

ENVIRONMENTAL EDUCATION AND TRAINING IN INDUSTRY: CHANGING ORIENTATIONS AND PRACTICE?

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This paper is a developing story of an emerging picture of how environmental education processes are being / can be shaped in industry settings. The paper argues that environmental training in industry can no longer trundle along 'business as usual' pathways, nor can it ignore the changes in education and training policies or environmental management practices. The paper points to current narrow orientations to environmental training, and the tendency in industry to design training programmes which are reactive and follow a 'default' approach to environmental management. It argues for a new look at the significant role that education and training might play in the implementation of preventative environmental management strategies, and notes that new orientations to environmental education and training are more likely to support a re-orientation of environmental management processes.

The paper therefore reflects dimensions of the methodological debates in environmental education and training in industry, debates which, in South Africa, are gradually centering in on two key shaping forces: the integrated and applied competence orientation of the outcomes-based National Qualifications Framework and the international trend towards Preventative Environmental Management. These two orienting concepts are beginning to provide a framework for discussion about environmental education and training methods and processes in industry settings, which the paper aims to open up.

PROLOGUE

In writing this paper, I draw on three significant course development experiences that I have been involved in over the past year:

* The development of the first Rhodes University Certificate Course in Environmental Education for Industry, Business and Local Government (which I developed and presented with Glenda Louw and Nicola Jenkin from October 1998 - June 1999);

* The development of an industry environmental management and education course for the Occupational Health and Safety Directorate of the Ministry of Labour in Malawi (which I am developing with Autman Tembo and Martin Mkandawire); and

* The 'Educate the Educators' course which I attended at the International Institute for Industrial Environmental Economics (IIIEE), Lund University, Sweden, in June 1999.

These course development experiences have provided some insights into the *status quo* of environmental education and training in industry settings, and useful methodological insights. They have also raised a number of issues associated with the transformational intent of environmental education and training.

Throughout the paper I have highlighted some of the arising issues and challenges which have to be taken account of in the development of environmental education and training programmes in industry settings, if they are to be developed within the above-noted emerging and transformative framework.

INTRODUCTION: CHANGING CONTEXTS FOR ENVIRONMENTAL EDUCATION AND TRAINING

In the debate on how to achieve sustainable development, industry plays a paradoxical role. On the one hand it is one of the major productive and wealth-creating sectors of society, and on the other hand, industry is a major polluter and resource consumer, both directly through its production processes and indirectly through the products it sells. The challenge to industry is to meet needs in ways which do not exacerbate growing inequality or degrade the environment.

The World Commission on Environment and Development projects a further five-to ten-fold expansion in production before the world population starts to stabilise sometime in the next century (Kirby *et al.*, 1995). However, this unprecedented expansion is seldom questioned. Neither is the model of progress (modernistic, linear and eco-

conomic) which underpins the growth in industrial development. Kirby *et al.* (1995) raised a concern that the very nature and assumptions which underpin such growth and expansion should be questioned, given the accelerating depletion of 'natural capital stocks'. In this model of a global growth economy money is the god, material wealth is the principal virtue, and market economics is the ruler of our times. The economics of consumption is full of hidden costs and is drawing us ever deeper into social, ecological and economic crisis (Ekins, 1992). Many publications provide insight into the extent of this social, ecological and economic crisis; see for example the *State of the Environment in South Africa Report* (DEA&T, 1999) and the *Living Planet Report* (WWF, 1999). There are an increasing number of publications that provide insight into the contributions of industrial developments to environmental issues and risks (for example Ekins, 1992; Howes *et al.*, 1997; Weldon *et al.*, 1995). An increased understanding of the social origins of the environmental crisis, and its complex issues and risks, have emphasised the need for social change and social transformation if we are to resolve environmental issues and challenge the production of risks in any meaningful way.

SUSTAINABILITY: RECONCILING ENVIRONMENTAL CONSERVATION AND ECONOMIC DEVELOPMENT

Internationally industry and governments have responded to emerging environmental issues and the unsustainability of environmental risk production in many diverse ways, including the development of eco-efficient options for production, the development of environmental management systems and standards such as ISO 14000, auditing procedures, increased legislative pressure and the integration of environmental concerns into occupational health and safety programmes. The diversity of responses are evident in South African environmental management practices too. In the Rhodes University (RU) Certificate course, for example, participants were variously engaged in developing Safety, Health and Environment (SHE) programmes, auditing procedures, implementing ISO 14000 system standards, developing environmental policies and doing environmental impact assessments (RUEEU, 1999).

Environmental education and training is increasingly seen as an important process in responding to environmental issues and risks. In the RU

Certificate course participants were all involved in some way with the development, implementation and support of environmental management systems or processes, and ultimately environmental education and training in their specific places of work, indicating the close link between environmental management processes and environmental education and training. This emphasis on environmental education and training can be seen in the incorporation of 'training' as a key element of an ISO14000 certified Environmental Management System, and in the shift in orientation to action-based environmental training methods in Preventative Environmental Management processes (Huisingsh & Mebratu, 1999). In the RU Certificate course, the way in which environmental management was being approached in different contexts varied, but with little or no proactive, preventative environmental management in evidence, indicating the 'status' of environmental management practices in South Africa. Of importance here is the changing face of environmental management (from reactive environmental management or end-of-pipe solutions to proactive, preventative approaches to managing environmental impacts) and the associated implications for changes in focus for environmental education and training in industry settings. This is one of the challenges we aim to address in the Malawi Industry Environmental Management and Education course (Lotz *et al.*, 1999).

Participants on the RU Certificate course, and in the IIIIEE 'Educate the Educators' programme, were all interested in exploring the role of education and training within the context of changing environmental management practice. Besides the need for environmental education and training programmes that are responsive within the particular environmental management processes of a particular company or industry, a profile of the programmes developed by the RU Certificate course participants indicates the need for environmental education and training programmes at various 'levels' in the education and training system. Course participants developed programmes for, amongst others, Adult Basic Education and Training (ABET) in integrated SHE programmes, extension and entrepreneurship training, company-wide awareness training, environmental management courses in tertiary institutions, at policy level through the design of qualification frameworks, community participation and awareness and for the education and training of decision makers - indicating the breadth and scope of environmental

education and training in industry settings (RUEEU, 1999).

Education has been described as the world's greatest resource in bringing about a preparedness for changes in social systems towards sustainable living. Increasingly environmental educators are recognising the need to link environmental education to the social, economic and political nature of environmental issues in ways which move beyond narrow orientations of awareness raising and information communication which are technicist and managerial-hierarchical in their orientation to change (Janse van Rensburg, 1995). Thus, national policy support for environmental education as part of the social transformation process in the country indicates the need for education to "empower communities to act on environmental issues" (ANC, 1994). The 1995 *White Paper on Education and Training* includes a cross-curricular (cross-field), action-based orientation to environmental education as a principle of the new education and training system introduced through the National Qualifications Framework and legally implemented through the South African Qualifications Authority (SAQA) Act of 1995.

In recent years the concern for social change has motivated the development of more participatory orientations to environmental issues and environmental education programmes (O'Donoghue, this issue), and an ongoing questioning of the approaches and orientations to environmental education. For example, Tilbury (1995) noted that environmental education no longer considers immediate environmental improvement as an actual goal, but also addresses education for sustainability in the long term, which requires reconciliation between environmental conservation and economic development. The reconciliation between environmental conservation and economic development has seemingly become the central goal for environmental education in the 1990's (Scoullous, 1998). More recently narrow interpretations of education for sustainability are being questioned, and much debate is ensuing about the meaning of sustainable development in different contexts, including the relevance of the term sustainability as a guiding framework for environmental education and training (Jickling, 1999; Sauve, 1999). Sauve (1999), for example, notes that the prevailing discourse of education for sustainable development "... follows a rational-technological paradigm of education" while Jickling questions whether 'sustainability' and 'sustainable develop-

ment' provide suitable goals for environmental action and environmental education. Mebratu (1998) argued that sustainable development in Africa requires a new methodology of interpretation in industry settings to engage with the implications of sustainable development in 'developing' economies. Participants from 25 'developing' countries in the IIIIE Course which I attended indicated that countries in the 'developing' world are increasingly starting to realise the importance of environmental improvement to their business and to adopt preventative environmental strategies as the basis for achieving environmental improvement in industries - leading to both economic and environmental benefits (IIIIE, 1999). The role of education and training was recognised in making this shift to preventative environmental strategies and all course participants are engaged in some or other process of establishing educational programmes with this in mind - reflecting the shift in emphasis in the goals for environmental education in industry noted above (Huisingh & Nebratu, 1999).

While these debates take place in international academic circles, the South African government has made a commitment to reconcile environmental conservation and economic development through the South African National Environmental Management Act (NEMA) of 1999. This Act commits the government to sustainable development and takes a significant step towards making formal environmental management systems (EMS) mandatory requirements for companies. NEMA has far reaching implications for environmental risk profiles in many companies in South Africa, as well as substantially increased director liability risks. It requires companies to pursue the best practicable environmental option, while taking account of environmental justice issues, and of the life cycle impacts of a policy or programme. NEMA also enables access to information and the participation of interested and affected parties while it entrenches the right of workers to refuse work which might be harmful to their health and the environment. The Act effectively entrenches environmental rights, the concepts of life cycle analysis and full cost accounting into law (EMS, 1998), thus introducing a preventative orientation to environmental management in South Africa - an orientation which is only just beginning to shape environmental management practices in South Africa as can be seen by the waste minimisation, toxic substance reduction, and resource conservation items in the National Occupational Safety

Association (NOSA) integrated SH&E audit note book (NOSA, 1999).

OPPORTUNITIES FOR ENVIRONMENTAL EDUCATION AND TRAINING IN INDUSTRY AND BUSINESS SETTINGS

This new regulatory framework, together with the new emphasis on life-long learning, the development of a National Qualifications Framework (NQF), the economic imperatives, and the human development priorities of the government are leading to enormous changes in the training sector to create life-long learning opportunities for all South Africans. New qualifications are being developed to enable access to education and training, redress, portability and the transformation of the entire education and training system. The Environmental Standards Generating Initiative are taking a proactive approach to enable the development of environmental learning across the 12 fields of the NQF (Lotz, Janse van Rensburg & Mosidi, in press). Outcomes-based competency models of education and training are being piloted for accreditation and qualifications in different industry sectors, and a skills development levy has been established to fund education and training. These developments create a context of opportunity for the development of courses and qualifications which might enable industry to respond more adequately to the environmental issues and risks it faces.

With the realisation of the importance of the environment in business and industry, the International Standards Organisation has formulated the ISO 14000 series of standards according to which companies globally should conduct business. The adoption of these standards are aimed at providing the yardstick by which companies govern their own business practices and evaluate the environmental performance of their suppliers and customers. A significant element of these environmental management systems is the development of appropriate training processes which requires industries to identify training needs which enable employees at all levels to become aware of company environmental policy and potential environmental impacts of their work activities. Through this training, organisations are required to enable workers at all levels to develop the action competence to respond to arising issues and risks. Many companies in South Africa are adopting the ISO 14000 EMS standard as guideline for their practice.

A recent research report on the status of environmental education and training in South African industry notes that environmental management and environmental training practice in companies are interdependent. This study recommends that "environmental training should ... be directed and informed by an understanding of a company's specific impact on the environment" (Craffert *et al.*, 1997). This implies that employees should be clear about the nature, causes and impacts of environmental issues and risks associated with the business of the company and should have a broader understanding of the relationships between environmental conservation and economic development, and the implications of more sustainable living options in a given work context.

While Craffert *et al.* (1997) recommend that environmental training should focus on a company's specific impact on the environment, recent trends in preventative environmental management note that an eco-systems approach to environmental management is more appropriate for resolving environmental issues and risks. Wallner (1999) for example, notes that 'industrial ecology' promotes the formation of ecologically compatible industrial clusters that network actively on the basis of material and energy flows. These networks currently operate mainly on the ancilliary flows of the industrial metabolism, where waste from one company provides raw material for another. He argues that while this approach will undoubtedly make progress in terms of ecology, it will not be adequate to enable a sustainable production system. If environmental education and training programmes are to be conceptualised within an eco-systems approach to environmental management, it follows that training programmes should not only focus on the understanding of a company's specific impact on the environment, but that it should incorporate the particular industry's interrelationships with other industries, consumers, the market and government at local, national, regional and global scales.

SOME ARISING CHALLENGES FOR EE&T IN BUSINESS/INDUSTRY SETTINGS

* How should environmental education programmes be developed in order to encompass a broad view of environment which includes social, economic, political and bio-physical considerations?

* How should environmental education and

training deal with the paradoxical role of industry in sustainable development?

- * How should environmental education and training programmes be developed to enable learners to critically analyse the root causes of environmental degradation and risk production - which lie in the very nature of the economic system being supported by industry practices?
- * How should environmental education and training programmes develop concepts of inter-relatedness within eco-system approaches to environmental management?
- * How can environmental education and training programmes be developed within the outcomes-based competency orientation of the NQF?

LEARNING WITH ADULTS: SHIFTS IN ORIENTATION TO EDUCATION AND TRAINING

Methodological Trends

The new government in South Africa has developed policy processes and mechanisms to integrate education and training. These are to form part of a system of human resource development which provides for the establishment of an integrated approach to education and training which is expressed in nationally acceptable qualifications (Perold, 1994). Gough (1997) recognised that the integration of environmental education into business and management training presents serious difficulties due to the participatory, critical and action-oriented approaches required to resolve environmental issues and risks. Most current environmental training takes place in a context of business and management training systems which are essentially individualistic and reductionist (Shaw & Dingle, 1998). Patterson & Hunter (1995) distinguish between training and education as follows:

Training: This instructional experience is provided primarily by organisations for employees and/or projects participants and is designed to develop new skills and knowledge that are expected to be applied immediately upon arrival or return to the job.

Education: This learning activity allows for a participant who is identified as having potential for advancement or promotion to acquire additional knowledge and personal development.

The convergence of education and training is shaping shifts away from narrow orientations to training, to include a convergence between the principles of human organisation and educational approaches favoured by both environmental educators and contemporary management theorists. These are mainly visible in the shift towards experiential learning approaches currently favoured in management training and in the development and adoption of systems-based approaches to training based on ongoing analysis and re-engineering according to identified needs in process (Paterson & Hunter, 1995). In the 'Educate the Educators' programme offered by the IIIIEE a number of these experiential learning approaches were explored, ranging from case study examination, simulations of industrial scenarios and exploring possible solutions to environmental problems, on-site environmental audits as an educational process. The objectives of this course refer to these as 'evolving tools and methodologies in preventative environmental management education and training' (Huisingsh & Mebratu, 1999). These 'tools and methodologies' reflect the trend towards seeking action-oriented and relevant solutions to environmental problems through training.

In the RU Certificate course for industry settings, we explored the notion of competence, and worked with participants to design courses that would enable the development of action competence for environmental management processes through education and training, again reflecting the trend towards experiential, competence-based educational methods (RUEEU, 1999). In the RU Certificate course we did not, however, present the participants with a range of tools and methodologies to implement, but we encouraged an insight into the educational orientations which shape different 'tools and methodologies', and the design of educational processes which are responsive to context and enable the development of reflexive competence. We found that while participants were able to recognise the difference in orientations to different kinds of educational activities, they were less able to incorporate them into their courses (Jenkin, 2000), although many of the programmes reflected some engagement with the curricular issues associated with competence development

(RUEEU, 1999).

Assumptions about Learning

Recent insights into the landscape of adult learning indicate that false dichotomies have been created between adult and child learning, and that theories of adult learning are often based on simplistic assumptions about learning (Usher *et al.*, 1997). Many popular adult learning approaches (including experiential learning techniques) are based on simplistic assumptions that awareness-raising leads to behaviour change - assumptions which have long lost credibility in the field of human learning (RUEEU, 1998). Developments in cognitive psychology have shaped learning theories which recognise the socially constructed nature of knowledge and the construction of meaning. Early individualistic models of constructivist learning assumed that meaning is constructed in the mind of the learner, a perspective which has been challenged by researchers such as Vygotsky who recognised the role of language and culture in the construction of meaning. The emphasis on language, culture, history and social interaction in learning processes, has enabled an understanding that learning is a socially constructed process involving open-ended processes of dialogue, encounter and reflection in a context of action taking (Janse van Rensburg & O'Donoghue, 1995).

These understandings of learning inform many of the methodological trends in adult learning. For example, earlier approaches aimed at 'targeting messages' and 'raising awareness' reflect behaviourist assumptions about learning. Individualised experiential learning processes reflect an understanding that meaning is constructed in the mind of the learner, and that learners should be given the opportunity to participate actively in the learning process. Many of these approaches, however, still assume that awareness-raising will lead to behaviour changes. These and many other 'techniqued' orientations to training such as 'fishbowl' sessions, case study work and simulations fall short of enabling learners to develop the action competence (Jensen & Schnack, 1997) needed to respond to arising environmental issues in context.

Action Competence and Environmental Learning

The Environmental Education Curriculum Initiative described action competence as a learning process which consists of:

- * an understanding of social, economic, political and biophysical systems and their interactions
- * the nature and effects of environmental issues
- * the nature of, and need for, sustainable resource use; as well as
- * the capacity to address environmental problems and develop practical ways to move our society towards sustainability (EECI, 1998).

Development of action competence in industry settings would therefore require environmental learning which enable learners to become active participants in the transformation of business practices towards sustainability. The framework of action competence in environmental education and training is not unlike current proposals for competency development supported by the National Skills Bill (1998). This Bill supports an integrated orientation to competency development which both highlights and draws on the development of applied competence, the over-arching term for these three kinds of competence:

- * Practical competence: Demonstrated ability to perform a set of tasks
- * Foundational competence: Demonstrated understanding of what we are doing and why
- * Reflexive competence: Demonstrated ability to connect what is known with what we do so that we can learn from our actions and adapt (Department of Labour, 1997).

Thus policy documents in South Africa define competency in broad terms to include knowledge, skills, values and affective factors. The ability to apply and transfer knowledge, skills and values critically and reflexively is a crucial aspect of the competence debate in South Africa. The idea of 'competence' has traditionally been closely associated with narrow approaches to training. However, with an emphasis on reflexive competence, the integration of education and training becomes more possible and the 'hybrid' nature of competence becomes visible (Janse van Rensburg & Lotz, 1997):

- * If cast in the framework of economic rationalism aimed merely at "turning out the product which industry consumes" (Usher *et al.*, 1997), a context of instrumentalist learning can be created in which there is little room for open-endedness, unforeseen out-

comes or social critique.

- * On the other hand, the blurring of the boundaries between education and training can work both ways, to introduce more humanistic orientations to vocational training and greater social relevance to education. Usher *et al.*, (*ibid*) also notes that "to become more competent ... is to become more empowered".

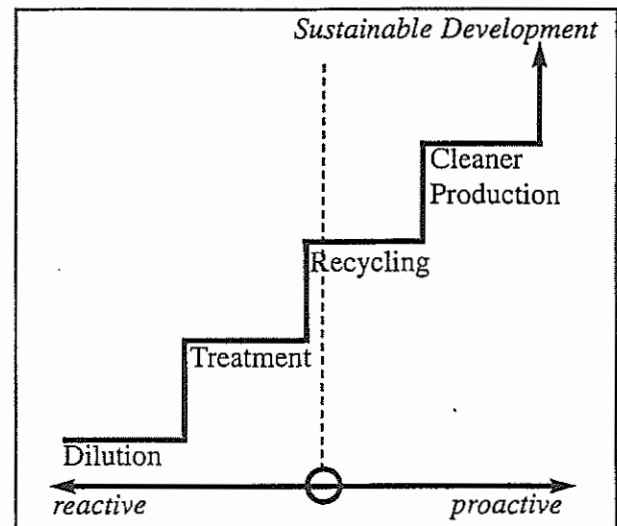
Arising Challenges for Environmental Education and Training in Industry

- * How do we begin to develop environmental education and training programmes which move beyond 'awareness raising' and 'behaviour change' models of training?
- * How do we draw on the many useful experiential learning methods in industry training, without falling into the instrumentalist trap of using the methods as techniques and tools for change?
- * How can we begin to clarify the relationship between experiential learning methods and action competence for environmental management processes?
- * What kinds of curriculum processes are likely to enable reflexive and applied competence, and how can we begin to develop new environmental training programmes within this competency framework?
- * How do we recognise the links between reflexive competence and action competence in environmental management processes - and draw on these concepts in designing environmental training?
- * In designing environmental education and training programmes, how ought we to deal with the 'hybrid' nature of competency-based education?

ENVIRONMENTAL EDUCATION AND TRAINING PROCESSES WITHIN ENVIRONMENTAL MANAGEMENT SYSTEMS

The ISO 14000 series is designed to create standardised global procedures for corporate environmental management. The series of standards includes the development of an EMS standard, auditing, performance evaluation, eco-labelling, life-cycle assessment and product standards. ISO 14001 provides a 'model' for an EMS. The ISO 14001 standard requires companies to measure their conformance to an internal set of targets.

Figure 1: Shifts in Environmental Management (in *Cleaner Production: A Training Resource Package*. United Nations Environment Programme, 1996)



Most often EMS such as ISO 14000 are implemented from a 'default' approach, and focus on direct, negative environmental impacts associated with production processes (Sherman, 1997). This 'default' model is driven primarily by private interests and is not necessarily preventative in orientation, but often re-active. Recent trends in environmental management have moved away from re-active approaches to environmental management, to preventative approaches - as noted above (see Figure 1).

As noted above, the orientation to environmental management often influences the type of training provided within the EMS framework/s. The study by Craffert *et al.*, (1997) indicates that companies with environmental policies are far more likely to implement environmental training. In South Africa, most environmental training is taking place as part of integrated SHE programmes where workers are most at risk. Second to environmental training in SHE programmes is environmental training associated with compliance and waste management. These training priorities reflect the deficit model of environmental management adopted by most ISO140001 environmental management systems. This trend in environmental training in South Africa indicates that environmental education and training programmes have a paradoxical, but transformative role to play in the movement towards sustainability. While environmental education and training processes ought to facilitate and support the implementation of envi-

ronmental management in the context of particular industries, they also have a broader role to play in critically and reflexively reviewing environmental management processes in the light of broader national and international trends. Thus environmental education and training processes in industry settings are vital to move us beyond the deficit model of environmental management currently reflected in South Africa.

Arising Challenges for Environmental Education and Training

- * How can Environmental Education & Training programmes raise critical awareness of the models being implemented in environmental management processes, while at the same time supporting the implementation of environmental management processes?

TOWARDS MORE EFFECTIVE MODELS OF PROCESS IN ENVIRONMENTAL EDUCATION AND TRAINING

Transforming society towards an environmentally sustainable path will not be easy, because it means a fundamental shift in thinking, values and actions of all institutions and individuals worldwide. A shift in our beliefs and patterns of thinking are essential to make the leap forward. In developing environmental education and training programmes we need to take cognizance of the above-noted trend of adopting a deficit model of environmental management and environmental training, and of broader trends in environmental management. We will also need to take cognizance of the changing trends in education and training more broadly, introduced by the NQF and the outcomes-based, competency approaches to education and training. With this in mind, we might reflect more critically on the research findings of Craffert *et al.* (1997) in which they note that discussions, meetings and workshops were rated as the most successful methods of training senior management, middle management and supervisors. On-the-job training was considered to be the most successful training method for artisans, unskilled (shop floor) and temporary workers as well as for contractors. These perspectives, coupled with the above outline of some of the arising challenges for environmental education and training in a changing policy context, lead us to question what the most appropriate training methods might be in environmental education and training,

given international shifts towards preventative environmental management based on a striving towards sustainability, rather than a 'flight from bad practice'.

While the above scoping of environmental training in South Africa noted narrow approaches to training, and technicist and transmission oriented approaches to the delivery of environmental training in South African industries, there are instances where environmental educators have begun to challenge these traditional (and often limited) methodologies. The SEAS/ SAPPI / SAFCOL 'Environmental Talks' teaching materials for example reflect a number of principles of environmental education and training which indicate some initial shifts towards the integration of education and training in workplace-based training programmes. These materials:

- * encourage a deeper understanding of the issues at hand
- * are contextually relevant and draw on the experience of the workers
- * are interactive, encouraging debate and dialogue
- * encourage a broader view of environment/s
- * are designed to encourage the development of action plans
- * form part of a broader policy implementation process (ISO 14000)
- * respond to contextual constraints such as limited time for training and low levels of functional literacy
- * are flexible enough to be used in different ways in different contexts
- * encourage the development of applied competence (practical competence, foundational competence and reflexive competence).

Other examples of more innovative environmental education and training methodologies include action learning approaches (Foiland, 1994) which involve groups of between six and 30 employees (sometimes including vendors and customers). A real work challenge is the centre piece of an action learning experience. Teams or work groups take an actual problem to the training programme, work on solving it, commit to an action plan, and are accountable for carrying out the plan. In collaboration with the groups, group-process experts and subject-matter experts assist the group to provide the 'just-in-time' (responsive) learning to support the action taking in a context of dialogue, encounter and reflection. Working with this

methodology in environmental training could enable companies to respond to issues and risks as they arise in context. Action learning approaches work well at executive level, but have been applied at other training levels too. Foiland (1994) indicates that action learning groups made up of integrated multi-levelled teams work particularly well as they draw on different levels of expertise and different roles within an organisation.

According to Hamner (1999) cleaner production education and training is most successful when it includes case studies of companies that have successfully prevented the generation of wastes and the prevention of pollution. He also notes that participatory approaches to training are more effective and goes on to describe a range of different participatory approaches adopted in the ASEAN Environmental Improvement Project. These include:

- * using real-world examples to illustrate concepts and processes
- * drawing on participants' experience and knowledge in designing solutions to real world problems
- * drawing on participants' interest in each other and each other's work-related environmental problems and issues
- * use of short presentations in lecture format (combined with activities and problem-solving discussions)
- * provision of good quality information and a directory of resources to support on-site action after training has taken place
- * on-site production-flow walk through assessments and clean production analysis and implementation.

Hamner (1999) further notes the importance of viewing training as an "evolutionary process both for the trainer and the trainee". He also notes the importance of top management support to enable technical and other training to be implemented on site through establishing 'the right' management systems. Action learning approaches such as these outlined here appear to need plenty of time, should focus on significant projects and should involve the taking of real risks. The programme should furthermore be integrated into the business management processes of the organisation.

John Murphy's statement (see below) seems particularly relevant in the light of recent criticism of the Earth Summit +5 which warns that the world is

too slow to take action to halt environmental degradation. Criticisms against ISO14000 as a management system based on the lowest common denominator that 'does not go far enough' towards ensuring sustainable development (Welford, 1996) also indicate that the concept of sustainability requires a new approach to business, or that business needs to re-orient their thinking about sustainability. Environmental education and training methodologies need to be part of this new approach to business and need to be firmly grounded in a movement towards more sustainable business practices. These methods and processes ought to play a central role in the development of a radical paradigm shift which will help to reshape corporate cultures towards more sustainable living processes (both internally and externally), and enable employees at all levels of the corporate structure to develop the action competencies needed to respond to environmental issues and risks as they arise in context.

In order to reach the moon, the astronauts used most of the energy on the voyage to break through the tremendous gravity pull of the earth. But once they were there, they were able to have an entirely different view of Planet Earth. Similarly, changes in the way we educate people and what we educate them for will be difficult at first, but will reap tremendous rewards for society in the longer term (Murphy, quoted in Cortese, 1993).

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