in environmental decision-making. In so doing, it argues that the conservation, sustainable use and equitable sharing goals outlined by the Convention on Biological Diversity (signed in 1992 under the auspices of the United Nations Environmental Programme) demand new models of governance which embrace the adaptive management qualities of learning organisations.

KEY WORDS

Biodiversity, education, traditional knowledge, environmental decision-making, public, constructivism, adaptive management, learning organisation

Environmental Values **12** (2003): 00–00

2

ELIN KELSEY

BEYOND A SCIENCE-FIRST MODEL OF ENVIRONMENTAL DECISION-MAKING

Biodiversity initiatives have traditionally operated within a 'science-first' model of decision-making (Kelsey, 2001a). In the science-first model the public is expected to respond to environmental problems, initially and accurately described by scientists (Macnaghten and Urry, 1998). Solutions, according to this rationalist model, are informed by science, negotiated and adopted by politicians and enacted by the public through various means of persuasion and regulation (Grove-White, 1993).

The trouble with the science-first model is that it assumes a hierarchical relationship in which scientific knowledge is elevated above other knowledge systems. As science is the only recognised form of legitimate environmental information in this model, and science requires specialised expertise, the views of the public are perceived to be ignorant. Consequently, other types of knowledge held by the public, such as traditional or lay knowledges, are undervalued and under-represented in biodiversity projects (McFetridge, 2001).

The conceptualisation of the public as ignorant undermines the espoused goal of public participation and robs environmental decision-making processes of information that resides in the realm of the public. This is a costly mistake. As Dryzek (1996: 9) puts it, political rationality is never to be found in the calculations of any governing elite:

> Rather, as John Dewey argued at length (for example, Dewey 1927), political rationality is a matter of experimentation carried out by democratic publics conceived of as communities of inquirers, each of whom initially brings only a partial perspective to bear.

The privileged status of expert information marginalises public knowledge, and restricts the ability of the public to participate. Clearly, this is a problem in terms of achieving the goal of public involvement in environmental problem-resolution. Yet more problematic still, is the potential of the authoritarian ideology that underpins the science-first model to undermine the public's own belief in the value of their knowledge and participation.

When one's knowledge of a situation is denied a voice, whether through a bureaucratic framework that physically denies access, or a science-first model that conceptually denies access, that individual may perceive the barriers in question as obstacle that cannot be removed. Thus, individuals may censor themselves from further attempts at participation (Freire, 1998).

The science-first model is also problematic on a pragmatic level. It implies a hierarchy based on expertise, with both power and knowledge centralised at the apex. Those at the apex are assumed to know better than others at subordinate levels, and are better able to assign tasks and co-ordinate operations. However, the complexity and controversial nature of biodiversity issues, coupled with the

increasing number and scope of multi-national environmental agreements defies intelligent desegregation (UNEP/CBD-UNESCO, 2001).

Institutional background

Since it first came into force in 1992, attempts to implement the Convention on Biological Diversity (CBD) have demonstrated that biodiversity issues are not straightforward. Nor are they exclusively confined to problems best answered by science. As Johnson and Poulin (2001: 1) describe, biodiversity issues 'are defined as much by socio-cultural values and political and economic factors as by the biophysical dimension'. The comprehensiveness and complexity of biodiversity issues pose a challenge to policy-makers and communicators alike. According to McGraw (2002) the breadth and depth of biodiversity make it difficult to define a clear *problématique*. In essence, biodiversity lacks 'issue salience' (a trait derived from an issue's simplicity, clarity and/or familiarity). Concretely, biodiversity does not offer an uncomplicated formula that advocates can explain to policy-makers in straightforward terms and that journalists can encapsulate in headlines for public consumption. Thus, biodiversity issues demand management approaches that are flexible and responsive.

Such a concept of 'adaptive management' was first defined by an interdisciplinary team working at the International Institute of Applied Systems Analysis in Laxenburg, Austria in the mid-1970s. Instead of assuming that all eventualities can be forecasted and planned for, adaptive management is based on the belief that surprises are inevitable, and thus policies and organisational structures should be flexible and responsive to change. Surprises, thus, become opportunities to learn rather than failures to predict (Lee, 1993). Recognition that the conservation and sustainable use of biodiversity rely not only upon scientific knowledge, but also upon other knowledge systems (such as local knowledge and traditional knowledge) has further fuelled the demand for new models of management that successfully integrate multiple systems of knowledge.

In 2000, a Consultative Group of Experts on Biological Diversity Education and Public Awareness (experts group) was convened and charged by the Conference of the Parties to the CBD with the task of further advancing and, in particular, identifying priority activities for a global initiative on biological diversity education and public awareness. The experts group concluded that education instruments fail to be effectively utilised in the development and implementation of CBD work programmes and national biodiversity strategies and action plans. Among its recommendations was a call for informed case-study analyses of best practices of biodiversity education, awareness and training within national contexts (UNEP, 2001). The Biodiversity Convention Office of Environment Canada responded to this deficit by commissioning a biodiversity education report – *Learning Through Real Life Experiences* (Kelsey, 2001b).

ELIN KELSEY

Valuing multiple systems of knowledge

This paper draws upon two of the case studies included in *Learning Through Real Life Experiences* – the Eastern Ontario Model Forest (EOMF) and the Ashkui project – as examples of attempts to integrate multiple systems of knowledge into environmental decision-making. As these cases demonstrate, integrating local, traditional and scientific knowledge is not simply a matter of substituting alternative sources of information into an existing bureaucratic system. Instead, effective integration requires a willingness to adopt decision-making processes, timelines and organisational structures that reflect the different values upon which alternative knowledge systems are based.

The paper is divided into three sections. Sections I and II provide descriptions of the case studies. Section III discusses implications of these cases for biodiversity education, public involvement and management.

I. CASE STUDY 1: A CONSENSUS APPROACH TO MULTI-STAKEHOLDER DECISION-MAKING: THE EASTERN ONTARIO MODEL FOREST

The Eastern Ontario Model Forest (EOMF) is no ordinary woodland. Stretching across 1.5 million hectares, from Algonquin Park to the Quebec border to the St Lawrence River, the EOMF is home to one million people, 8,000 of who are woodlot owners owning 88% of the forested land. The EOMF was initiated in 1992 as one of ten model forest sites across Canada, under a federal sustainable development initiative. It currently works with industry, First Nations, government, landowners and other stakeholders to develop new ways to sustain and manage forest resources.

Despite the scope and diversity of its stakeholders, the EOMF is widely recognised for its success in partnership building. Brian Barclay (General Manager) credits that success to one of the EOMF's key partnerships – the Mohawk Community of Akwesasne – for its mandate to incorporate traditional knowledge into the decision-making, policy-making, planning, evaluation and operating mechanisms of the model forest as a whole.

Operating within an organisational culture that marries aboriginal traditional knowledge or 'naturalised knowledge systems' with western scientific practices demands on-going reflection and learning. 'The hardest part about making a commitment to this approach', Barclay acknowledges, 'is believing that it's possible. It takes a leap of faith. In the case of the EOMF, we were lucky to be able to rely on our Mohawk partners. They had a model we could see and follow and the Elders were willing to listen on the side and give us the encouragement and re-direction we needed.'

The EOMF's commitment to operating within multiple knowledge systems clearly reflects the value for aboriginal traditional knowledge, western scientific knowledge, and lay or local knowledge ascribed by the Convention on Biological Diversity. Thus, the EOMF provides an insightful case example of biodiversity education as it relates to multi-stakeholder decision-making processes.

According to Henry Lickers (Director, Department of Environment, Mohawk Council of Akwesasne) *the* most powerful concept in the aboriginal traditional knowledge taught to the EOMF is a process he calls the 'zeal to deal'. It is firmly grounded in the aboriginal ideal that 'co-operation is the only way to survive'. The ideology of the zeal to deal is integral in solidifying relationships between potential partners. There are three elements to this process: respect, equity and empowerment. These elements must be used in proper order and in the proper proportions for a successful partnership process.

A second, essential concept is 'consensus' – a decision-making process based upon group understanding and agreement on how to proceed. The process is time consuming, yet not tremendously complex. Each member at the decision-making table is encouraged to speak his or her mind. Further discussions into the rationale, background, thoughts, feelings and experiences of dissenting persons are invited and explored. Because it differs so dramatically from mainstream confrontational styles of decision-making, consensus-style decision-making is sometimes seen as 'revolutionary' or naïve (Story and Lickers, 1997). Many argue that reaching consensus takes too much time and energy and that the likelihood of reaching a decision to which everyone can agree is remote.

Brian Barclay empathises with such sceptics. 'Building consensus *does* take more time initially', he agrees, 'but it also saves time and money at the implementation stage because you don't have to deal with dissenting views.' After ten years of operating in a consensus decision-making culture, the EOMF believes the advantages far outweigh whatever difficulties inevitably arise. A recent evaluation of the EOMF echoes this perspective. The EOMF is seen as an 'honest broker' and it has a 'strong reputation of dealing fairly' (Barclay, personal communication, 1997).

Such a trustworthy reputation is critical in terms of fostering the kinds of innovative approaches needed to achieve biodiversity conservation and sustainable use. The issue of sustainable forest certification is a case in point. Because of its implications for industry, operators, government and private landowners, each of these stakeholders has strong interests in the issue. Yet, by the same token, none is in a position to lead an 'unbiased' process. The EOMF provided a safe mechanism for the development of a pilot project through which these and other stakeholders could explore whether or not a system for certification *should* be developed and if so, *what* the ideal system could look like.

The EOMF works well for governments, particularly when they need to try out new ideas or concepts in a charged political climate. The 1998 ice storm, for example, was a natural disaster with unprecedented economic implications for the forest sector.[1] Because the EOMF 'table' creates a forum where ideas can be divorced from their source, government representatives were able to explore a wide range of options with key stakeholders, without fear of being backed into a corner.

Empowerment is defined by Story and Lickers (1997) as the act of enabling. This means that any partnership with a 'host' organisation must allow the partner to undertake and complete the project on its own terms and with its own particular style. This is the hardest of all of the three concepts to implement, as it requires trust between potential partners. Without respect and equity, trust cannot be built.

The EOMF's top five lessons learned:

- Create as open and transparent a process as you possibly can.
- Park your agenda outside the door. As a facilitator, you cannot go into the process with preconceived notions of the desired outcome or a sense of power or desire to control what happens. You have to help the stakeholders *listen* to each other and to trust that the process itself will yield successful results.
- Make a concentrated effort to look for gaps in perspective. Who is around the table and the diversity of ideas they represent is critically important. You must always be looking for others who should be included and be willing to stop and reconvene if the 'right' players are missing.
- Have realistic expectations. Be clear about the purpose of the process.
- Be responsive and available. The EOMF has a strong existence value; stakeholders take comfort in knowing that it exists, even if they may not use it for a number of years. Such a legacy requires a reliable, long-term process that is accessible to stakeholders when *they* need it.

BOX 1. The Eastern Ontario Model Forest Case Study

II. CASE STUDY 2: MARRYING TRADITIONAL, LOCAL AND SCIENTIFIC KNOWLEDGE – THREE PROJECTS THAT ACCESS COMMUNITY-SITUATED KNOWLEDGE

'Hit and run science' is how Geoff Howell of Environment Canada describes the tendency for scientists to enter a community, extract information and disappear. 'It's a big mistake to come in with a fixed research design and to try to add traditional or local knowledge to confirm the results. It undermines ownership by the community and simply serves to build two solitudes.'

Geoff Howell knows of what he speaks. Since 1998, he and his partners from the Innu Nation, Environment Canada, the Gorsebrook Research Institute of Saint Mary's University and Natural Resources Canada have been exploring new ways to connect traditional knowledge and western science. The result is the Ashkui Project – an innovative project based on the hypothesis that a combined form of ecological knowledge can be developed, which recognises the qualities and limitations of traditional and Scientific knowledge systems and situates both within the specific context of the times in which they are produced.

Time is an important factor in working with local communities. 'You need to take the eraser to March 31 and adopt a longer term view', Howell explains. 'We didn't do *any* science for the first year. We took the time to become oriented with the community, to begin to discover what's valuable in that landscape to the people that depend on it.'

Although the Ashkui Project is situated in a northern community in Labrador, its findings resonate with the case studies described in *Learning Through Real Life Experience* (Kelsey, 2002b). 'Total inclusion from the beginning is essential', Howell reflects. 'We want to repaint the map of Labrador from a cultural perspective; to begin with a holistic view and then build the western scientific knowledge around that. All of our ideas and projects come from the community, from the elders themselves. It is the connecting dynamic of the two systems of knowledge that gives strength to their use together not the accumulation of one by the other.'

Howell further emphasises the contextual nature of knowledge*:*

> We don't meet in board rooms, don't rely on Powerpoint presentations. We set up camp together – 20 scientists and a similar number of people from the community – and live on the land together for a few days. These 'in-country' meetings have shaped our research in ways boardroom meetings never could. In May 2000, for instance, we talked with an elder, an 87-year-old woman who had been born and raised (and raised her own family) on Seal Lake. She described changes she had seen in the area from an eighty-year perspective. Later, when we met in her kitchen to continue our interviews, we got to chatting about elders on other sites who also had intimate long term perspectives on change – the kinds of

> animals, the ice conditions, the ability to use the water to make tea, etc. Today we have a project that investigates climate change in Labrador from elder interviews and another that uses scientific methods. We're just coming to the point where we have enough data to compare and contrast the findings.'

Attempts to marry multiple systems of knowledge are also evident in Eastern Ontario. The Eastern Ontario Biodiversity Museum, for example, together with the Stewardship Council, the Eastern Ontario Model Forest and the St. Lawrence Island National Park, has created the Community NatureWatch Program. The program is committed to supporting community-based efforts in which both local knowledge and scientific knowledge are used to assemble biodiversity inventories.

The Great Canadian Bio-Blitz puts a playful twist on community-based biodiversity inventories. The goal of a 'Bio-Blitz' is to count as many species as possible within a particular area in a 24-hour period. Ottawa hosted the first Canadian-based blitz in June 2000, recording more than 750 species. Today, thanks to the Canadian Biodiversity Institute and its community-based partners, bio-blitzes are popping up across the country, focusing the complementary knowledges of scientists, expert amateurs and interested members of the public on the identification of Canada's natural diversity.

Though very different in orientation, the Ashkui project, the Community NatureWatch Program and the bio-blitz experiences share a common dilemma with respect to information management. Given the aforementioned tendency to equate biodiversity information with scientific information, most biodiversity information management systems are based on a western scientific model. Attempts to input information from local or traditional knowledge systems into this model have proven inappropriate and unsuccessful (Hirsch, 1995). A recent report on the Canadian Information System for the Environment, for example, concludes that 'collection and the use of western methods for archiving are of limited value as they have historically removed the knowledge/data from the authority of its holders, interpreted it outside of its context and limited it to a historical record' (McFetridge, 2001: 5).

The Ashkui project has pioneered a number of computer and multi-media systems that can manage and share information originating from holistically based traditional knowledge *and* more reductionist western science knowledge. Not only are these products invaluable to the project's on-going biodiversity research and management work, but the capacity of the products to support multi-lingual, multi-cultural, multi-disciplinary learning has led to their incorporation into the Innu school system.

The three projects mentioned in Case II also highlight the importance of experimenting with alternative methods for collecting information 'on the ground'. At their in-country meetings, for example, the Ashkui project collaborators have used topographic maps, satellite images, local photos, and other visual products to see which people feel most comfortable with in terms of

talking about their knowledge. It appears that the type of 'map' individuals prefer is just as diverse and context-dependent as the knowledge itself.

It is the connecting dynamic of the two systems of knowledge that gives strength to their use together not the accumulation of one by the other. Viewed this way, traditional knowledge remains an independent and parallel system shared when needed, providing ongoing benefits, and recognition to its holders in its own rich, evolving environment.

The Ashkui project's top five lessons learned:

- Total inclusion from the very beginning. Involve the community in every aspect of decision-making from the start to the finish. Create a solid presence in the community. Employ people from the community and establish a physical office on site.
- Agree to a set of operating principles. Ownership of data residing with the community, for example, is an important principle upon which the Ashkui project operates.
- Communicate, communicate, communicate. Establish clear forums and formats for ongoing communication between community members and the other project participants.
- Educate, educate, educate. Share what you're learning with senior management and other influential stakeholders.
- Value a broader range of project outcomes. Relationships with partners, popular media coverage, tools for information management – these products are just as valuable to the goals of the project as scientific papers.

BOX 2. The Ashkui Project Case Study

III. IMPLICATIONS FOR CONCEPTIONS OF BIODIVERSITY EDUCATION

These case studies support a constructivist conception of biodiversity education. The core commitment of a constructivist position is that knowledge is not transmitted directly from one knower to another, but is actively built up by the learner. Knowledge is individually and socially *constructed* within specific contexts (Larochelle, Bednarz and Garrison, 1998; Driver et al., 1996; Gergen, 1995).

A constructivist definition of biodiversity education has important implications for the ways in which learning and teaching are understood and practised. Recognition that individuals are *active* agents in learning, for example, demands that biodiversity education activities must be truly participatory. Furthermore, recognition that individuals construct knowledge in *specific contexts* demands that biodiversity education activities must be planned and implemented *within* biodiversity projects.

This participatory, context-specific conception of biodiversity education marks an important departure from the widespread tendency to treat education, awareness and training as stand-alone entities. In the latter scenario, biodiversity education projects are created in generalised, 'one size fits all' formats with the assumption that they can be plugged into existing biodiversity initiatives whenever the need for education, awareness or training arises (Kelsey, 2001a).

An erroneous emphasis on information dissemination

The problem with this 'one size fits all' approach is that it portrays education as a simple act of transferring information from expert to recipient. Instead of focusing on the construction of knowledge, emphasis is placed on mechanisms for disseminating information. Education is, thus, narrowly framed as an information management problem in which emphasis is placed on gathering expert scientific information, organising it and re-packaging it for easier public consumption. Education expertise is not recognised because information transmission is perceived to be simply a matter of putting the right information in, storing it, and making it easily accessible. Consequently, emphasis is placed on dissemination mechanisms with the greatest public reach, specifically brochures, mass media and the Internet.

Despite its prevalence, there is little support for this de-contextualised approach in the academic literature. Because learners *do* bring their own knowledge, experiences and interpretations to bear on new information, knowledge acquisition is not a 'success-without-effort system'. Indeed, from an information dissemination standpoint, failure is the norm and success is the exception. Information *does not* transfer directly from source to recipient. Learners *do not* hear, read or interpret information in the same ways. Knowledge *is not* passively received and independent of context (Reddy, 1993).

The importance of trust and relationship

Furthermore, as the cases in this paper demonstrate, the interaction of the public with expert knowledge is not based solely on access to information. Importance is given to the source of the information, and particularly, to the extent to which it could be judged trustworthy and reflective of an understanding of their situation (Lindblom, 1990). The ability of the Eastern Ontario Model Forest, for

example, to serve as a forum for the investigation and resolution of controversial issues, is based on the EOMF's identify as an open, transparent and trustworthy organisation.

The experience of the EOMF is in keeping with contemporary academic literature that challenges the belief that facts speak for themselves and reveals the importance of context to understanding (Irwin and Wynne, 1996; Irwin, 1995). People do not, according to Layton et al. (1993: 122) 'encounter scientific knowledge as free-floating and unencumbered by social and institutional connections. The questions of "From whom", "From where?" and "From what institutional source?" are central to judgements about the trustworthiness and reliability of the knowledge.'

Similarly, the cases demonstrate the significance of relationships to learning. As Brian Barclay explains 'Farmers want to talk with farmers; rural landowners appreciate the concerns of other rural landowners'. When a program is seen as relevant and personally meaningful, the motivation to learn is greatly enhanced (Howlett, 1991; Weiss and Tschirhart, 1994). This assertion gains support from other research findings which indicate that when science is seen as relevant to an individual's concerns, these individuals demonstrate considerable resourcefulness in locating sources and impressive capability in translating scientific knowledge into forms which support practical action (Wynne, 1991; Layton et al., 1993).

Indeed, the necessity of targeting specific individuals or groups and developing relevant materials to meet their specific interests and needs resonates in both case studies. Brochures and publications aimed at a general public audience, therefore, are unlikely to address the specific experiences and motivations of the individuals that biodiversity initiatives need to reach. The legacy of this supply-driven approach, as one case study participant points out, 'is that we're waist deep in glossy brochures and no farther ahead in public involvement' (Kohl, personal communication).

Implications for public involvement

Erroneously equating education with information dissemination also inadvertently weakens public involvement. Not only do information dissemination approaches neglect the crucial human ability and necessity to construct knowledge, but also by reducing the role of the public to that of information recipient, public input into biodiversity problem solving is marginalised and public agency is undermined. The public is thus relegated to the status of an 'accidental public'; a passive audience extrinsic to the real work of biodiversity conservation and sustainable development (Farrell and Goodnight, 1998).

The cases also provide a reminder of the power, authority and agency issues that arise when building the capacity of the public to participate in biodiversity initiatives. Education activities are not value-free; they entail judgements about

who holds knowledge, and what knowledge is deemed valuable (Madsen, 1996; Freire, 1998).

Implications for management

As the case of the Eastern Ontario Model Forest demonstrates, a commitment to consensus decision-making helps to ensure that all voices are heard regardless of the knowledge system in which they are operating. The same commitment, however, also necessitates an organisational culture that is serious about listening, able to foster co-operation and willing to invest the amount of time it takes to reach a decision based upon group understanding and agreement on how to proceed

The crucial importance of listening to deliberative and participatory practices – inquiring and learning together in the face of difference and conflict; coming to see issues, relationships, and options in new ways; and thus arguing and acting together – is demonstrated repeatedly in the practitioner accounts of public participation processes described by Forester (1999). Deliberative practice and participatory processes will fail, Forester cautions, if attention to technique or 'substance' overshadows or diminishes the history and culture, the self-perceptions and deeply defining experiences, of the individuals and organisations involved.

Similarly, the Ashkui project has dispensed with the science-first model of environmental decision-making implicit within traditional government bureaucracies in favour of knowledge-gathering processes that respect the holistic nature of local and aboriginal knowledge. This decision supports an essential characteristics of adaptive management as defined by Lee (1993: 63): 'The time scale of adaptive management is the biological generation rather than the business cycle, the electoral term of office or the budget process.'

As these cases demonstrate, marrying multiple systems of knowledge requires an adaptive management culture that is receptive to a greater diversity of ways of thinking and acting and is committed to working in mutual collaboration. This is a difficult task, given the prevalence of the science-first model in environmental decision-making and the historical bias of western science to regard traditional and local knowledges as anecdotal, non-quantitative, without adequate methods and therefore of little value (McFetridge, 2001).

Yet, the importance of traditional and local knowledges to biodiversity conservation and sustainable use is unquestionable. Indeed, the CBD specifically recognises their value. In its most recent decisions, the Conference of the Parties to the Convention identified the need to facilitate the full and effective participation of indigenous and local communities in the implementation of the Convention (McFetridge, 2001).

Learning as an organisation

The cases in this paper can also be understood as examples of learning organisations. Learning organisations are organisations skilled at creating, acquiring and transferring knowledge, and at modifying their own behaviours to reflect new knowledge and insights (Garvin, 1993). The two cases are particularly impressive in their embodiment of the features of a learning organisation as defined by a recent workshop devoted to the subject held at Stanford University's School of Education (Marshall, Mobley and Calvert, 1995; Gephart et al., 1996). These features include:

- A culture of learning and creativity and a spirit of flexibility and experimentation.
- A people-centred community that values and supports the development of every individual.
- Leadership and management who model learning behaviour, solicit employee input, and provide critical support and resources.
- A culture of trust and openness that encourages inquiry, dialogue, diversity, and risk-taking.
- Knowledge generation, capture, and sharing.
- Critical, systemic thinking to recognise links and feedback loops and identify assumptions.

Perhaps even more significant is the way in which the projects extend these principles not only to their own staff, management and board members but also to the many different individuals and organisations with which they collaborate. By applying the principles of a successful learning organisation to their relationships, both internal and external, the EOMF and the Ashkui project are making significant inroads in broadening and deepening the effectiveness of their multi-stakeholder processes.

Learning is a risky business. On a personal level, learning is often uncomfortable and difficult. It can make one feel vulnerable, uncertain or frustrated and carries the very real risk of costing time or money. The same may be said of learning at the organisational level. As with personal learning, organisations need a serious belief in the ultimate value of learning to see them through the financial, political and opportunity-based risks that are an inevitable part of the territory of learning organisations (Marshall, Mobley and Calvert, 1995). Campbell (1977) describes the prevalence of 'trapped administrators' who have so committed themselves to the efficacy of the reform that they cannot afford honest evaluation. He warns of the moral hazard for adaptive management: that

such managers will cook the books. As Lee (1993: 77) describes: 'Skewed science can be beneficial to the trapped administrator, giving the appearance of rigorous evaluation and testing but providing a predetermined positive result.'

As the cases illustrate, biodiversity initiatives demand institutions that are willing to take risks and put aside their own familiar ways of working in favour of experimenting with new approaches that better meet the needs of their diverse partners and the biodiversity goals they seek to achieve. Yet, as these cases also demonstrate, biodiversity initiatives are not executed by rational actors in an ideal world. Instead, they demand learning strategies that recognise conditions favouring adaptive management, while at the same time responding to the social dynamics and institutional rigidities that inevitably arise (Lee, 1993).

NOTE

[1] In 1998, a major ice storm struck the region of Eastern Ontario and Western Quebec, causing millions of dollars in damage and resulting in several deaths. The natural vegetation and wildlife in the Eastern Ontario Region are still recovering from the devastating effects of the storm.

REFERENCES

Campbell, D. T. 1977. 'Reforms as experiments', in F.G. Caro (ed.), *Readings in Evaluation Research* (New York: Russell Sage Foundation), pp. 172–204.

Driver, R., Leach, J., Millar, R., and Scott, P. 1996. *Young People's Images of Science*. Buckingham, Philadelphia: Open University Press.

Dryzek, J. 1996. *Democracy in Capitalist Times: Ideals, Limits and Struggles*. Oxford: Oxford University Press.

Farrrell, T., B. and Goodnight, T. 1998. 'Accidental rhetoric: The root metaphors of Three Mile Island', in C. Waddell (ed.), *Landmark Essays on Rhetoric and the Environment* (Mahwah, New Jersey: Lawrence Erlbaum Associates), pp. 75–105. (Original essay published in 1981 in *Communication Monographs*, **48**: 271–300).

Forester, J. 1999. *The Deliberative Practitioner*. Cambridge, Mass.: MIT Press.

Freire, P. 1998. *Pedagogy of Hope: Reliving Pedagogy of the Oppressed.* New York: Continuum Publishing Company.

Garvin, D. 1993. 'Building a learning organization', *Harvard Business Review*, **71**(4): 78–91.

Gephart, M., Marsick, V., Van Buren, M., and Spiro, M. 1996. 'Learning organizations come alive', *Training and Development*, **50**(12): 34–45.

Gergen, K. J. 1995. 'Social construction and the educational process', in L. P. Steffe and J. Gale (eds) *Constructivism in Education* (Hillsdale, N.J. , Lawrence Erlbaum).

Grove-White, R. 1993. 'Environmentalism: A new moral discourse for technological society?', in K. Milton (ed.), *Environmentalism: The View from Anthropology* (London: Routledge).

Hirsch, E. 1995. 'Landscape: Between place and space', in E. Hirsch (ed.) *The Anthropology of Landscape: Perspectives on Place and Space* (Oxford University Press).

Howlett, M. 1991. 'Policy instruments, policy styles, and policy implementation: national approaches to the theory of instrument choice', *Policy Studies Journal*, **19**(2): 1–21.

Irwin, A. 1995. *Citizen Science: A Study of People, Expertise and Sustainable Development*. London: Routledge.

Irwin, A., and Wynne, B. (eds) 1996. *Misunderstanding Science?: The Public Reconstruction of Science and Technology*. Cambridge: Cambridge University Press.

Johnson, M.C. and Poulin, M. 2001. 'Bringing science to the public through biodiversity monitoring: Lessons learned from the Rideau River Biodiversity Project'. Paper Commissioned by Canadian Biodiversity Office, Environment Canada.

Kelsey, E. 2001a. 'Reconfiguring public involvement: Conceptions of "education" and "the public" in international environmental agreements'. Doctoral Thesis, King's College London.

Kelsey, E. 2001b. *Learning through Real Life Experiences: Case Studies of Biodiversity Initiatives in Eastern Ontario*. Biodiversity Convention Office, Environment Canada.

Larochelle, M., Bednarz, N. and Garrison, J. (eds) 1998. *Constructivism and Education*. Cambridge: Cambridge University Press.

Layton, D., Jenkins, E., Macgill, S. and Davey, A. 1993. *Inarticulate Science? Perspectives on the Public Understanding of Science and Some Implications for Science Education*. Nafferton: Studies in Education Ltd.

Lee, K. N. 1993 *Compass and Gyroscope: Integrating Science and Politics for the Environment.* Washington, D.C.: Island Press.

Lee, K.N. 1995. 'Deliberately seeeking sustainability in the Columbia River Basin', in L. Gunderson, C. Holling and S. Light (eds), *Barriers and Bridges to the Renewal of Ecosystems and Institutions* (New York: Columbia University Press), pp. 214–38.

Lindblom, C. E. 1990. *Inquiry and Change: The Troubled Attempt to Understand and Shape Society*. New Haven, Connecticut: Yale University Press.

Macnaghten, P., and Urry, J. 1998. *Contested Natures*. London: Sage

Madsen, P. 1996. 'What can universities and professional schools do to save the environment?' in J.B. Callicott and F. J. R. da Rocha (eds), *Earth Summit Ethics: Toward a Reconstructive Postmodern Philsophy of Environmental Education* (New York: State University of New York Press), pp. 71–92.

Marshall, L., Mobley, S. and Calvert, G. 1995. 'Why smart organizations don't learn', in S. Chawla and J. Renesch (eds), *Learning Organizations. Developing Cultures for Tomorrow's Workplace* (Portland, OR: Productivity Press).

McGraw, D. 2002. 'The story of the Biodiversity Convention: Origins, characteristics and implications for implementation', in P. Le Prestre (ed.), *The CBD and the Construction of a New International Biological Order* (London: Ashgate Publications).

McFetridge, R. 2001. *The Canadian Information System for the Environment: Linking Western Sciences and Traditional Knowledge*. CISE Task Force Report, Biodiversity Convention Office, Environment Canada.

Reddy, M. J. 1993. 'The conduit metaphor: A case of frame conflict in our language about language', in A. Ortony (ed.), *Metaphor and Thought* (Cambridge: Cambridge University Press, 2nd edn), pp. 164–201.

Story, P. A. and Lickers, F. H. 1997. 'Partnership building for sustainable development: A First Nations perspective from Ontario', in O. T. Bournan and D. G. Brand (eds), *Sustainable Forests: Global Challenges and Local Solutions* (The Hawthorn Press).

UNEP 2001. *Report of the CBD–UNESCO Consultative Working Group of Experts on Biological Diversity Education and Public Awareness on the Work of its Second Meeting. (UNEP/CBD/GEEPA/2/3).* Bergen, Norway: UNEP.

UNEP/CBD–UNESCO/CWGEBDEPA–3/2, 27 August 2001

Weiss, J. A. and Tschirhart, M. 1994. 'Public information campaigns as policy instruments', *Journal of Policy Analysis and Management,* **13**(1): 82–119.

Wynne, B. 1991. 'Knowledges in context', *Science, Technology and Human Values,* **16**(1): 111–21.