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A National Review of Environmental Education and its Contribution to Sustainability in Australia

School Education

2

MACQUARIE
UNIVERSITY ~ SYDNEY

This report is Volume 2 in a five part series that reviews Environmental Education and its contribution to sustainability in Australia. The research which underpins it was undertaken between January and May 2004 by the Australian Research Institute in Education for Sustainability (ARIES) for the Australian Government Department of the Environment and Heritage. This series is titled '*A National Review of Environmental Education and its Contribution to Sustainability*' and covers the following areas:

***Volume 1**: Frameworks for Sustainability*
***Volume 2**: School Education*
***Volume 3**: Community Education*
***Volume 4**: Business and Industry Education*
***Volume 5**: Further and Higher Education*

This volume is the first national review undertaken in Australia and one of few attempts to capture needs and opportunities in this area. It provides a snapshot of the current context and identifies a number of key themes which assist with constructing a picture of Environmental Education experiences in school education. These themes are classified under the areas of primary and secondary education, early childhood education and teacher education. The document provides analysis as well as recommendations to improve sustainability practice through Environmental Education.

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Abbreviations

AAEE	Australian Association for Environmental Education
ARIES	Australian Research Institute in Education for Sustainability
CERES	Centre for Educational Research in Environmental Strategies
DEC	NSW Department of Environment and Conservation
DEH	Australian Government Department of the Environment and Heritage
DET	NSW Department of Education and Training
EE	Environmental Education
EEC	Environmental Education Centre
EFS	Education for Sustainability
ENSI	Environment and Schools Initiative
EPA	NSW Environmental Protection Authority
GLOBE	Global Learning and Observations to Benefit the Environment
KLA	Key Learning Area
MCEETYA	Ministerial Council on Education, Employment, Training and Youth Affairs
NEEC	National Environmental Education Council
NGO	Non-Government Organisation
NHT	Natural Heritage Trust
NSW CEE	NSW Council for Environmental Education
OECD	Organisation for Economic Co-operation and Development
PCE	New Zealand Parliamentary Commissioner for the Environment
SDEP	Sustainable Development Education Panel
SSP	Sustainable Schools Program
SWAP	Schools Water Action Project
UN	United Nations
UNCED	United Nations Commission on Environment and Development
UNEP	United Nations Environment Program
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UTS	University of Technology Sydney
VAEE	Victorian Association of Environmental Education
WHO	World Health Organisation
WSSD	World Summit for Sustainable Development
WWF	Worldwide Fund for Nature, formerly World Wildlife Fund

2.1 Overview of School Education

Box 2.1
Examples from Other Countries:

Canada: '*A Framework for Environmental Learning and Sustainability in Canada*'[6] was developed in 2002. It provides a national framework for environmental learning and sustainability for all sectors. In addition to this, the document '*Education for a Sustainable Future*: *A Resource for Curriculum Developers, Teachers and Administrators*'[7] provides a comprehensive framework to assist curriculum developers and educators integrate sustainability concepts into new and existing curricula.

England: '*Learning to Last: The Government's Draft Sustainable Development Education Strategy*'[8] and the '*Sustainable Development Action Plan for Education and Skills*'[9] provide the framework to assist the re-orientation of school and further education structures toward sustainability. It required the Qualifications and Curriculum Authority to undertake a review of curriculum to identify where learning for sustainable development is and can occur within the curriculum[10].

The Learning and Skills Development Agency has also developed a text entitled '*Learning to Last: Skills, Sustainability and Strategy*'[11] on how to integrate sustainability principles and practices into all levels of post-16 years learning.

In Australia, the school education sector continues to be the dominant focus of much of Environmental Education (EE) thought and practice[1]. An analysis of EE books published in Australia over the past 10 years reveals that 81%[2] are targeted at school education. Professional associations, such as the Australian Association for Environmental Education, have been traditionally comprised of school teachers and teacher educators.

Interestingly, the school education sector in Australia, has been the most resistant to change towards sustainability[3]. Curriculum policy and guideline documents across the States have been slow to react to this thrust in EE and have only recently begun to take on the language of sustainability[4]. Similarly there are few EE programs with a sustainability focus and even fewer courses that promote learning for sustainability[5].

Intergovernmental meetings, such as the *World Education Forum (2000)*, recognised that there is a need for a substantial reorientation of school curriculum structures and increased support for learning for sustainability[12]. Growing recognition of the need to prioritise actions in education has led to a *United Nations Decade of Education for Sustainable Development (2005-2014)*. Many countries such as Canada, United Kingdom and more recently New Zealand have embraced the challenge of learning for sustainability by developing national frameworks or documents to stimulate the process of reorienting school education structures toward sustainability[13] (see Box 2.1).

Reorienting school education is a costly and large-scale endeavour. The task is made more difficult by the fact that in Australia education policy is decentralised to the States and Territories, so there is no national EE policy. Another difficulty is matching the aspirations of the international policy agreements with those of the education sector. There is some resistance among educators to using education as an instrument of policy and of adding more issues to an already over-crowded curriculum[14]. It is therefore not surprising to find that progress towards learning for sustainability in this sector is slow with many efforts only resulting in the integration of some sustainability concepts into curriculum content rather than in educational change[15].

This volume will show that there is a need to strengthen the contribution to sustainability by EE in the school education sector. However, this cannot be achieved solely through integrating sustainability content across school curriculum. It requires a fundamental shift in current practice.

The EE Experience in School Education

This volume builds upon earlier reviews[16] and identifies the current status and needs of EE in the school education sector from a national perspective. It provides a snapshot of the current context and experiences within primary and secondary education, teacher education and early childhood education in order to inform future work in this area. Unlike previous studies, this research has a focus on reviewing EE's current and potential contribution to sustainability.

In Australia school education, for students aged 4 - 18 years[17], is divided into *primary and secondary* school components, with some recent trends to adopt a middle (year 5 -8) school approach. Education is compulsory for students from Year 1 (student age approximately 5 years) through to Year 10 (student age approximately 15 - 16 years). School education is non-compulsory for pre-primary school students aged approximately 4-5 years as well as for 17-18 year old students who may continue into senior secondary school to attain formal qualifications required for further and higher education.

In addition, *early childhood education*, defined in this context as the years prior to primary school, is also considered in this school education sector review. In recent years, early childhood education in Australia has seen considerable development and now represents a growing area in EE. However, there is a paucity of EE references, research and resources for these critical years[18]. This is the first national review of EE in Australia that considers early childhood education experiences.

The volume also reviews *teacher education* and its contribution to EE and learning for sustainability. In the last decade, initial teacher education has become the responsibility of universities making it akin to other areas of professional education[19]. Teacher education includes both initial and in-service education for teachers. Initial teacher education is available to prospective teachers who can attain qualifications through a number of routes:

- 3-4 year undergraduate bachelor of education program;
- 4-5 year double degree bachelor programs (includes an education degree); and
- 1-2 year 'end-on' graduate teacher education program with graduates from another discipline[20].

In-service teacher education programs are designed for practising teachers to update their professional knowledge or develop new skills. In-service teacher education ranges from the attainment of formal postgraduate qualifications to mentoring, short courses and one-day school workshops. Efforts to build teachers' capacities in EE and learning for sustainability through both pre-service and in-service teacher education are reviewed in this document.

Volume 2 does not include a review of EE in the higher or vocational education sector. This sector has a significant role to play in building capacity in EE across Australia and thus is reviewed separately in volume 5 of this series.

2.2 Overview of EE in Primary and Secondary Schools

Box 2.2
Adelaide Declaration

The '*Adelaide Declaration*' outlined a set of National Goals for Schooling in the Twenty First Century. These represent a set of common and agreed goals by each State and Territory. Goal 1.7 states that when students leave school they should:

> 'have an understanding of, and concern for, stewardship of the natural environment, and the knowledge and skills to contribute to ecologically sustainable development'.

MCEETYA (1999)

Since its inception in the early 1970s EE has continued to struggle for acceptance in mainstream school education[21]. Despite significant efforts from environmental educators over the last 30 years to raise its profile in school education, EE remains a non-mandatory component of schools in Australia - with the exception of NSW[22] (see Box 2.3). This low status means that there are no systematic efforts for mainstreaming EE and opportunities for modelling or developing understanding for sustainability in schools are limited. EE remains the domain of dedicated enthusiasts within schools rather than whole-school communities.

Recently, there has been an attempt at providing a national approach to EE through the '*Environmental Education for a Sustainable Future: National Action Plan*'[23], which provides direction for EE in Australia across the sectors. This plan is the first authoritative document to be released in Australia which recognises the role of EE in contributing to change towards sustainability. It called for greater integration of EE and sustainability principles into mainstream education as well as more professional development opportunities for teachers.

The '*Adelaide Declaration*'[24] which outlined a set of 'National Goals for Schooling in the Twenty First Century' also provided direction at the national level. The document presents a set of common and agreed goals for school education by each State and Territory. Importantly, one of these goals supports the objectives of developing 'stewardship for the natural environment' often associated with EE and makes reference to sustainable development (see Box 2.2).

Ultimately, school education is the responsibility of each State and Territory, so it is not surprising to find that the status and place of EE varies across the country. NSW, Queensland and Victoria have an EE policy document for schools. However, NSW is the only state where EE is mandatory in government schools[25]. In Queensland, ACT and NT, there are specific curriculum guidelines for EE. In WA, SA, and Tasmania, EE is integrated into the core curriculum documents (see Box 2.3). There have been several calls for an Australian EE policy that represents a national agreement on the key curriculum aims and pedagogical principles for schools in the area of EE[26].

Most State and Territory documents (identified in Box 2.3) place EE as a cross-curricular perspective in schools – promoting it as a strand within 'Key Learning Areas', 'Essential Learnings' and/or 'Learning Area Objectives'. The NSW documents differ in that they promote a '*whole-school approach*' to EE and learning for sustainability, taking it beyond the school curriculum boundaries[40] to also consider school management and the management of resources.

In practice, the nonmandatory status of EE (except in NSW) means that teachers and school managers in Australia do not consider EE to be a component of their work[41]. The Australian Government Department of the Environment and Heritage (DEH) and the National Environmental Education Council (NEEC) have been exploring ways to work with the school education sector to raise the profile of EE and learning for sustainability across the whole-school[42]. However, the reality is that whole-school approaches to EE are rare, and although there are many curriculum opportunities for EE, there is generally no obligation, thus EE struggles for an influential presence in curriculum[43].

EE in Primary and Secondary School Curriculum

EE was formally introduced into the Australian curriculum in the early 1970s and its place within the curriculum since then has evolved and changed in principle[44]. Initial interpretations in the curriculum were focussed on education about environmental science and conservation essentially taught through science and geography subjects[45]. EE policy has since developed its focus on extending EE coverage across all Key Learning Areas (KLAs)[46] (see Box 2.5).

In Australia the compulsory years of schooling (from age 5-15 years) are structured into 8 KLAs: English, Mathematics, Science, Studies of Society and Environment, Health and Personal Development, the Arts, Technology and Languages (these titles vary slightly between the States and Territories). These KLAs provide the basis of the curriculum in all schools throughout Australia.

Box 2.3
EE Policy and Curriculum Guidelines for the School Education Sector

Australian Capital Territory: The ACT does not have a specific EE policy for schools. However, the '*Environment Education Curriculum Support Paper*'[27] assists teachers in implementing EE as a crosscurricular perspective. EE is identified as one of nine cross-curricular perspectives and applies to all ACT curriculum frameworks[28].

New South Wales: The '*Learning for Sustainability: NSW Environmental Education Plan 2002-2005*'[29] provides a co-ordinated approach to EE across all sectors and calls for the expansion of EE opportunities within the NSW school curriculum. The NSW '*EE Policy for Schools*'[30] is mandatory for government schools in NSW. This policy promotes a whole-school approach to EE involving curriculum, management of resources as well as development of school grounds. The NSW Department of Education and Training has also produced supporting documents for each of the 7 - 10 Key Learning Areas (KLAs) to assist schools in adopting the policy.

Northern Territory: The NT Board of Studies' '*Environmental Education Policy Statement*'[31] is currently under review. The policy encourages the integration of EE across all Learning Areas, with specific focus on the 'Studies of Society and Environment' Key Learning Area and Constructive Learner 4 in the '*Essential Learnings*'[32].

Queensland: The '*EE in Queensland State Schools*'[33] document remains the current EE policy for schools in Qld. In addition to this, the '*P-12 Environmental Education Curriculum Guide*'[34] provides a framework for EE in the curriculum and is aimed at encouraging teachers to incorporate EE into their existing teachings. A new set of documents are currently under review.

South Australia: EE is integrated via Essential Learnings and Key Learning Areas throughout the '*South Australia Curriculum and Standards Accountability (SACSA) Framework*'[35]. Essential Learnings in SA include 'futures' and 'interdependence', which are considered fundamental to EE. SA does not have a specific EE policy for schools.

Box 2.3
(continued...)

Tasmania: There is no specific EE policy for Tasmanian schools. In 2005, the Department of Education will introduce '*Essential Learnings*'[36], which will underpin the state's curriculum. These 'Essential Learnings' will include concepts and processes of learning associated with EE, such as 'futures thinking' and 'social responsibilities'.

Victoria: '*Learning to Care*'[37] Victoria's EE Strategy is currently being reviewed by the Victorian Association for EE for the Department of Sustainability and the Environment. This document provided a crosssectoral framework for EE. '*Investing in the Future: Environmental Education for Victoria's Schools* '[38] builds on this strategy and provides a specific framework for EE provision in the school curriculum. The EE policy promotes EE as an integral component of the curriculum.

Western Australia: While WA does not have a specific EE policy for schools, its curriculum framework[39] contains EE principles. Within this framework the area of 'Overarching and Learning Area Outcomes' encourage students to develop knowledge, skills and values for the environment and society to enable action and decision-making.

Box 2.4 Essential Learnings:

'*Essential Learnings: Northern Territory's Curriculum Framework*'[47] identifies the exploration of environmental and social issues within the local and global community and takes steps to promote change as one of the components to essential learning.

Box 2.5 EE in the Key Learning Areas Across Australia[57]

- **Studies of Science and Environment:** has an EE emphasis in all States and Territories, particularly in Western Australia, which has a strong focus on sustainability;
- **Science:** curriculum guidelines across Australia, particularly South Australia, contain learning outcomes based around learning *about* the environment;
- **English:** no guidelines refer explicitly to EE, however, they contain *processes* that underpin EE, such as 'critical reflection'. One quarter of its documents provide opportunities for teachers to introduce environmental issues into learning;
- **Mathematics:** all state and territory learning outcomes provide opportunities for students to learn *in* their environment. Documents typically refer to the environment to understand measurement (mapping, geometry) or shapes;
- **Health and Physical Education:** across all States and Territories encourage students to consider the quality of their environment. Queensland, NSW and South Australia also encourage students to reflect on the actions of themselves and others;
- **Technology:** outcomes in South Australia and Western Australia are strongly focused on EE concerns, such as quality of life, sustainability, environmental impacts and ethics; and
- **Arts:** most States and Territories provide opportunities to incorporate EE into their programs. Typically the focus is on understanding, reflecting upon and interpreting their environments.

The non-compulsory senior secondary education (Years 11 and 12), involve a more diverse range of subjects, including specialist subjects such as Biology, Chemistry, Photography, and Technical Design. Within this framework, EE is considered to be a cross-curricular perspective that may be incorporated into all KLAs but competes with other cross-curricular strands such as Career Education and Drug Education.

'Essential Learnings' underpins the curriculum in Tasmania, South Australia, Northern Territory and Queensland (see Box 2.4). These are understandings, dispositions and capabilities, which are seen as integral to student learning and prepare and encourage learning beyond school[48]. In these States the 'Essential Learnings' are underpinned by key competencies that provide opportunities, but not obligations, for EE and related learning[49]. However, EE's non-mandatory status and the lack of explicit reference to EE in the 'Essential Learnings', or indeed, in the learning outcomes of each KLA, has meant that EE is not always present in the implementation of curriculum[50].

Debate surrounding EE's place within the curriculum has been ongoing since its inception in the 1970's. This debate has generally focused on viewing EE as *content* versus *process* and also on the various curriculum models, whether EE should be a *separate course*, a *cross-curricula* theme or a combination of both[51]. Annette Gough provides an in-depth exploration of the debate in her book '*Education and the Environment: Policy, Trends, and the Problems of Marginalisation*'[52]. The cross-curricular approach to EE is favoured by many environmental educators because it cannot be confined to a single subject as it requires a holistic and interdisciplinary focus[53].

A recent curriculum audit commissioned by the National Environmental Education Council and undertaken by the Curriculum Corporation identified the representation of EE in the curriculum across the States and Territories[54]. This study, completed in 2003, mapped out EE in relation to each Key Learning Area[55]. The review highlighted that the nature and extent of EE in the curriculum varies widely within and between the States and Territories[56].

The review found that during the compulsory years of schooling, and despite its recognised cross-curricular nature, EE is still occurring predominately in the Science and Studies of Society and Environment KLAs[58]. However, reference to the environment and EE can also be found in Health and Physical Education, Technology and Mathematics[59]. Furthermore, the general nature of some learning outcomes provides teachers with opportunities to deal with environmental issues and learning for sustainability in other KLAs. These opportunities can be found in English, Technology, Health and Physical Education, and the Arts[60] (see Box 2.5).

Across Australia, current EE opportunities within the curriculum at the senior secondary level are fewer than during the compulsory years of schooling[61]. In the senior levels, EE is found predominantly in the Science and Geography syllabuses. The inclusion of EE in Geography courses varies widely across the States. For example, Western Australia has a very small focus, while South Australia, NSW and Queensland focus strongly on EE in Geography[62]. Senior science subjects (Biology, Chemistry and Environmental Studies/ Science) tend to focus on student learning *about* the environment. International research indicates that this is not unique to

Australia. A study by the National Foundation for Educational Research in the United Kingdom not only confirms the tendency to locate EE within the geography and science subjects but also that scientific teaching *about* the environment can be disempowering. The evidence collated by this study indicates that views of the future amongst students reveal varying concerns and much pessimism (see Box 2.6).

The national review of EE in the Australian curriculum also identified the extent to which the KLA's provided opportunities for development of student action, skills and values toward the environment (see Box 2.7). The report identified that a curriculum focus on **action** is evident in a small number of cases. The NSW and Queensland EE documents promote environmental citizenship action through the KLA, Studies of Society and Environment[64]. Also, in the Queensland and South Australian curriculum guidelines for senior level Geography and the Victorian Environmental Studies, action competence is promoted as a learning outcome[65]. Overall, however, the curriculum at compulsory levels of schooling across Australia does not address action and action competencies often associated with education *for* the environment[66]. This is particularly evident in the Science KLA, where actions are rarely found in the curriculum, except for South Australia which addresses actions such as energy conservation and waste minimisation in their Science syllabuses[67].

Box 2.6
Learners and Learning in Environmental Education: A Critical Review of the Evidence[63]

The National Foundation for Educational Research in the United Kingdom undertook a review of over 100 journal articles, books and reports from around the world (dated between 1993 – 1999) that related to EE in schools. The review aimed to:

- chart the nature of current evidence on learners and learnings in EE;
- identify key messages emerging from this evidence base and assess limitations of these in terms of empirical underpinnings; and
- raise questions about the nature, quality and accessibility of recent EE research and suggest priorities for future work.

Major findings of the review included:

- **Learners' environmental knowledge:** is generally low; understanding of environmental issues is more limited than their factual knowledge; environmental knowledge is science-based and understanding of the complexities of environmental issues is more limited than factual knowledge about the environment.
- **Learners' environmental attitudes and behaviours:** views of the future amongst students reveal varying concerns and considerable pessimism; attitudes, behaviours and concerns appear to be affected by certain factors (eg. gender and socio-economic factors); scientific teachings about the environment can be disempowering.
- **Learners' environmental learning outcomes:** education can change learners' environmental knowledge, attitudes and actions; certain aspects of programs appear to facilitate positive outcomes. However, little is known about how and why programs are able to bring about certain kinds of learning outcomes.

Box 2.6
(continued...)

- **Emerging evidence on learners' perceptions of nature, experiences of learning and influences on adults:** perceptions of nature vary and are influenced by a range of factors; action-oriented programs are praised rather than specific content issue programs, which lack a practical element; students experience learning situations in active and individual ways and their views can conflict with their teachers'; students can influence the behaviour of their parents but this does not happen automatically.

These findings led Mark Rickinson to conclude that there have been many more studies focussed on investigating the characteristics of school students than there have been exploring the process or outcomes of environmental learning.

Possible work on future focus areas:

1. building upon the research and seeking to understand learning and the role learners play within this process;
2. more reviews in EE which approach the field as an evidence base and focus on the nature and quality of the empirical evidence; and
3. need for the development of user reviews focussing on specific issues of relevance to particular groups or users.

Box 2.7
Curriculum Corporation Review of EE in the Curriculum[70]

EE indicators developed for the review were based on the EE objectives identified in the Tbilisi Declaration[71]. The five categories identified were:

- information about the environment;
- studies of humans and the environment;
- skill, problem-solving and competencies;
- attitudes, values and viewpoints; and
- action.

Box 2.8
EE and Geography

'Through the study of Geography, students will develop skills in:

- participating as active and informed citizens;
- acquiring knowledge about citizenship;
- applying this knowledge to take action.'

Board of Studies NSW (1998, p8)

Box 2.9
From Awareness to Action

'…we have been making people aware of the environment for 16 years or more. It is now time to examine how we can do something about it.'

Smith (2004, p. 2)

Box 2.10
EE Content of Curricula

'Although the environmental content of school curricula has increased, most schools are not involved in education for the environment… (schools are) incorporating environmental content (knowledge and awareness) into their existing curricula rather than engaging in the kinds of social action that are being undertaken by other community agencies and activists.'

Gough (1997, p. 77)

Participation has recently been identified as a core element of approaches that contribute to learning for sustainability[68]. Rather than simply focussing on action elements of the curriculum there is a need to move toward a participatory approach based on equity, sharing, listening, reflection, co-learning, negotiation, 'critical' thinking, co-operation, collaboration, trust, futures-orientation and democracy[69]. (See 'From Action to Participation' on page 26 for further details on the concept of participation and its links to sustainability).

The curriculum review also identified the potential for EE skill development in Science, Studies of Society and Environment and Arts curricula across all States and Territories. Currently, however, the focus is on collecting, analysing and organising information as well as on the communication of these ideas[72]. Studies of Society and Environment and the Arts embrace a process-based approach, which promotes the development of reflective and 'critical' thinking skills in their students[73]. Other learning skills such as *participation, futures-thinking, critical thinking* and *reflection* have been identified by EE thinkers as central to helping people and societies move towards sustainability[74]. It is not clear from the curriculum audit whether the curriculum offers specific opportunities for these skills to be developed.

As a whole, the ethical and values dimension of EE was not well represented in the curriculum documents[75]. Whilst Science offered opportunities for students to develop an appreciation of the interrelationship between science, technology, society and ethics[76], it often focused on developing environmental stewardship[77] as against values clarification. *Values clarification*, that is the uncovering of assumptions and beliefs that underpin one's actions, has been identified as a crucial element for education's contribution to sustainability[78].

Across all States and Territories in Australia, the current EE curriculum focus is on learning '*about*' the environment and learning '*in*' the environment[79]. The review of EE in the curriculum highlighted the limited opportunities for education '*for*' the environment and for facilitating action or exploring mechanisms for social change[80].

The Curriculum Corporation review found an underrepresentation of concepts associated with sustainability such as carrying capacity, eco-efficiency, ecological footprints, eco-space, lifecycle analysis, natural resource accounting, and precautionary principle[81]. While 'sustainability' is a term commonly found within the Studies of Society and Environment curriculum, its use varies. However, the Western Australia Studies of Society and Environment curriculum and South Australian Science curriculum feature sustainability and its issues strongly.

It has also been noted, in earlier reviews, that although EE content within Australian curriculum may have increased, very little of this is congruent with education *for* the environment[82] (see Box 2.10) or learning for sustainability. The result is that more people are aware of the environment and of the need to protect or improve it but this has not necessarily transferred into an increase in actions or participation for change. This issue is further explored in Volume 1 of this series.

The EE indicators used to review the curriculum by the Curriculum Corporation are based on a definition of EE from the 1970s. It is not clear from this set of indicators what EE's contribution to sustainability is, through the formal education curriculum. However, Syd Smith's recent review of the NSW syllabuses[83] helps identify the limitations of EE and learning for sustainability within the current curriculum. In a submission to the NSW Board of Studies, on behalf of the NSW Council for Environmental Education, he outlines the following concerns relating to the way EE is treated within some NSW syllabuses:

- 'The inference that the environment is separate from people and that society can be apart from it. The title 'Human Society and its Environment' reinforces this dichotomy;
- An emphasis on *awareness raising about* the environment and not stressing a need to take action *for* the environment;
- The *omission* of the concept of sustainability which figures predominantly in the EE curriculum literature;
- The inability of 7-12 syllabuses to promote a holistic integrated approach to EE. A highly structured Key Learning Area framework prevents this from happening. The framework allocates particular content to specific learning areas and discourages integration of ideas across learning areas; and
- Lack of opportunities for students to make connections between bodies of knowledge and being able to see things from a broader perspective. EE is cross-curricula and goes beyond isolated courses of science, geography, design and technology or other studies of society and environments. Yet some educators and teachers maintain that it belongs within one specific study area.'

In his submission, Syd Smith calls for a separate course on *Learning for Sustainability* in levels 7-12 (see Box 2.11). Previously, John Fien made similar calls for the introduction of a core programme of studies of sustainability in Years 11 and 12 (see Box 2.12).

Sue Coad[84] has argued that sustainability is a curriculum imperative. However, recognising Stephen Sterling's argument[85] that learning for sustainability is not simply an add-on or crosscurricula theme, she acknowledges that it requires a significant shift in current curriculum practice[86]. Learning for sustainability is not solely about integrating new content into the curriculum, it is also about challenging teaching and learning approaches. This presents uncomfortable tensions for EE as it moves away from being a subset in Science and Geography syllabuses towards becoming a truly cross-curricular theme within the school[87]. There are, however, emerging trends in schools that provide signposts for future directions in EE towards approaches more aligned with sustainability. These trends are explored through the ensuing themes.

Box 2.11
Courses on Learning for Sustainability

'Courses should contain themes such as intergenerational equity, social justice, ecological sustainability, cultural diversity, intercultural understanding, the fair distribution of wealth and resources, democracy and peace. The outcomes should relate to an understanding of power, the value of participation and ownership and the achievement of skills in capacity building, 'critical' thinking, futures thinking, integrated thinking and action and the exploration of the change process. The course should be holistic, integrated, supportive of the value of working towards a more sustainable lifestyle and future.'

Smith (2004 p, 7)

Box 2.12
Reorientating Schools

John Fien in his Tela paper, '*Education for Sustainability: Reorientating Australian schools for a sustainable future*' recommends the need for:

- 'Educational thinking and practice based upon inter-disciplinary curricula, a problem-solving focus and outcomes oriented teaching strategies;
- The introduction of a core programme of studies of sustainability in Years 11 and 12 to include: a) creating a new interdisciplinary subject on sustainable futures; and b) integrating principles and practices of sustainability into all relevant subjects and teaching strategies; and
- Support for teaching and learning experiences that encourage students to explore questions, issues and problems of sustainability in contexts relevant to them and their communities, from local to global.'

Fien (2001a, p. 2)

2.3 The EE Experience in Primary and Secondary Schools: From Principles to Practice

A number of key themes are identified to assist in constructing a picture of EE experiences in primary and secondary schools and their contribution to sustainability. The themes are inextricably linked and need to be read in conjunction for greatest understanding[88]. This section explores the following key themes:

i) Citizen Science: Generation and Control of Knowledge;

ii) Systems Approaches and Systemic Thinking;

iii) Experience, Experiential Learning and Action Learning;

iv) Partnerships for Change;

v) School Buildings and Grounds: Opportunities for Learning and Modelling Sustainability;

vi) From Action to Participation;

vii) Action Research;

viii) Environmental Education Centres: From Earth Education to Ecological Foot-printing;

ix) Sustainable Consumption; and

x) Adjectival Education.

i) Citizen Science: Generation and Control of Knowledge

Citizen Science is gathering support within EE in Australia. It emerged out of the USA during a time when science was wrestling with public distrust of scientific evidence and critique of the role of scientific institutions in addressing risks in our society[89] (see Box 2.13).

Citizen science is a participatory process that attempts to build public understanding of science as well as support for scientific knowledge (see Box 2.14). It is aimed not only at restoring public confidence in science, but also at reorienting science towards coping with the complexity of sustainability[91]. Those who advocate citizen science see it as a process of social learning for the community and the researcher[92] (see Box 2.15).

School-based approaches to citizen science, involve students in collecting scientific data about their local environment-such as water quality, air quality and biodiversity. Through this approach, students are actively involved in learning about the scientific information that affects them and their communities. Many popular Australian EE programs are underpinned by citizen science approaches, including *GLOBE*[93], *Waterwatch*[94], *Saltwatch*[95], *Streamwatch*[96], *Frogwatch*[97] and *Airwatch*[98].

The data collected in these programs is not only used by the students to learn about their local environment, through observing change over time, or to make comparison with other regions, but is also returned to the co-ordinating organisation for analysis. These organisations include government agencies like Sydney Water, the Western Australian Museum and the Australian Government Department of the Environment and Heritage, as well as publicly funded non-profit organisations such as Waterwatch Australia, Saltwatch, and Airwatch Australia.

These organisations use this data for a variety of purposes. For example, *GLOBE* data (see Box 2.16) is shared internationally and used in scientific research[99], whilst Sydney Water uses Streamwatch data to campaign and raise awareness about water issues amongst local government, businesses, industries or other agencies[100]. In effect, programs such as these are inexpensive and offer an effective mechanism for broad data collection. The information generated has the potential to trigger community concern about the state of the environment[101]. While a small number of schools may analyse and use the data to motivate community action towards sustainability, these programs typically do not provide the extension tools for this[102].

In these programs, schools are typically encouraged to share their information with the organising body via the internet[105]. *Streamwatch*, however, asks schools to engage in a contractual arrangement concerning the program.

Box 2.13
Citizen Science

'Citizen science is an attempt to take science out of the laboratory in the sense of being conducted within a wider social context.'

Leach and Fairhead (2002, p. 301)

Box 2.14
Citizen Science is Participatory Education[90]

Citizen Science is grounded in sound environmental research – not necessarily traditional scientific research. Its focus is on full participation, the adoption of adaptive management practices and the development of democratic values, skills and institutions for an active civil society. It is through this democratic, participatory and partnership approach that learners own the knowledge generated.

Box 2.15
Participatory Paradigm

'Participatory, civil, citizen, civic stakeholder and democratic science are catchwords that signify the ascendancy of participatory paradigm in science policy.'

Bäckstrand (2002, p. 2)

Box 2.16 Global Learning and Observations to Benefit the Environment (GLOBE)[103]

The *GLOBE Program* is a citizen science and education program, involving more than 300 Australian schools and 100 countries. In it students' focus on a key investigation area, such as water or air, and measure the physical, chemical and biological properties of that area in their local environment.

The data from these measurements are entered directly into *GLOBE's* single online database, which is accessed and compiled by both schools and scientists internationally. Students are able to access the data for further classroom studies, research and worldwide school-to-school collaborations. Internationally, scientists have also used *GLOBE* data to understand the current environment and emerging trends[104].

Box 2.17 MyRiver[108]

MyRiver is an OzGreen program, aimed at strengthening the capacity of young people, their families and communities, to be informed and active participants in landscape restoration and sustainable living and working in river catchments.

The *MyRiver* program provides students with an opportunity to gather primary and secondary data and analyse the results to determine the health of the catchment. It is different from other approaches to citizen science because the knowledge generated is retained and used by the students, rather than a third party, further empowering the students for sustainability and challenging them to think about how they can use their skills in other areas. Young people and communities involved with *MyRiver* are mentored by Oz GREEN staff to:

- Conduct health checks in the river;
- Interpret the results, determining the health of the river, and impacts upon it;
- Develop a vision and action plan; and
- Communicate findings, vision and plan at a community forum.

The retainment of knowledge by the student empowers them for change. Students are engaged throughout the whole process and are instrumental in the decision-making regarding the improvement of the catchment.

This is required primarily as it supplies quality monitoring equipment necessary for effective scientific testing[106]. While the data collected by students can be used by schools to promote science and the environment, the organising bodies can share the data with others without the knowledge or explicit permission of the school.

Emerging however, are a small number of programs that are ensuring the data generated remains with the students and school. *MyRiver*[107], for example, provides an opportunity for the learner to engage in developing a vision and action plan for their local river (see Box 2.17). This activity develops a sense of belonging and responsibility to local environments.

Evident in programs such as this, however, is the assumption that awareness-raising will result in change for sustainability[109]. In *MyRiver*, students are encouraged to develop an understanding of their local environment and, at times, the sustainability issues surrounding it. The results are often presented to the community with the expectation that change will occur because they are now more aware of the problem. While students may be inspired to act, they are often not provided with the skills or understanding of existing systems or structures to participate in decision-making for change. Consequently, as the students are not communicating to the community competencies for action, the likelihood of engaging the community in decision-making or change for sustainability is further reduced.

International agreements, such as '*Agenda 21*'[110] and '*WSSD Implementation Plan*'[111], have recognised the importance of democratic decision-making and the redistribution of power inequities as key to sustainability. The empowerment, participation and ownerships of processes for change by all stakeholders are instrumental in achieving higher levels of competency for change[112]. EE is increasingly recognising the importance of student ownership and control of learning and engagement in community processes of decision-making as key to change for sustainability[113].

The Citizen Science approaches need to adopt more participatory approaches to science and decision-making if they are to contribute to learning for sustainability. Past models of citizen science have failed to achieve this (see Box 2.18). Citizen science for sustainability actively engages students in the community, presenting data findings on sustainability issues, communicating proposed courses for action by the community and participating in democratic decision-making.

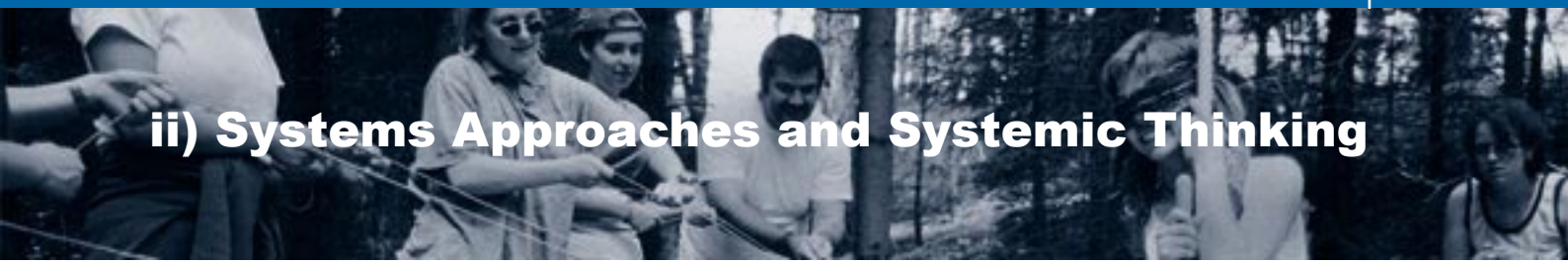
Box 2.18
Dimensions of Student Understanding of Science

	← Passive							Active →			
Examples	Student appreciation (science in general)	Student appreciation (science in particular)	Student access to information	Student interest in	Student support of	Student identification with	Student ability to analyse	Student ability to take action	Student communicates findings to the community	Students communicate courses of action to influence change	Students engage in participatory decision making
Lane's 'civic scientist'	X	X	X	X	X						
Schmandt's 'civic science'			X				X	X			
Audubon 'civic volunteer'		X	X	X	X	X					
Schneider's 'citizen scientist'	X	X	X	X			X	X			
Citizen science for sustainability	X	X	X	X	X	X	X	X	X	X	X

'NOTE: The dimensions of student understanding most likely to be influenced by five particular approaches to civic science are indicated by an 'x' in the appropriate column. The patterns help visualise the differences in emphasis of these four approaches.'

Type of participatory science	Explanation
Lane's Civic Scientist	'a scientist who communicates with the general audience and brings knowledge and expertise into the public arena to increase awareness about science and/or facilitate discussion and decision making in issues of importance to society.'[114] The role of the scientist is not only to teach others, but also to learn from the public.
Civic Science	A process by which interdisciplinary teams of expert scientists collaborate on the assessment of development issues, whilst providing attention to community goals, preferences, and priorities necessary. In this model citizens have an active role in analysing data ad taking action.
Civic Volunteer	Members of the general public participate in projects initiated and directed by scientists.
Citizen Scientist	Citizens are actively involved in learning about the scientific information that affects them and their communities. Science developed and enacted by citizens.
Citizen science for sustainability	Students are actively engaged with the community, presenting data findings on sustainability issues, communicating proposed courses for action by the community and participating in democratic decision making.

Adapted from Clarke and Illman (2001, p. 17)



ii) Systems Approaches and Systemic Thinking

Thinking and practice in EE is increasingly influenced by systems approaches and systemic thinking[115]. These components feature in several national EE and *Education for Sustainability* (EFS) strategies (e.g. England[116], Jamaica[117]) where they are recognised as critical to constructing an understanding of sustainability and how change for sustainability can occur (see Boxes 2.19 and 2.20).

EE programs such as the WWF Scotland *Linking Thinking* EE program and toolbox, explicitly teach the skills associated with thinking in an inclusive, integrative, systemic and holistic manner[119]. *Linking Thinking* introduces systemic and relational thinking concepts and skills. These skills offer clarity and overview when dealing with complex and difficult matters such as sustainability[120]. They recognise that meaningful understanding of environment and sustainability concerns comes from building up whole pictures of phenomena and understanding of relationships rather than focusing on dividing concerns into smaller parts[121].

Systems approaches to education attempt to recognise interrelationship, complexity and our participation in the world, and therefore embrace educational change such as interdisciplinarity, participative learning and school-community links.

Recent education initiatives, such as the *Sustainable School pilot program* in Victoria, have been built upon an understanding of systems approaches and the need to influence systems, if change is to be sustainable. It recognises that a single teacher cannot sustain change unless the change is rooted within the system. A school cannot become sustainable without the structures and management systems in place to support it, thus sustainability necessitates holistic thinking not only about the school education sector (eg. facilities, operations, supplies, management) but also the education system itself.

Systems approaches have underpinned conceptions of EE since its early days (see Box 2.21). In 1977, the world's first intergovernmental conference on EE, identified '*integration, interaction, interdependence and complexity in relationships*' as guiding principles for EE[122]. These principles are also embedded in the authoritative international EE literature including documents emerging out of the Rio and Johannesburg Summits[123] (see Box 2.22).

Many definitions of EE consistently identify interconnectedness, interdisciplinarity and viewing the environment in its entirety, in linking local to global and the natural to the human-made environment as essential elements of EE. Such elements are characteristic of a systems approach[124]. This way of seeing the environment and world is supported by Gaian Theory[125] and by the work of Fritjof Capra, who in his book '*The Web of Life*'[126], underscores the need to recognise that we live in a systemic world.

Box 2.19 Linking Thinking

'Linking thinking emphasises that we live in a highly connected world….it makes sense to recognise and try to understand the systemic connection and possible consequences of our actions'

Sterling (2001, p. 230)

Box 2.20 Interdependence is Key

The English Government's *Sustainable Development Education Panel*[118] was set up in 1998 to advise on strategies to promote and support learning for sustainability. They developed a framework for the school sector which identified interdependence as one of the key principles and argued for the need to teach about all living things and their needs as well as the interdependence of one's choices, actions and understanding of the inter-related concepts.

Box 2.21 The Tbilisi Declaration

Intergovernmental Conference on Environmental Education: October 14-26, 1977

'Environmental education, properly understood, should constitute a comprehensive lifelong education, one responsive to changes in a rapidly changing world. Adopting a *holistic* approach, rooted in a broad **interdisciplinary** base, recreates an overall perspective which acknowledges the fact that natural environment and man-made environment are profoundly **interdependent**. It helps reveal the enduring continuity which links the acts of today to the consequences for tomorrow. It demonstrates the **interdependencies** among national communities and the need for solidarity among all mankind.'

UNESCO-UNEP (1978)

Box 2.22
UNESCO report presented at Johannesburg 26th August-4th September 2002

'The vision of education emphasises a holistic interdisciplinary approach to developing the knowledge and skills needed for a sustainable future….'

UNESCO (2002a, p. 10)

Box 2.23
Interdependence

'Systemic thinking promotes learning that demonstrates the interdependent complex relationships between the physical, social and economic environments.'

Sterling (1996, p5)

Box 2.24
Understanding Connections

'In whole systems thinking there is a focus on understanding the interconnections and interdependence between all things. Understanding of the whole system is achieved by developing partnerships where individual insights and skills are brought together to form connections and relationships as part of the whole.'

Wilson-Hill (2003, p. 10)

Systemic thinking has implications for EE, particularly in terms *what we learn, how we learn* and *what we learn for*. The work of Stephen Sterling has been influential in providing a platform for exploring these ideas further (see Box 2.23) and learning for sustainability approaches have focused attention on this way of thinking.

What we learn?

Recognising that sustainability issues are multi-dimensional, systems approaches promote learning that this is non-linear and captures complexity so that we have a more complete understanding of the situation. Systemic thinking deals with more than just understanding the components of a situation or issue – it also focuses learning on the relationships and linkages.

Systems approaches to education attempt to promote thinking and learning in a way that does not draw boundaries or box it into categories, but promotes the interdependent and complex relationships of the world we live in[127]. This enhances the links between environment and lifestyle issues eg. consumption and the system that those actions are based on, i.e., how what we do on a daily basis contributes to the system.

How we learn?

Systemic thinking challenges assumptions in school education where we can understand and learn by compartmentalising knowledge into subjects and into a structured curriculum when in reality much learning can occur in the school corridors and playgrounds and cannot be reduced into categories or timeslots. Much of our learning occurs by reflecting upon knowledge and experience regardless of where the learning takes place[129].

Systemic thinking counters Western society's dominant approach to learning, which is based upon a scientific foundation of understanding. This approach attempts to simplify the world by viewing it in its individual parts[130], and ensures school education is underpinned by an outcomes based, individualistic approach. This dominant traditional approach to education does not facilitate learners to understand or to deal with complex and interrelated issues of sustainability[131].

Schools are increasingly partnering with the local community, involving local councils, industry and community action groups to address local issues. This has taken students outside of the curriculum boundaries encouraging them to engage with the local community in real projects, which expose them to the complexity and reality of environmental issues. This presents an integrated understanding that is often difficult to teach within the structured theme-based curriculum[132].

What we learn for?

Learning to influence for change is at the core of this approach. It recognises that change requires more than merely understanding the problem or articulating the problem effectively or persuasively to others. It requires an understanding of how the system works and how change within the system can occur.

In schools, students are often taught and assessed on *how clearly and*

persuasively they communicate environmental issues to stakeholders. They are rewarded for expressing how well they understand the problem, but not how well they understand the system which has resulted in this problem. Similarly, learning often disregards how to influence the system for the problem to be addressed. There is an assumption that if you communicate the problem to the stakeholders effectively, that the problem will be resolved. In reality, it is more about stakeholders influencing the system than influencing stakeholders' individual actions. Essentially, systems thinking challenges behaviourist approaches to EE.

Systems approaches to EE require a new way of looking at schools, curriculum, professional development and school-community partnerships. Essentially, it is about moving from the fragmentary and reductionist view of the world and of knowledge, towards a relational and integrative view of the world and of knowledge[134]. While EE is ostensibly holistic and all authoritative literature refers to interconnectedness, there has been a lack of engagement with systems approaches and tools, and insufficient resource materials, which demystify these approaches[135].

Box 2.25 Redrawing Problems

'The purpose of the activity is to generate fresh insights on a problem or issue by redrawing boundaries. The learner identifies a problem which could be personal, institutional, social, environmental or economic. The learner brainstorms thoughts and ideas to illuminate the problem in some way. The ideas are scattered around a sheet of paper. The learner is then asked to draw boundaries around ideas which appear similar. They are asked to consider: 'What do these ideas have in common? Does the grouping of ideas generate new insights about the problem? Draw boundaries around ideas that seem dissimilar. Does this help generate new insights?' The activity is valuable in encouraging learners working on the same problem to compare how they draw boundaries around issues. This assists them in **understanding relationships as perceived by others and generates a more complete understanding** of environmental issues.'

Sterling (2002, p. 243)

Box 2.26 National Framework for Education for Sustainability

England's national Education for Sustainability framework for formal education stresses the importance of learning that 'major issues such as poverty, consumption, development, health and loss of species are interrelated'. It also stresses 'the tension between sustainable development based on local production and consumption and the globalisation of trade and finance'.

Sustainable Development Education Panel (1998, p. 5)

Box 2.27 Learning to Last

The UK Sustainable Development Education Panel in their document '*Learning to Last*'[128] identified the need to address learning for sustainability within schools as the need to achieve coherence across subject areas, the school ethos and the school and grounds/ facilities management.

Box 2.28 Fragmented Thoughts

'It is not an accident that our fragmentary form of thought is leading to such a widespread range of crises, social, political, economic, ecological, psychological, etc in the individual and in society as a whole.'

Bohm (1980, p. 16)

Box 2.29 Hands on For Habitat[133]

Hands on For Habitat is an EE resource developed by the Natural Heritage Trust and Cadbury Yowie. The resource is designed to help children aged 6-12 explore the issue of threatened species.

The resource covers several key learning areas and includes teacher's material, information sheets, an interactive CD-Rom, posters and booklets. The resources are supported by a national competition which selects an illustration to promote National Threatened Species Day.

Through this program students are encouraged to consider what a habitat is, how they are threatened and potential solutions to the threats.

The initiative focuses on encouraging and rewarding students who explore and explain biodiversity and its threats, but rarely engages students in the true complexities of the issue or relationships between economic and social choices and habit loss.

The program does encourage students to challenge and seek to change the systems which exploit biodiversity.

iii) Experience, Experiential Learning and Action Learning

Box 2.30
Sustainable Schools Program[136]

The *Sustainable Schools Program* (SSP) is informed by systems based approaches to EE. The Program, which has been recently piloted in NSW and Victoria, seeks to integrate existing fragmented EE programs (such as *Energy Smart Schools, Waste Wise, Waterwatch, Waterwise* and *Landcare*) into a more integrative program. *SSP* is Australia's first systems based, school education program, which considers the integrated, interrelated, interdependent and integral relationships between the school's curriculum, management and physical environment in its approach to EE. The initiative is also innovative as it has been driven by new partnerships formed between State and Commonwealth government education and environmental agencies, industry, local government, NGOs and schools. The *Sustainable Schools Program* challenges schools to shift their current views on the role of education and schooling. It locates the school within the social system and locates the learner within the system of the school.

Box 2.31
Integrating Experience into EE

'….the way of the future - will require the reintegration of experience into education, because experience is an indispensable ingredient of good thinking...an antidote to the despair felt by students who understand problems but are powerless to effect change.'

Orr (1999, p. 232)

Providing opportunities for students to have direct contact with the natural environment has been a key component of EE experiences in school. Steve Van Matre's *Earth Education Programs*[137] and Joseph Cornell's[138] work, which build on a long tradition of outdoor experiences in education, are commonly associated with EE practice in schools. Some Environmental Education Centres (EECs) in Australia have based their work in this tradition in an attempt to build awareness and wonder of nature among students. Many environmental educators cite the work of Thomas Tanner[139], Joy Palmer[140] and Louise Chawla[141] in arguing that significant life experiences in the environment are important in developing attitudes and sensitivities towards the environment.

Significant life experience research, however, has been criticised for a number of reasons including:

- basing its research predominantly on environmental activists[142];
- basing its research sample on an older generation that may not necessarily represent current generation's interest or motivations[143];
- lack of gender and cultural considerations in research data[144]; and
- the ambiguous way the natural environment is considered[145].

For these and many other reasons, the validity of the research is questionable, providing no direct evidence to support that experience of the natural environment leads to people engaging in positive action for environment[146]. There is certainly no empirical evidence to link experience of the natural environment with participation for change towards sustainability.

Studies do, however, suggest that *experiential learning* can lead to developing awareness, encouraging ownership, empowering learners, and to the testing and evaluation of ideas in practice[147]. As such, experiential learning does not require a direct experience with the physical environment. Rather, it is a process that challenges the learner's attitudes, values and practice by reflecting on the learning experience. Outside of the school education sector, *experiential learning* is often associated with adaptive management techniques, which encourage individuals or groups to reflect upon and learn from an experience[148]. The work of Kai Lee[149] has informed some of these adaptive management initiatives. Examples in Australia can be found in community development and agriculture[150].

Based on David Kolb's[151] work, experiential learning involves four phases:

- *Experience*: Engaging in an experience and observing its effects.
- *Processing the experience*: Understanding what we did, thought and felt during the experience.
- *Generalising*: Understanding the general principle (called

a 'generalisation') behind the relationship between the action and its effects.

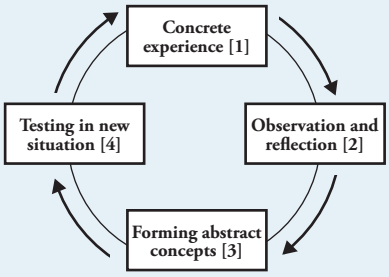
- *Applying:* Applying the principle or generalisation to a new situation[152].

This interpretation of experiential learning has had a small, but noteworthy, impact upon EE in schools[153]. Barry Law[154] identified four interconnected characteristics of experiential learning that contribute to the social action outcomes of EE. These include; *reflection, connection to personal experience, emotionally engaged learning and student-centred teaching and learning*. Research has shown that the impact of combining these four characteristics can lead to higher student interest, motivation and enthusiasm for achieving social action[155]. Experiential learning for social action in this sense has sometimes been referred to as action learning.

Action learning was first applied to school education by Reg Revans[156] in the 1940s. Action learning is distinguished from experiential learning in that actions with others, and from others, inform the learning[157] and are generally aimed at addressing a specific issue or focus[158]. Action learning maintains a focus on a single learning concern. As such it is able to engage the learner in an iterative process of critical questioning resulting in a second loop of reflection. This provides self-direction for further learning experiences[159].

Action learning requires a personal commitment by the learner to the change focus[160]. It enables learner ownership over the learning experience. However, it is often undertaken in collaborative groups, but can be just as effective when done individually. Action learning is now being integrated into a number of sectors (see Box 2.33) but there is little documented evidence of this in school based EE in Australia.

Figure 2.1:
Kolb's Model of Experiential



Learning Kolb (1984, p. 21)

Box 2.32
Action learning is:

'a process by which groups of people (whether managers, academics, teachers, students or 'learners' generally) address actual workplace issues or problems, in complex situations and conditions'.

Zuber-Skerritt (2002, p. 115)

Box 2.33
Our Environment: It's a Living Thing Mentoring Program

Funded by the NSW Government *Our Environment: It's a Living Thing Program (OEILT)*, the mentoring component invited community educators to participate in a professional development program for sustainability. The mentoring program used action learning to build the capacity of community educators to implement change in the workplace/community educational program.

Community educators used a process of reflection-on-action to make changes to their education program toward learning for sustainability. The action learning process required educators to:

- identify a change focus for the program;
- develop an action plan to achieve these changes;
- then *act* upon the plan; and
- critically *reflect on the process* to learn from the action and plan the next stage.

Through the project evaluation the process has been shown to be effective in supporting educators in applying the learning for sustainability approaches to their workplace programs[161].

iv) Partnerships for Change

Box 2.34
One of the Guiding Principles of the Johannesburg Plan of Implementation

'Enhance partnerships between governmental and non-governmental actors, including all major groups, as well as, volunteer groups, on programmes and activities for the achievement of sustainable development at all levels.'

United Nations (2002, p. 7)

Box 2.35
Partnerships Featuring in National Frameworks.

The Canadian '*Environmental Education Strategy*' calls for support to be provided for '...the creation of partnerships between and among educators, governments, NGO's, institutions and private sector.'

Government of Canada (2002, p. 6)

England's '*Sustainable Development Action Plan for Schools*'[166] reiterates this message and goes further by specifically identifying key stakeholders and partners to assist schools in achieving sustainability.

Box 2.36
Sharing Experiences

'Partnerships, which share learning experiences, can accelerate the process of change towards sustainable development.'

Tilbury (2004a, p. 4)

Cross-sectoral and multi-stakeholder partnerships are seen as critical to sustainability. This is well documented in the authoritative literature arising out of the Rio and Johannesburg Summits and including, Rio's '*Agenda 21*'[162] and the '*Johannesburg Plan of Implementation*'[163](see Box 2.34). The international literature also sees partnerships as vital to reorienting school education towards sustainability[164]. The recently adopted *United Nations Decade in Education for Sustainable Development*[165] locates partnerships at the core of its implementation plan.

Given its prominence within the sustainability literature, it is not surprising to find that partnerships feature strongly within national sustainability strategies, policies and guidelines around the world[167] (see Box 2.35). Arguments for the importance of partnerships in achieving sustainability are also visible in education and learning for sustainability strategic frameworks[168]. The concept of partnerships, therefore, is beginning to feature in EE initiatives.

Voluntary, participatory and collaborative partnerships that are credible and transparent are needed across and between sectors to achieve the goals set down in the sustainability plans and strategies[169]. The expectation is that these collaborations will result in more than simply working together on projects. Partnerships offer great potential for challenging the world views and the assumptions of partners[170].

In Australia, the EE literature also associates the establishment of partnerships with the shift towards sustainability. Australia's '*Environmental Education for a Sustainble Future: National Action Plan*'[172] promotes the importance of cross-sectoral and multi-stakeholder partnerships. It recommends the establishment of a *National Environmental Education Council* comprised of members from a variety of sectors to provide recommendations and advice to the Australian Government on EE matters[173].

A number of state EE policies and guidelines also acknowledge the importance of partnerships in EE[175]. Both the Victorian[176] and NSW[177] EE policies for schools encourage schools to seek partnerships with a variety of stakeholders to help protect the environment. These policies, however, do not outline what types of partnerships are needed or how these partnerships should be formed. The NSW EE plan '*Learning for Sustainability*'[178], however, strongly encourages cross-sectoral partnerships (see Box 2.39). It calls for improved planning and co-ordination of partnerships that align and develop common multi-sectoral environmental priorities, goals and principles. This EE plan differs from the EE policy from

other States, as it identifies a series of strategies and actions to promote cross-sectoral EE partnerships.

The importance of partnerships is also beginning to influence EE funding opportunities and grants for schools. The NSW Government *Environmental Trust EcoSchools Grants*[181] (see Box 2.40) and the Australian Government's *Environmental Education Grants Program*[182] both encourage schools to form partnerships with their local community to address environmental problems. Their assessment criteria give priority to applications which have partnerships as a core component of the initiatives.

The EE sector has acknowledged the importance of partnerships and is quickly learning how to engage in cross-sectoral and multi-stakeholder partnerships for sustainability. This was highlighted at the 2004 New Zealand Association for Environmental Education Conference, titled '*Partnerships for the Planet*'[183]. Dialogue at the Conference explored what types of EE partnerships are needed for sustainability and their implications for planning and practice. Cross-sectoral partnerships were seen as crucial to challenging worldviews, assumptions and priorities needed for change towards sustainability[184]. The discussion was significant given that those attending were predominantly from the education sector.

The concept of partnerships is not new to education (see Box 2.43). However, the sustainability agenda

Box 2.37 Engaging Others

'Nurturing effective education for sustainable development will frequently require cross-departmental, cross-sectoral or cross-organisational engagement. That is not easy to achieve.'

Sustainable Development Education Panel (2003, p. 4)

Box 2.38 Adelaide Declaration

The '*Adelaide Declaration*'[171] recognises the importance of learning through partnerships in schools. The purpose and type of partnership in this document, however, has not been defined. Despite this, the role of partnerships is becoming increasingly important to both environmental and educational sectors. Item 7 refers directly to environmental stewardship in Australian schools.

Box 2.39 NSW EE Plan

Two key outcomes of the NSW EE Plan '*Learning for Sustainability*'[174] relate directly to improving partnerships for sustainability:

- Enhanced crosssectoral co-ordination of EE programs; and
- An expansion of partnership and network activities between EE providers.

Box 2.40 NSW Environmental Trust Eco Schools Grants[179]

The NSW *Environmental Trust Eco Schools Grants* encourages schools to undertake, in conjunction with the community, activities which address local environmental problems. Priorities for funding include establishing partnerships that link the students' learning to the local community.

Box 2.41 Environment and Schools Initiative[180]

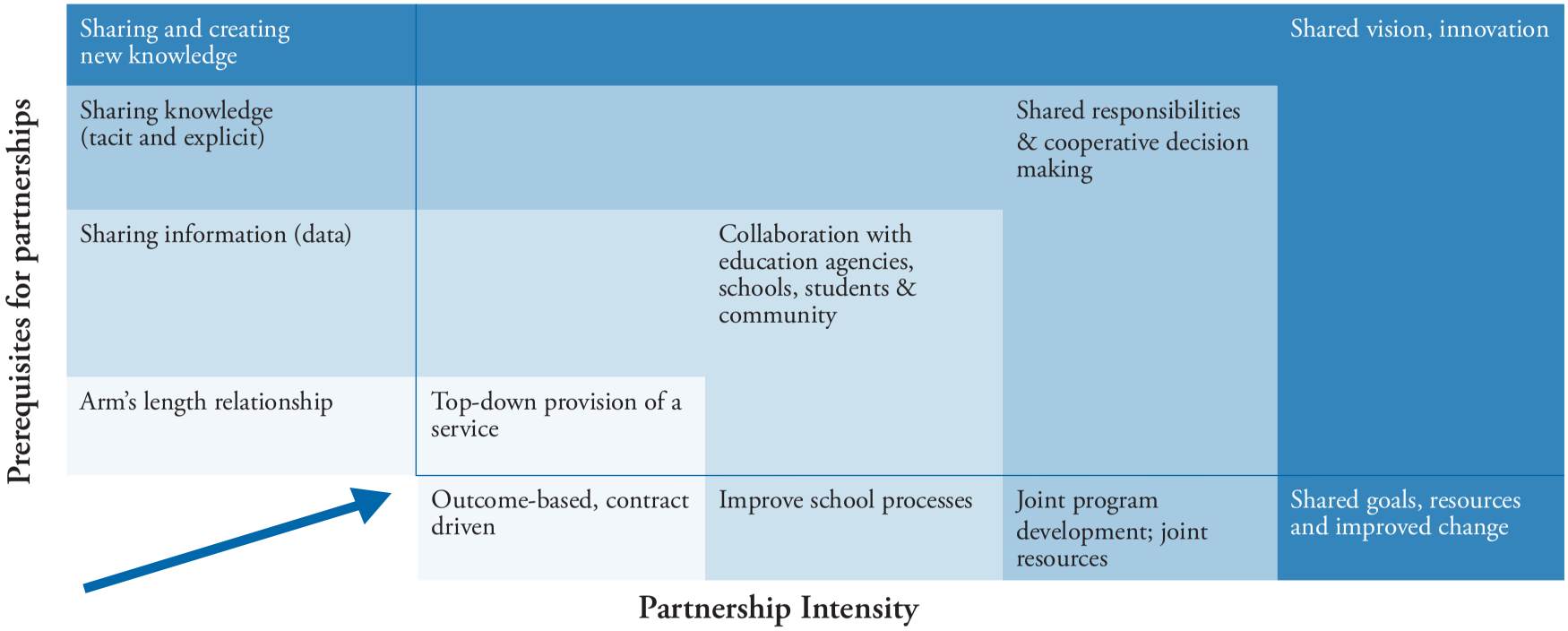
The OECD *Environment and Schools Initiative (ENSI)* at its 2004 AGM undertook a strategic planning process mapping a focus for the next 5 years. The new strategic plan will shift OECD *ENSI's* EE priorities towards research into community-school partnerships which will was interpreted as a critical shift for schools wanting to engage with sustainability.

Box 2.42 Beyond Networking

'Partnerships are a complex and multi-dimensional form of relationship that goes beyond simple linking and networking between different parties and stakeholders in education.'

Eames & Bolstad (2004, p. 2)

■ Table 2.1
Partnerships Continuum for Improved EE in Schools



Adapted from Prahalad and Ramaswamy (2001, p. 4)

is influencing EE towards *multi-stakeholder* partnerships for change based on participation, ownership and commitment amongst stakeholders[185]. These partnerships are characterised by shared decision-making and common visions[186] (see Table 2.1).

Cross-sectoral partnerships are difficult to achieve, particularly where there is not a strong culture or experience of collaboration. In Australia, partnerships are commonly characterised by predetermined outcomes rather than a jointly developed vision and innovation[187]. Partnerships in this context relate to the prevalence of sponsorships where a service is provided to schools rather than a collaboration. For example, Holden's provision of a vehicle to assist Sustainable Schools support teachers to visit pilot schools as part of the *Sustainable Schools pilot program* in NSW[188]. Increasingly though, EE partnerships between schools and external stakeholders are beginning to move away from what could be termed 'partnerships at an arms length'[189], to reciprocal relationships that share and create new visions, enabling change and improving schools' innovation for sustainability[190].

There are, however, many factors inhibiting partnerships between schools and external stakeholders. The legalities of partnerships, policy contradictions and funding/resource issues can prevent the establishment of partnerships that share a vision and seek innovation for sustainability. For example, while government policies promote the importance of partnerships, legislation and legal terminology ensure that 'partnerships' involve strict contractual agreements. These contracts are designed for business, involving complexities of risk such as intellectual property and data management, making it difficult for schools and community groups to engage in legal partnerships[195]. In fact, many school/community partnerships may 'modify the rules' to create a project policy match[196].

Box 2.43
Examples of Partnerships

The *Waste Wise Schools*[191] program in Victoria was based on a close collaboration between Eco-Recycle Victoria, the Gould League and local authorities. Evaluation of this program demonstrates the importance of partnerships and highlights significant social, educational, environmental and economic outcomes as a result of the Wastewise program.

The pilot *Sustainable Schools*[192] programs in Victoria and NSW[193] acknowledge the importance of partnerships by placing it at the core of program design. The NSW program involves a partnership between the NSW Department of Education and Training and the NSW Department of Environment and Conservation. Together these government departments have established a Joint Agency Support Group which includes most government departments that have an environmental brief. The challenge though is how to involve non-government organisations, which are prevented from participating because they have to raise their own funds or charge for their services. This exclusion could lead to unhealthy competition and cause disunity within the environmental network[194].

Although, there is some preliminary anecdotal evidence to suggest that partnerships are important to shifting schools towards sustainability, the success and impact of this approach is yet to be evaluated.

Box 2.44
True Partnerships

'Challenges appear to exist in many schools in realising the full potential of such partnerships…much negotiation, planning and power-sharing is required to establish true partnerships.'

Eames and Bolstad (2004, p. 7)

v) School Buildings and Grounds: Opportunities for Learning and Modelling Sustainability

Box 2.45
Experiences From Overseas:

School grounds as EE learning environments are popular overseas. Programs found abroad include:

- Learnscapes Across The Globe, an OECD CERI ENSI program (International)[197];
- Learning through Landscapes (UK)[198];
- The Boston Schoolyard Initiative (USA)[199];
- Learning Grounds programs (Canada)[200];
- Learning Through Landscapes (Bermuda)[201];
- *Skolans Uterum* or the 'School's Outdoor Room' (Sweden)[202];
- Enviroschools Programme (New Zealand)[203].

These programs have similar goals, that is, to change existing school buildings and grounds, in order to improve the natural environment of the school and to provide EE learning opportunities[204].

Box 2.46
NSW EE Policy for Schools

'Schools will:

- manage school grounds in accordance with the principles of ecologically sustainable development;
- develop school grounds as part of the overall school plan;
- identify learning opportunities for students resulting from the management of school grounds.'

NSW Govenment (2001a, p. 11)

In Australia, and other countries (see Box 2.45), schools are developing and managing their buildings and grounds to:

- model environmental and sustainability messages contained within the curriculum;
- provide sites for formal and informal learning in EE; and
- reduce the use of physical resources and limit their environmental impact[205].

In Australia, the NSW, Victorian and Queensland policies and guidelines for EE in schools promote the use of school buildings and grounds as sites for learning[206]. These documents also highlight the importance of sustainable design and management of school buildings and grounds to reduce resource use and limit environmental impact. Student participation in the sustainable design process and management of school buildings and grounds are also emphasised as part of the EE curricula[207].

Funding programs such as the NSW Government Environmental *Trust EcoSchools Grants* have been instrumental in providing opportunities for the development of school buildings and grounds for EE learning. Last year it provided $120 000 to schools in NSW for the redesign and development of sustainable school buildings and grounds[208]. Funding opportunities such as the *EcoSchools Grants* has led to some schools across Australia re-designing their grounds to include features such as:

- outdoor classrooms;
- native gardens;
- community vegetable gardens; and
- bush-tucker gardens[209].

The design, features, size, utilisation and management of school grounds can impact upon the life and work of the school and on the quality of education provided[211]. Research from the United Kingdom suggests that design and management of school buildings and grounds based on *Learnscapes* (see Box 2.47) can lead to:

- improved relationships between teachers and students;
- improved relationships between parents and teachers;
- an enhanced image of the school within the community;
- a reduction in the incidents of bullying, accidents and vandalism;
- more effective teaching and learning; and
- more efficient use of resources[212].

In Australia, there has been a history of educators exploring ways to improve the school buildings and grounds

(see Box 2.49). However, within mainstream school education many schools have only just begun to explore the potential of sustainability learning opportunities provided through the school buildings and grounds[213].

The *Sustainable Schools pilot program,* in Australia, is beginning to address sustainable design and management of school buildings and grounds (see Box 2.50). The participation of all stakeholders in the vision, design and creation of sustainable buildings and grounds is seen as crucial to developing a school culture underpinned by sustainability[214]. A participatory process, involving stakeholders in design and management has led to the strengthening of the EE component within the curricula as well as stimulating school-community partnerships for sustainability[215].

Box 2.47 Learnscapes[210]

Hands on Learnscapes Inc., a non-profit organisation, established *Learnscapes* in 1997. *Learnscapes* is a collaborative, dynamic and context specific project, linking the curricula to school grounds. Originally starting with just three schools in NSW, the program now extends to over 60 schools in three States and is similar to the international OECD CERI *ENSI* program.

Learnscapes are places where a learning program has been designed to permit users to interact with an environment. They may be natural or built, interior or exterior and may be located in schools, near schools or beyond schools. They may relate to any one or many key learning areas and must be safe and accessible.

Learnscapes are characterised by:

- design of a wider range of learning experiences and the creation of a learnscape environment
- enhancement of student learning through their active participation in the project
- collaborative process within which the feature is created and plans for how it will be maintained and used for learning
- active involvement and contribution of students, teachers and other groups within the school community.

This program has resulted in a number outputs from the program, including increasing the flora and fauna biodiversity in school grounds through tree planting; the creation of native gardens and rehabilitation of local environments; the design of unique and energy efficient buildings including building of outdoor classrooms; and the creation of community vegetable gardens.

Box 2.48 Youth Culture

'..children want spaces which offer them opportunities to design their own places of youth culture in schools'

Tschapka (2002)

Box 2.49 Other Australian Experiences

There is a long history of work on school grounds in Australia. John Smith wrote '*Bringing School Grounds Alive*'[216] for the SA Eduction Dept in 1975 to promote EE opportunities within school grounds. This became available nationally through the Curriculum Development Centre's Environmental Education Project's Sourcebooks. Tony Fyson and Eileen Adams from the United Kingdom were here in the 1970s and 1980s promoting 'Learning through Learnscapes' and 'Streetscapes' long before the Learnscapes project and lots of activities grew from there[217].

Examples of projects in Australia include:

- **Flora For Fauna Project for Schools**[218]: The *Flora for Fauna* website is a web-based resource for teachers throughout Australia. The resource provides teachers with worksheets and information to assist students to develop plans for wildlife habitats in their school grounds.
- **Architects in Schools Program**[219]: Schools in Victoria have, for many years had access to the *Architects in Schools Program*. In this program architects worked with schools to make their buildings more suitable for EE as well as more sustainable. The need to modify school buildings and change energy consumption patterns in schools were a focus of energy education projects in Victoria in the 1980s. Nationally school design and modification projects were supported by the Royal Australian Institute of Architects and some great education materials were developed through the *Built Environment Education* project.
- **NSW Eco-Schools Program**[220]: Throughout the 1990s the Eco-schools project provided support and resources to schools to develop Learnscapes within their school grounds.

Box 2.50
Sustainable Schools Victoria[221]

The sustainable design and management of school grounds is a key feature of the *Sustainable Schools program*. The program requires schools to self-assess the grounds in preparation for planning and implementing the School Environmental Management Plan.

Schools are encouraged, in this process, to consider how the schools' grounds can be used as a tool for curriculum learning and how they can engage stakeholders in partnerships throughout the process.

Sustainable Schools Program helps schools to:

- save considerable money in waste disposal, cleaning and excess water and energy bills;
- improve the image and appearance of the school;
- develop amongst students a feeling of personal control and empowerment;
- work in real-world problems and outcomes; and
- provide learning outcomes across many Key Learning Areas, such as Mathematics, Science and Studies of Science and Environment, in a real life context that helps students engage with real issues and change.

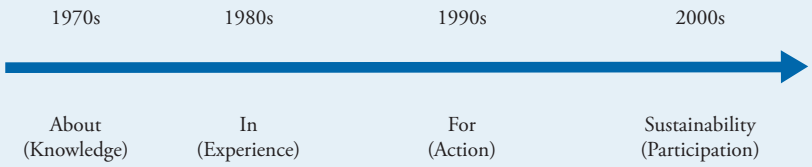
vi) From Action to Participation

EE has undergone an evolution of approaches away from educating *about* the environment in the 1970s, to a focus in practice on education *in* the environment and experiencing environments in the early 1980s. The focus again shifted in the mid-1980s when action oriented objectives began to feature in EE plans and programs. The term 'education *for* the environment' was often associated with this shift[222]. Another influence in the late 1990s and the 2000s has been the sustainability agenda. Sustainability is challenging EE to move away from single actions, such as planting of trees and recycling paper (often associated with action-oriented approaches), towards a focus on student participation in decision-making. This move is seen as important for embedding change.

on a number of levels, including negotiation, persuasion, consumerism, political, legal and eco-management[227]. In practice, the reflective component of action-oriented approaches has often been omitted from the learning process. This has meant that, at times, it has been replaced by predetermined environmental action (see Box 2.51).

The educational (reflexive), the social (cooperative negotiated action) and political (involvement in decision-making) dimensions associated with action-oriented approaches in theory have been diluted in practice. This has resulted in many commentators such as Bob Jickling[228], arguing that education *for* the environment (associated with this action orientation) equates to a prescription or coercion of agendas

■ **Figure 2.2**
Evolution of EE Approaches in Policy[223]



Action-oriented approaches are increasingly featured in the goals of EE programs over the last ten years. In theory, these approaches assumed that EE learning is an active, problem-solving process, which encouraged the learner to be reflective and responsible for their actions in the environment[226]. These approaches endorsed real and simulated action and actions. This does not lead to educational outcomes as it does not allow learners to think or reflect for themselves[229].

Throughout the 1980s and early 1990s researchers Harold Hungerford and Trudi Volk made a significant contribution to promoting action orientated objectives through EE[230].

■ **Box 2.51**
ECO-Action Without Reflection

Many EE initiatives in Australia aim to involve students in 'hands on' environmental actions:

***Schools Clean Up Australia Day*[224]**, which is conducted in Term 1 each year, involves schools in cleaning up rubbish in their local environment. On a specific date every year (determined by Clean Up Australia) schools transport students to local litter 'hot-spots' and provide them with gloves, bags and the motivation to contribute to local environmental improvement.

***Schools National Tree Day*[225]** is an initiative of Planet Ark that aims to get students across Australia involved in planting trees. This is a similar one-day eco-action event, which also provides an opportunity for students to have 'hands on' experience in the local environment.

Both these programs have immediate tangible environmental outcomes. However, it is difficult to ascertain the sustainability of these outcomes as well as the educational value of these activities. The initiatives often do not encourage 'critical' thinking or reflective practice. Some of these initiatives are not linked to curriculum or assessment. The actions are not the result of a process of choice or an exploration of the complexities of these issues. Another concern is that these environmental outcomes are often not sustainable as they do not deal with the underlying issues at the core of the problem rather they address the end-of-pipe issue. Such activities need to go beyond issues of litter to waste management and consumption.

Box 2.52 Problem Solving

'Scanning early editions of professional journals such as the *Australian Journal for Environmental Education (AAEE)*, would lead one to interpret EE as an area of learning primarily concerned with problem-solving.'

Andrew and Malone (1995, p.131)

Box 2.53 Curriculum and Action

Many Australian EE policy documents and curriculum guidelines are still grounded in the issue investigation and problem solving rhetoric.

Queensland: The Queensland Government Department of Education policy statement for EE[232] also identified 'environmental problem solving' as a key aim for EE. The '*P-12 Environmental Education Curriculum Guide*'[233] states that EE 'encourages problem solving by searching for solutions to real issues.'

New South Wales: The '*EE for Schools Policy*'[234] identifies that students should develop skills 'in applying technical expertise within an environmental context; identifying and assessing environmental problems; communicating environmental problems to others; and resolving environmental problems.'

Australian Capital Territory: The '*EE Curriculum*'[235] identifies taking 'part in creative problem solving and negotiation' as a key skill for learners, and encourages teachers to offer 'innovative and creative problem solving on key issues'.

Box 2.54 OECD ENSI[240]

Environmental education as defined by the OECD-Project '*Environment and School Initiatives*' (*ENSI*) is premised on the concept of interdisciplinary studies and the achievement of dynamic learning qualities in students, in which knowledge is not passively appropriated but actively constructed. Furthermore, it relates knowledge to spheres of socially important action and requires the interrogation of assumptions and values that configure controversial issues. Finally it encourages reflexive and responsible action.

Box 2.55 Dynamic Qualities[242]

The dynamic qualities promoted by ENSI include ability to:

- think independently;
- co-operate;
- reflect upon all processes in the school; and
- assist with responsible action in the face of complexity and uncertainty.

Box 2.56 Action Competence

'Developing action competence becomes a formative ideal in a democratic approach to education.'

Jensen and Schnack (1997, p. 165)

Their work featured in the UNESCO-UNEP *International Environmental Education Program* in the 1980s and 1990s had a strong focus on problem-solving as the basis for environmental action. These authors encouraged opportunities for the learner to engage with issue identification, investigation and problem-solving[231].

Stephen Sterling[236] argues however, that these approaches can mislead students to believe that all environmental issues can be 'solved' through problem-solving approaches. He argues, as most environmental issues are characterised by complexity, they often cannot be 'solved' as such, but rather, ameliorated or lessened. This involves developing some understanding of the complexity and limits of simple 'cause-effect' analysis. This issue is further explored in Sterling's *Linking Thinking* program[237].

Problem-solving approaches often deal with issues superficially and do not permit learners to comprehend complexities of action or indeed influence for change. This Jensen and Schnack[238] argue has led to '*action paralysis*' causing many students to disengage from environmental issues[239].

The work of OECD's *Environment and Schools Initiative* (*ENSI*) has also contributed considerably to the promotion of action-oriented objectives in EE (see Box 2.54). *ENSI* refers to '*dynamic qualities*' as opposed to '*actions*'[241]. There is a significant difference with regards to process in *ENSI's* interpretation of action orientation in EE (see Box 2.55).

OECD *ENSI's* dynamic qualities have implications for:

a) the way learners understand and how learners come to know; and

b) the way teachers teach.

OECD *ENSI* promotes a constructivist approach to EE, which engages the learner in actively generating knowledge as part of the learning task. Action in this sense does not take place in the environment but in learning. Students actively construct their own understanding of environment and sustainability issues and in doing so, learn independent and reflective thinking as well as take control of their learning and actions. They are active rather than passive in the educational process. For *ENSI*, this process generates an action-orientation as well as an understanding of the responsibility associated with action-taking.

A Danish group of EE researchers have further developed the participatory component of current action-oriented practice in EE. Their work has led to an *action competence* framework that has challenged environmental educators to consider:

a) the role of democratic engagement in learning;

b) the need for understanding the context for action; and

c) the development of action-taking skills[243].

The action competence framework is characterised by learner choice, reflection and critical decision-making which are seen as critical to effective student participation for change[244].

More recently, Faye Wilson-Hill[245] explored the work of Sherry Arnstein[246], Roger Hart[247] and David Driscoll[248] on democratic participation in the context of school EE. She argues that participatory approaches in EE need to be underpinned by elements of equity, sharing, listening, reflection, co-learning, negotiation, 'critical' thinking, co-operation, collaboration, trust, futures orientation and democracy[249]. These components are at the core of learning for sustainability[250]. Wilson-Hill used these elements as criteria to assess whether participatory processes were applied to EE programs in schools. Using the New Zealand *Enviroschools* program as a case-study Wilson-Hill concluded that elements of participation were evident in practice, however, on a limited basis[251]. The level of student participation was limited by the teachers understanding of participatory processes and capacity to apply these processes[252].

The sustainability literature recognises that moves to an improved quality of life require democratic participation and engagement of citizens in decision-making[253]. Education initiatives are responding to this challenge and acknowledging the importance of moving EE practice towards promoting democratic participation in decision-making[254]. Essentially, the sustainability agenda is challenging EE to move away from single actions, towards a focus on student participation in decision-making. This move is seen as important for understanding the real context of sustainability and for embedding change towards sustainability.

As highlighted by Wilson-Hill[255], there is a need to build the capacities of teachers in participatory pedagogies to promote more widespread use of democratic participatory approaches in schools. Democratic participation is emerging in a number of programs, though few link to it to decision-making. This needs to be the next step for EE in Australia.

Box 2.57
Active Participation

Active participation is encouraged by:

- democratic learning and decision-making;
- knowledge constructed through dialogue;
- learners building capacities and becoming emancipated;
- learners assuming ownership over the project;
- a more complex collective understanding of issues and actions.

Janse van Rensburg (2000)

Box 2.58
Long Term Perspective

'We recognize that sustainable development requires a long-term perspective and broad-based participation in policy formulation, decision-making and implementation at all levels.'

United Nations (2002, p. 4)

vii) Action Research

Box 2.59
Action Research Approach

The action research approach of 'encouraging teachers to adopt a research perspective in gaining greater, more complex understanding of their own professional practices and the context within which these occur is not only different from the more conventional top-down, instrumentalist, competency-based approaches, it is also much more consistent with the particular characteristics of environmental education itself.'

Kyburz-Graber and Robottom (1999, p. 289)

Box 2.60
Skills Developed by Action Research[257].

Good practice in action research is based on the development of a number of student skills, including:

- inquiry and critical questioning;
- reflection on one's own actions;
- advocacy, to influence decision-making;
- social skills, needed to work in groups or teams to address an issue;
- democratic skills and values;
- political literacy;
- action skills - necessary for active learning and participation in decision-making. These skills might include negotiation; persuasion; responsible consumerism, political action; legal action and eco-management (physical environmental action).

Since the mid 1980s action research has had a strong presence in EE literature, with some evidence of its value in practice within school education. Action research, as an education methodology, has focused EE school work on issues of student empowerment, curriculum improvement and, more importantly, action-oriented practice[256].

Action research programs engage students and teachers in an active and participative learning process, which focuses on continual 'critical reflection' aimed at creating change[258]. Collaboratively, students and teachers identify an environmental or sustainability issue, develop questions and an action plan to explore the issue. Acting on the plan involves both students and teachers in observing and reflecting critically on the process and outcomes. This process enables students and teachers to engage with real issues, whilst developing essential skills to address environmental and sustainability issues[259] (see Box 2.60).

Action research as a methodology has challenged traditional and linear models of learning, which start with, and focus on, knowledge[260]. Instead, learning promoted by action research is based on a cyclical process[261] (see Box 2.61).

The cyclical approach to EE promoted by action research views environmental improvement as a goal of education[262]. It seeks to integrate concepts of student empowerment and action for change[263]. This approach aims to develop a sense of responsibility and active student participation in learning about and addressing environmental issues. It is holistic, interdisciplinary, and recognises political interests underpinning the study of the environment[264].

The *Schools Water Action Project* (South Africa) demonstrates the potential of action research for student empowerment, curriculum improvement but most importantly for reconnecting students with their community and environments[268]. The project documents how the action research methodology ensures that learning is rooted in the real context of the local community - where students can make a difference. It was based on an action oriented process of learning, which engages the learner in taking actions for improving their environment and addressing sustainability issues in the community[269] (see Box 2.64).

Environmental educators have used action research to explore the relationship between the student and the teacher, and the student and community[274]. EE action research projects have shifted teacher-student relationships by challenging the role of teachers as simply disseminators of information *about* the environment, towards a relationship with the students based on mutual respect and mutual inquiry[275] (see Box 2.65). Throughout the learning process, teachers and students consistently negotiate learning opportunities and the curriculum[276]. Consequently, teachers guide students in the inquiry and reflection of real environmental issues within their community (see Box 2.66).

In Australia, the work of John Fien[277], Annette Gough[278] and Ian Robottom[279] in action research has challenged traditional teaching and professional development approaches in EE and promoted a more learner-centred and action-oriented focus. However, it is the international work undertaken more recently by OECD's *Environment and*

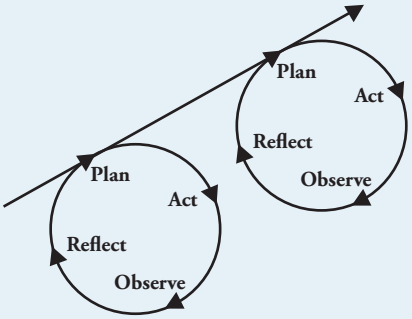
Schools Initiative (ENSI)[280], which is demonstrating the potential of action research to promoting school innovation, development and policy change towards sustainability.

Action research can be a catalyst for school development towards sustainability. The methodology promotes a view of schools as dynamic organisations. OECD's *ENSI*[281] promotes action research since it encourages dynamic (active) engagement of the learner in the learning process and the development of '*dynamic qualities*' in students (action oriented and participatory skills). It sees action research as an important process to involve the wider community in developing change for sustainability (see Box 2.67)[282].

Action research encourages dialogue, participation and partnerships amongst stakeholders to effect cultural change in schools and in other educational institutions[284]. An EU evaluation is documenting how the *second order action research approach* (see Box 2.67) of OECD *ENSI* has been instrumental in effecting innovation and school development, by developing intra- and inter-national networks for teachers, researchers and policymakers[285]. OECD *ENSI* has encouraged new dialogue, participation and partnerships amongst stakeholders to effect structural change in schools and in the institution of education[286]. Action research can help bring about systemic change within the school so that it is more aligned with the concept and process of sustainability.

Action research is increasingly endorsed as a methodology in Australia[287] and offers great potential for learning for sustainability and in attaining concrete environmental outcomes as well as educational ones.

Box 2.61 Cyclical Process of Learning



Zuber-Skerrit (2001, p. 15)

Box 2.62 Action Research Methodology[265]

In schools, action research methodology embraces:

- Participation and dialogue;
- Capacity building;
- Partnerships;
- Learner centredness;
- Iterative process;
- Interdisciplinarity; and
- Questioning of assumptions underpinning knowledge and value.

Box 2.63 Dynamic Process

'The action research process greatly contributes to the dynamic nature of the project as well as to developing project ownership and empowerment which are necessary ingredients for citizenship action.'

Tilbury (1999a, p. 59)

Box 2.64 Schools Water Action Project - WWF South Africa[266]

The *Schools Water Action Project (SWAP)* was established in 1992, at the University of Stellenbosch, South Africa. It engages teachers, students, and communities in study and action to protect local freshwater catchments.

SWAP is designed to function at two levels. Action research is used by:

- students to reflect upon and act towards improving the quality of the local catchment; and
- teachers to reflect upon and improve their practice towards action oriented learning. This action orientation aims to improve the quality of school and its curriculum experiences.

An evaluation concluded that *SWAP* has been successful in stimulating pedagogical and curriculum innovation in EE. This has resulted from an approach that involves:

- interdisciplinarity, making it conducive to a holistic view of sustainability issues;
- shifts in the role of the teacher from disseminator of information, to becoming a supportive co-learner, creating opportunities for learning and change;
- stimulation of school-community dialogue and action through its hands-on practical experience approach to learning;
- promotion of the core values of sustainability; and
- adoption of a critical approach to EE, providing students with an opportunity to envision a better environment and society.

In practice, *SWAP* has not only raised awareness of sustainability issues, but also mobilized action, including the cleaning up of river catchment areas; ceasing pollution from agriculture and other industries; and a marked increase in levels of community involvement in managing local resources[267]. The action orientation and successful tangible environmental and social outcomes of the *SWAP* project make it unique internationally. Action research was instrumental as a tool in achieving these outcomes.

Box 2.65
Action Research in EE for Curriculum Change[270]

Queenscliff High School, in Victoria, participated in Australia's first action research in EE. In response to local issues, students embarked upon a critical study of sewerage pollution at their local beaches. With E-coli measurements 40 times higher than regulations, the students alerted the media to the local, redundant sewerage treatment facilities. The story was reported nationally. Eventually the Minister intervened and the local Water Board was forced to upgrade its facilities.

Their work in action research for EE within school education was able to facilitate change because it enabled the students to:

- treat society as problematic and explore critical assumptions;
- develop their 'working knowledge' through dialogue and partnership;
- develop 'critical' understandings of social structures and their power relationships;
- critically assess and analyse information;
- participate in an active process which created social change and emancipated the students; and
- change social practice.

Box 2.66
Action Research in EE for Teacher Development[271]

The '*Learning for a Sustainable Environment Project*'[272] was an action research professional development project for teacher education in the Asia-Pacific region which began in 1994. The aim of the program was to assist teacher educators in the Asia Pacific to integrate EE principles and concepts into their work.

The project formed a series of national networks of teachers and teacher educators throughout the Asia-Pacific to produce a series of modules on EE. Ten EE modules were developed by the participants: *Education for a Sustainable Environment; A Whole School Approach to EE; Experiential Learning for the Environment; Storytelling for the Environment; Indigenous Knowledge for the Environment; Value Education for the Environment; Enquiry Learning and Teaching for the Environment; Using the Environment as a Resource for Learning; Community Problem-solving; and Appropriate Assessment for EE.*

Funded by UNEP, UNESCO and Griffith University these modules were published in the manual '*Learning for Sustainable Environment: A professional development guide for Teacher Educators*'[273]. The project modeled a learning for sustainability approach incorporating elements on 'critical reflection', partnerhsip and participation. This was reflected in the content as well as the action research process itself.

Box 2.67
Action Research in EE for School Development: An OECD ENSI example[283]

Using curriculum development as a starting point the *Environment and Schools Initiative* has used action research approaches, to focus on integrating a culture of complexity, system thought and educational innovation into schools. In the whole-of-school approach, attention was given to:

- sustainability at a pedagogical level;
- sustainability at a socio-organisational level; and
- sustainability at a technical-economic level.

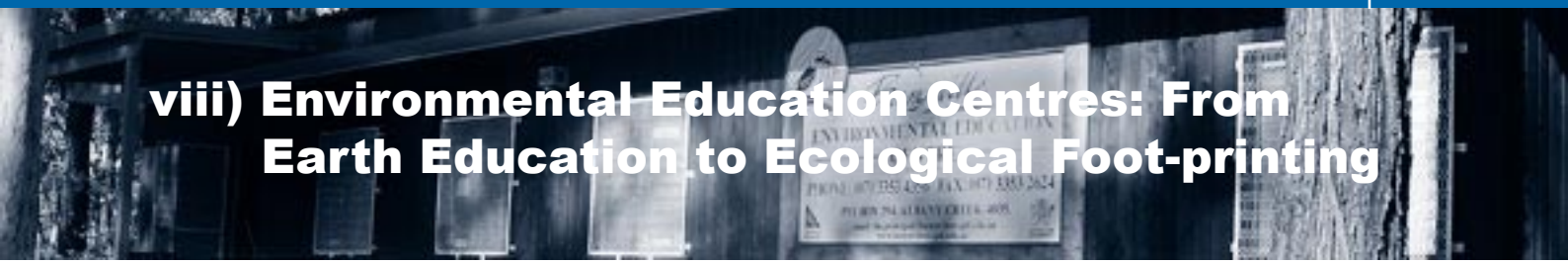
The OECD *ENSI* research approach operated at three levels:

- *Joint research* aimed at developing 'legitimate questions' concerning **concrete actions** to be carried out by students and/or teachers to **improve the quality of the school or surrounding landscape**;
- *Action research* by a group of teachers who, with partners, agreed to document and reflect upon the joint research, in order to develop and **improve its process**. It focused on underlying principles, implicit hypotheses, methodologies and obstacles concerning the research;
- *Second order action research* in which a network of practitioners jointly reflected upon the feasibility and effectiveness of the international OECD *ENSI* project partnership; the **effectiveness of local partnerships; and the diversity of partner roles.**

Box 2.68
Action Research Develops Organisational Capacity

'There is a need…for research into how best to develop organisational capacities and learning for education for sustainability, particularly through greater use of action research.'

NSW Government (2002e, p.13)



viii) Environmental Education Centres: From Earth Education to Ecological Foot-printing

Government funded and managed Environmental Education Centres (EECs) provide significant EE opportunities in Australia and have influenced EE school practice over the years. The extent of EECs in Australia varies amongst each State and Territory. In Queensland and NSW an extensive network of EECs exists with the other States and Territories less developed in this regard (see Box 2.69).

The EECs offer distinctive learning experiences to visiting student groups of all levels from Kindergarten/Preschool to Year 12. They were originally established as field studies centres and primarily served schools by providing practical learning experiences in the field[297]. Some of these activities were linked to syllabuses and curriculum, in particular the Science KLA.

The early EE approaches at the EECs were characterised by education *about* the environment and provided first hand experience *in* the environment[298]. These programs mainly focused on the identification and classification of nature and wildlife. Over the years, the EECs have developed their range of pedagogies and expanded their role to provide training courses for teachers and support for schools. Some EECs now design teaching and learning materials for teachers and advise schools on EE issues[299].

The EECs have always relished in the concept of offering distinctive learning experiences, which involve 'experiencing' the environment. Many EECs use the teaching tools developed by Steve Van Matre[300] associated with the Institute of Earth Education (see Boxes 2.70 and 2.71)[301]. These programs engage students in making a personal, and often spiritual, connection with the environment.

Earth Education programs, however, have been criticised for their focus on individual behaviour change without consideration of the historical, social and political context of individual action[302]. Noel Gough argues that EE needs to move away from this 'blame the victim' approach toward approaches that facilitate 'critical' thinking and collective action[303].

Some EECs have also adopted inquiry based learning predominantly focused on environmental management issues (see Box 2.73). Noel Gough in his book '*Blueprints for Greening Schools*'[305] identifies inquiry learning as a characteristic of good practice in EE. Inquiry learning involves a process of encouraging students to question and respond to their concerns through investigation and acting on the problem or issue[306]. The negotiated (between student and teacher) inquiry learning process involves:

1. *Tuning in*: identifying and defining an issue;
2. *Deciding directions*: formulating questions that require answering;
3. *Organising ourselves*: developing the process of how to investigate the issue;

Box 2.69
Government Funded EE Centres for Schools in Australia

- **NSW:** The NSW Department of Education and Training has established 23 EE Centre's[288].
- **Queensland:** The Queensland Department of Eduction has established 25 EECs[289].
- **Victoria:** There are no government EECs in Victoria. However, the Centre for Educational Research in Environmental Strategies (CERES), Melbourne Zoo[290], Healesville Sanctuary[291], Victoria's Open Range Zoo[292] and Melbourne Museum[293] provide EE to schools in Victoria.
- **South Australia:** The South Australian Department of Education and Children Services has established one government EEC at Arbury Park Outdoor School[294].
- **Western Australia:** WA does not have a network of EECs. However the Western Australian Department of Education supports the Herdsman Lake Wildlife Centre in partnership with the WA Gould League and the Department of Conservation and Land Management[295].
- **ACT:** ACT has one EEC called Birrigai Outdoor School, which was affected by the bush fires in January 2003 but is still functioning[296]. The Botanical Gardens and Diary Flat also provide EE opportunities
- **Tasmania:** Tasmania does not have any government funded EECs for schools.
- **Northern Territory:** NT does not have any government funded EECs.

Box 2.70 Institute of Earth Education (IEE)[304]

The IEE is based in the USA and was founded in the 1970s. The Institute has developed a series of programs that aim to build a deep connection (both sensory and cognitively/intellectually) within the participant to the natural world. These *Earth Education* programs are provided to educators for use once a contract has been established with the IEE.

These are some examples of IEE programs:

- ***Sunship Earth:*** is a 5-day program and targets 10–12 year olds. It aims to awaken the feelings and understandings that will help young people better fulfil their responsibilities.
- ***EarthKeepers:*** is a 2-to-3 day program targeted at 10–11 year olds . It aims to turn out youngsters who possess some basic ecological understandings and good feelings about the earth and its life, and will undertake not only to live more lightly themselves, but to share their insights and behaviours with others.
- ***Sunship III:*** is an ongoing program based around an initial 2 day workshop. It is targeted at 13–14 year olds and aims to provide a dynamic experience that is about seeing things in a new way and making personal choices for a new lifestyle.

Box 2.71 Earth Education in Australia[307]

Helping to Protect the Earth – The Kosciusko National Park Education Program is an example of an Earth Education program in Australia. The program was developed by the NSW National Parks and Wildlife Service in the late 1990s and provides a range of Earth Education courses for schools.

The courses target upper primary school years and aim to 'help students enjoy, understand and live in harmony with the environment'. The courses generally involve classes visiting the National Park for between 1 and 3 days participating in the structured Earth Education activities.

An evaluation of the course indicates that students develop increased awareness and understanding of the earth and positive environmental attitudes and behaviours. The evaluation did not specify, however, the specific nature of the student changes.

Box 2.72 Envirothon[308]

In NSW, a state-wide, annual competition for high school students called Envirothon, is organised by NSW Environmental Education Centres. It involves students studying and collecting data on how a National Park is managed.

Using an inquiry based approach students from different schools compete with each other to:

- identify an issue within a nominated National Park;
- identify a process to investigate the issue;
- identify the threats to the National Parks sustainability and biodiversity; and
- develop a management plan for the park.

The students then offer it to the National Parks and Wildlife Service for their consideration.

4. *Finding out*: investigating the issue and collecting data;
5. *Sorting out*: processing and analysing the data;
6. *Drawing conclusions*: students express their understandings and communicate them to others;
7. *Considering action*: students participate in decision-making to identify action to address the issue;
8. *Reflection and evaluation*: students and teachers reflect on the process and evaluate the outcomes.

Over recent years, some EECs have shifted their focus away from solely developing skills of identifying and naming species (or merely experiencing the environment) towards the study of interrelationships between natural, built and social environments. EECs have evolved to provide more diverse EE opportunities as well as teacher support in EE resources and advice to schools on environmental matters (see Box 2.73).

Furthermore, some EECs are responding to the learning for sustainability needs of schools and showcasing pedagogical tools which assist schools with EE in this area.

Ecological foot-printing is beginning to feature in some of the programs provided by EECs (see Box 2.74). The term ecological foot-printing was developed by Mathias Wackernagel and William Rees in 1996[311] and is a measure of human impact on nature. It shows how much productive land and water we use to produce all the resources we consume and the land-use taken up to dispose of all the waste produced. It is an innovative and rigorous way of measuring the impacts of our individual lifestyle choices and is a useful tool for EE. The use of the tool by some EECs highlights the

changing role of these Centres. It is an indication that EECs are moving closer to approaches characteristic of learning for sustainability.

Some EECs are also beginning to reach out to the community to address local environmental issues. The development of community links and partnerships is in its very early phase. However, an example of this occurring is demonstrated in by Arbury Park Outdoor School centre (see Box 2.75). Linking with the community in this way has seen EECs transform to a point where they now play an important role in community education.

Many EECs now see this as a crucial element of their function and provide opportunities to engage students with the broader community in environmental issues. Programs such as catchment congresses, student environmental forums and festivals are common place in EECs across Australia (see Box 2.76)[314]. In this way EECs provide an excellent network with schools and community and are beginning to play a much more pivotal role in change for sustainability (see Box 2.77) through programs such as the pilot *Sustainable Schools program*.

An emerging role for EECs is to provide advice, support and services to schools on environmental and sustainability matters. EECs are beginning to support teacher education in the form of physical resources and pedagogical materials rather than solely student education (see Box 2.78).

This is certainly the case in NSW where the EECs provide assistance to schools in the development and implementation of their school environmental management plan as part of the mandatory '*NSW EE Policy for Schools*'[316].

Box 2.73
Changing Role of EE Centres in Australia

In a review of EE Centres (EECs), Joan Webb[309] recommended renaming these centres from field study centres to EECs. This occurred in Queensland in 1992 and NSW in 1999. This name change had a profound effect on the way in which EECs viewed themselves and operated. Rather than simply providing a space where schools could come and learn first hand in the field, EECs have evolved to provide more diverse EE opportunities and also have become a resource for schools on matters relating to EE. EECs now provide advice and support to schools on ways to integrate EE into their school programs and also to promote change within the school[310].

Box 2.74
Toohey Forest EE Centre[312]

The Toohey Forest EE Centre in Queensland has developed a program that guides students in mapping their ecological footprints. This process helps students to analyse the rate of their lifestyle consumption rates both at school and their home.

The activity is designed to encourage students to consider their consumption patterns and the implications of this on the environment. The program aims to generate discussion amongst students of how they could reduce their consumption patterns.

Box 2.75
Arbury Park Outdoor School (Centre)[313]

This centre in South Australia has developed a program for schools that has involved a partnership with the local community.

Students work with local groups to collect and propagate native seeds. Students then participate in school and local community rehabilitation projects.

Box 2.76
Linking to Local Communities

'Strong links are fostered with local communities by providing information about environmental issues and serving as venues for community forums.'

Government of Queensland (2003a)

Box 2.77
NSW EE Centres[315]

The NSW EE Centres serve all schools by providing resources to help them integrate EE objectives and sustainable practices across all key learning areas and within specific syllabuses. The major goal of the EECs in NSW is for schools to implement environmental practices and provide opportunities for student learning that will ensure long term sustainable practices in our society. EECs are also a major support for the pilot *Sustainable Schools* program. The centres often supply office space for the support teachers in the program and also run courses for those schools that are part of the pilot program.

Box 2.78
Field of Mars EE Centre[317]

Field of Mars EE Centre is located in the metropolitan area of Sydney in NSW. The centre offers a range of EE programs for schools in the traditional sense of experience in nature. However, it has recently expanded its role to provide support and advice to schools on environmental issues.

It invests a large amount of its time in visiting, advising and supporting schools on how to do environmental audits, the development of environmental management plans and issues relating to the NSW '*EE Policy for Schools*'.

ix) Sustainable Consumption: Cultural and Critical Reflection

Box 2.79 Culture

'Environmental problems result from environmental practices and environmental practices are cultural activities…..we need to teach how culture works, because cultural differences frame what are seen as rational arguments.'

Saul (2000 p.7)

Box 2.80 Youth as Change Agents

The Australian Government through the Department of Family and Corrective Services has recently funded a study into youth and sustainable consumption in Australia. Led by Griffith University in partnership with the International Young Professional's Foundation, the study aims to identify how young people can be leaders and agents of change in their communities in the area of sustainable consumption[320]. The project builds on the '*Is the Future Yours?*'[321] research project conducted by UNEP into the consumption patterns of young people around the world.

Findings from the Australian research project are yet to be published. These concerns, however, are linked to environmental issues and are at the core of learning for sustainability (see Volume 1).

Box 2.81 Cultural and Critical Reflective Questions

Students need to ask critical questions and reflect upon three key areas[328]:

1. Resources - students question current production, use and distribution.
2. Media - students question how media portrays and transmits images about nature as well as about the relationship between people and environments.
3. Lifestyles - students examine lifestyles and identify practical ways in which they can contribute towards more sustainable relationships with the environment. Pupils develop an awareness of how everyday choices link with environmental quality and sustainability.

Today a child's identity, expectations and dreams are increasingly shaped by the global consumer culture, replacing the role of institutions such as the school and the church. Some students rest their loyalties with the pleasures of consumption and powerful multi-national brand names such as Nike and McDonalds, who offer not only an experience but also an identity, by appealing to student's emotions and desires[318]. The power-knowledge-pleasure dynamic of globalism and consumerism places pressures on existing education and raises important issues for EE[319]. Advertising and the internet have played a significant role in supporting this influence on pupils.

This new social culture has significant implications for EE and has reinforced calls for EE to embrace critical and reflective thinking approaches[322]. These approaches enable students to develop critical skills needed to see deeper than the cosmetic attraction conveyed by media and advertising (see Box 2.81). They are encouraged to ask critical questions about the global-local links in the current world as well as the homogenisation of culture attributed to globalisation[323]. These approaches also encourage students to question the powers and inequalities which shape our global order and which in turn impact on students' daily

lives[324]. WWF UK commissioned a significant EE program in the early 1990s which addresses these issues through critical reflective questions. The program was informed by the World Conservation Strategy plus WWF's experience of working in education and by EE research findings (see Box 2.82).

Many environmental educators argue that to achieve sustainability we need critical reflective models which will help learners reflect upon their cultural lens which determines their worldviews[325]. Values clarification is 'a method to encourage learners to clarify their thoughts, feelings and commitments, and thus enrich their awareness about their own values'[326]. It can help them engage in a critical review of learners own environmental values as well as help them comprehend that other complex cultural perceptions exist[327]. Values clarification resists the reduction of complex situations into simplified binary oppositions that often develop when controversy arises.

It can develop learners who are aware and critical of cultural perceptions and processes promoted by globalisation. This helps them understand how some aspects of global consumer culture can lead us more rapidly to unsustainability whilst others can help improve their quality of life. Despite the importance of this approach to EE, documented examples of it being used to address sustainable consumption issues in Australian schools are rare.

Box 2.82
Global Environmental Education Programme[329]

The *Global Environmental Education Programme* funded by WWF UK (developed by Roy Williams and John Huckle) includes a multidisciplinary curriculum development teaching pack for secondary students to investigate environmental and sustainability issues. It aims to develop students' critical questioning and encourages them in active participation. The pack includes modules on 'What we Consume'; 'Society and Nature'; and 'Environment and Democracy' and deals with issues such as advertising and nature, influencing decision-making and understanding cultural lenses.

The programme is framed around a list of critical questions in areas of 'Economic Production'; 'Distribution and Redistribution of Resources'; 'Power and Decision-making'; 'Social Organisation' and ' Culture and Ideology'.

Rationale of WWF Program:

> '…. If lasting solutions were to be achieved then changes to the attitudes, values and modes of operation of whole societies were needed. Education was identified as the major vehicle for the achievement of such changes. Such fundamental changes require in depth **understanding of how the world works**. Therefore Environmental Education programmes need to provide insight into the whole basis of human involvement on this planet (including) the economic, political, social and philosophical structures that direct and maintain cultures. Not only is the content of such programmes important, but also the method of presentation. The material should be presented in a way that engages the intellect of people in active processes of analysis, questioning, discussion and decision-making.'

Box 2.82
(continued...)

Example: Activity 3.1: The Real Cost
Students are encouraged to realise the production and disposal costs of cars on the environment. They also explore what economic and political changes are required to reduce this dependence locally, nationally and globally.

1. Students describe the appearance and construction of the car collectively.
2. Students describe the impact of the car on their local community and environment - considering their use/need, impacts on lives, costs, and local transport.
3. Students describe the impact of the car on their nation – considering economics/ industry, the environment and government policy.
4. Students describe the impact of the car on the world – considering global manufacturing/development, global inequities, impacts on the global environment, reduction of issues and action required.
5. Students consider the history and possible futures of the motor car.

x) Adjectival Education

■ **Box 2.83**
Four examples of Adjectival Education

Global Education
The influence of global education has provided a 'new focus to what was taught about other countries and cultures in the curriculum and served to problematise existing content. It also encouraged the questioning of power and inequalities that shape international order'.

Futures Education
The futures dimension in the 'curriculum involves appreciation of the fact that we have a choice of alternative futures before us. Educating about and for the future involves the generation of new ways of thinking and requires that we examine the values and assumptions behind different views of future'.

Multicultural Education
Multicultural education is 'primarily concerned with promoting social cohesion, tolerance and understanding and ensuring that students are equipped with the skills and values to successfully participate in a culturally and linguistically diverse society'.

Citizenship Education
Citizenship education seeks to 'promote participatory and reflective learning approaches from a holistic perspective; examining cultural, economic, political and social dimensions. Citizenship education is committed to democracy, social justice, responsibility, futures and respect and tolerance for diversity and difference'.

Tilbury and Henderson (2003 p. 88 - 91)

Adjectival education[330] is a term used to describe other areas of learning such as citizenship education, futures education, global education and multicultural education. These adjectival educations have broadened the scope of environmental issues taught in schools and challenged traditional approaches to EE.

Adjectival education strands promote cross-curriculum learning, which explores the linkages between society and environment, global and local issues as well as politics and power from an intercultural perspective[331]. They advocate for the development of skills for participation and decision-making in civil society[332] (see Box 2.83). Informing these adjectival strands is the socially-critical education paradigm[333], which also underpins 'critical' approaches to EE, commonly known as education *for* the environment (see Box 2.84).

Recent developments throughout Australia[334] in the adjectival education strands provide opportunities for EE and sustainability learning outcomes[335]. The adjectival education strands offer significant potential in equipping and empowering young Australians to actively participate in shaping their future and promoting change towards just and sustainable environments. These strands are characterised by active learning approaches now associated with learning for sustainability approaches such as: 'critical reflection'; holistic learning; values clarification; experiential learning; inquiry learning; dialogue; empowerment; and intercultural communication[336]. These approaches aim to develop reflective and critical judgement as well as the skills for change towards a better future (see Box 2.85).

Over the years, adjectival education has influenced social studies thinking and practice in Australia and ultimately played a significant role in promoting the key concepts aligned with sustainability. A review of the adjectival education literature permits an identification of key concepts underpinning these strands, which include[337]:

- ***Futures:*** seeking change for a better future. Understanding and seeking the mutually dependent goals of participatory democracy, ecological sustainability, cultural diversity and intergenerational and social equity.

- ***Social justice:*** Exploring local-global connections and addressing equity and equality in issues of power, politics, resource allocation, inter-cultural issues and poverty and wealth.

- ***Change for Sustainability:*** Affirming the desire to participate in, and contribute to bringing about a just, equitable and sustainable change in society. Recognising how social structures and institutions shape our

world and why there is a need to challenge them for sustainable change.

• ***Globalisation:*** Understanding the relationships and influences of the local-global dimensions in students' own lives and the lives of others and questioning the power and inequalities that shapes international order.

• ***Human Rights:*** Recognising the rights and responsibilities of all citizens including human rights, land rights and self-determination rights and affirming opportunities for empowerment, freedom, equality, spirituality, social and economic equity and freedom of expression. Rejecting discrimination and repression based on beliefs, gender, race, ethnicity and social class and enabling the participation of indigenous, minority and groups at risk.

'*Teaching Geography for a Better World*[347]' and '*New Wave Geography*[348]' are the earliest documented attempts at linking EE with adjectival strands within the curriculum in a way which challenges it to deal with sustainability themes and embrace active and reflective learning approaches. Later, '*A Better World for All*'[349] and '*Learning for a Sustainable Environment*'[350] further extended the challenge.

Australian EE frameworks (see Box 2.86) and other recent initiatives have had an impact on broadening the scope of EE concerns (specifically by embracing a stronger futures, local-global

Box 2.84
Socially Critical Education *For*

Socially critical approaches to EE evolved from the need to shift traditionally *in* and *about* the environment toward an approach commonly called education *for* the environment.

Education *for* the environment attempts to move beyond simply understanding the environment to a focus on equipping learners with the skills to take action to address environmental issues. It promotes reflection about the social, cultural and economic factors, which underlie environmental issues.

The sustainability agenda is strengthening socially critical approaches. The UNESCO '*Rio to Johannesburg*' document launched at *WSSD* strongly advocates for socially and culturally critical approaches to EE. The Draft '*Implementation Framework for the UN Decade in Education for Sustainable Development*' explicitly recognises the need to link adjectival education strands to EE in order to achieve learning for sustainability outcomes.

Box 2.85
Recent Adjectival Initiatives in Australia, which Advance EE and Learning for Sustainability Goals:

- '*Global Perspectives: A Statement on Global Education for Australian Schools*'[338] demonstrates significant opportunities to advance socially critical education principles and pedagogies as it is future focused, and emphasises core themes such as unity and interdependence, empowerment, social progress and sustainable development. It aims to instil this dimension into the whole-school experience and promotes this learning across the curriculum and from preschool to Year 12[339].
- The Australian Government's eight-year '*Discovering Democracy: Civics and Citizenship Education*'[340] curriculum development program for Australian schools has been a prominent influence on promoting citizenship education in schools[341]. The program, however, has a limited global focus and fails to adequately address the skills, values and tools students require for active global citizenship[342].
- The official Queensland Government's Report on Secondary School Curriculum, '*Shaping the Future*'[343] could significantly contribute to EE and learning for sustainability outcomes in the curriculum. '*Shaping the Future*' has strengthened calls for concepts of social change, peace, justice, participative decision-making and sustainable development within the curriculum.
- The Victorian '*Guidelines for Managing Cultural and Linguistic Diversity in Schools*'[344] recognises the need for Anti-racism school policy and curriculum. The guidelines promote the need for learner skills for co-operation and understanding in cross-cultural settings.

Box 2.86
Beyond Knowing *about*…

Over the years, the language of 'critical' approaches has filtered through school and education policy and programs. For example, current Australian EE frameworks such as '*Environmental Education for Sustainability: National Action Plan*'[345] and '*Learning for Sustainability: NSW EE Plan 2002-2005*'[346] reflect this discourse. They promote approaches that take students beyond acquiring knowledge ***about*** the environment and instead develop skills ***for*** engagement with environmental change.

Box 2.87
Studying Underlying Causes

The '*Learning for Sustainability: NSW EE Plan 2002-2005*'[351] highlights the need for EE to move towards an approach that deals with the underlying causes of problems such as human values, behaviour and lifestyles rather than looking at specific local environmental problems.

and citizenship dimension) but not on how students learn for the environment or for sustainability. The themes captured in this report provide evidence that education for change is not a widespread practice. School practice is still focused on single actions of waste reduction, planting trees and the improvement of school grounds without deeper understanding of the socio-economic or cultural contexts that are underlying causes of environmental issues. Similarly the intercultural perspective and indigenous knowledge associated with multicultural education is almost absent from EE in school education.

2.4 Overview of EE in Early Childhood Education

The early childhood years, defined as the years from birth to six[352], consist of the greatest and most significant development in an individual's life. Early childhood is often regarded as the foundation upon which the rest of an individual's life is constructed. From birth, young children develop cognitively, physically, socially, emotionally, and culturally acquiring the knowledge, skills and attitudes essential to their ongoing development and later life.

Recent research in neuroscience confirms that child development is a result of a complex interplay of biology and experience[355] and indicates the crucial importance of the early childhood years. A seminal Canadian study by Mustard and McCain[356] provided impetus to re-examine policies and investments in young children. A key finding of this study was that brain development from conception to six years sets the base for learning, behaviour and health over the entire life cycle. Essential to this development is that early experiences be stimulating and involve positive interactions with adults. Canadian governments have reacted to this study by investing in new approaches to early education and parenting, that are universal in reach, community based, provide integrated services and strengthen parenting skills, in the considered belief that 'action now, will put our children and our society on a firmer foundation for the future'[357]. This research has significant implications for EE and learning for sustainability.

Characteristics of Early Childhood Education in Australia

In Australia, and internationally, a key characteristic of the early childhood sector is the diversity of its service provision[358] - long day care, occasional care, sessional kindergarten, family day care, adjunct care and play groups. This reflects, to some extent, the different needs of families (full-time or part time working parents, home-based parents), and different affiliations (eg neighbourhood-based, work-based, attached to schools, shopping centres). The provision of such services is auspiced by a mix of public, non-government, not-for-profit, private for profit, and private not-for-profit organisations. Most centre-based long day care is provided by the private sector (73%)[359], while most other early childhood services are provided by state governments, local government and the non-profit sector.

The level of staff training of those working in early childhood education also varies. The diversity of staff training includes: university-trained teachers with undergraduate and post-graduate qualifications; those with TAFE or private provider certificates; as well as untrained and volunteer staff. Children's services and education policies and practices vary across the States in such matters as curriculum, course accreditation, resource allocation, staff employment and professional development. These variations mean that there is no coherent policy and direction across the early childhood sector with a great deal of variety in service provision

Box 2.88
Australia's Early Years Study

Australia has commenced its own early years study, based on the Canadian research titled: '*National Investment for the Early Years*'[353]. In collaboration with this study, the NSW and QLD Children's Commissioners have prepared a discussion report '*A Head Start for Australia: An early years framework*'[354] identifying priorities and outcomes for future investments in young children in Australia.

Box 2.89
Early Formation of Attitudes

'The early learning years are a fundamental period for the formation of attitudes and thus of great consequence to Environmental Education.'

Tilbury (1994, p11)

Box 2.90
Patches of Green

"…early childhood Environmental Education is still an emerging paradigm characterised by patches of green. The green patches are exemplary individuals, organisations and centres that share a passion and commitment about the importance of early childhood Environmental Education.'

NSW Government (2003, p.1)

Box 2.91
EE Gaining Presence in Early Childhood Education in Australia

- **1992**: A professional network, Environmental Education in Early Childhood Vic. Inc., was established to promote and support EE in early childhood education.
- **1995**: Queensland Early Childhood Environmental Education Network Inc. was established.
- **1999**: A symposium '*Early Childhood in Environmental Education: Mainstream not Marginal*' was held during AAEE's national conference '*Southern Crossings: Pointers for Change*'. This led to the establishment of an AAEE Significant Interest Group in this area.
- **2002**: A one day forum '*Early Childhood Environmental Education*' was held during the AAEE national conference '*Sustaining Environmental Education; Celebrating Diversity*.' The forum endorsed an EE policy for the peak national early childhood professional group Early Childhood Australia. The Early Childhood Teachers' Association, the peak professional association for early childhood educators in Queensland, conducted a series of ½ day conferences entitled: '*What do we do? Supporting children in today's world.*'
- **2003**: NSW Government releases '*Patches of Green*'[361]. Early Childhood Special Interest Group established by AAEE to develop a national action plan and facilitate co-ordination at a national level. The NSW Early Childhood Environmental Education Network was established. Funding from the Australian Government enabled Community Child Care Victoria to head an in-service training consortium in 2003. Six training sessions entitled '*Environmental Education: A holistic approach*' were conducted across metropolitan and regional areas with staff from long day care and family day care services. This training program is continuing in a revised format in 2004. The NSW Environment Protection Agency piloted a professional development program for early childhood educators. The program explores both policy and practice in EE through a one day training session and it is anticipated the program will be run over a period of two years. '*Early Childhood Society, Environment and Health*' is a new core unit for the Bachelor of Education at Queensland University of Technology with a strong futures orientation is introduced.
- **2004**: *Community Child Care In-service Training Project* in Victoria includes professional development in Early Childhood EE. The AAEE develops an Action Plan for Early Childhood Environmental Education. Early Childhood Australia published '*Early Childhood Environmental Education; Making it mainstream*[362]' a document that identifies the changes needed to move early childhood Environmental Education forward to a mainstream position in the early childhood sector.

and difficulties in responding to new curriculum initiatives or emerging trends.

To some extent this diversity and fragmentation helps explain why EE at the early childhood level has been rather slow to emerge, compared with other components of the school education sector. As the NSW Government's, '*Patches of Green*"[360] report into the scope, status and direction of early childhood EE identified, EE offerings are 'patches of green' rather than mainstream or sustainability focused (see Box 2.90).

Nevertheless, in recent times, momentum for these initiatives has risen from both within the early childhood sector, as well as from environment organisations. Box 2.91 identifies recent initiatives in EE in early childhood, which range from:

- establishment of professional networks;
- development of new resources;
- special forums within EE professional associations;
- offering of EE professional development courses to early childhood centres;
- new pre-service teacher education units; and
- a state government commissioned report on the status of EE in early childhood.

The last three years have seen the most number of initiatives in this area.

2.5 The EE Experience in Early Childhood Education: From Principles to Practice

The following key themes have been identified, which construct a picture of EE experiences in early childhood education focusing on sustainability:

i) More Than Just Hands-on Experience with the Outdoor or Natural Environment;

ii) Challenging Developmental Psychology Frameworks;

iii) Early Childhood Centres Extending the Influence;

iv) Change Towards Sustainability within Early Childhood Education; and

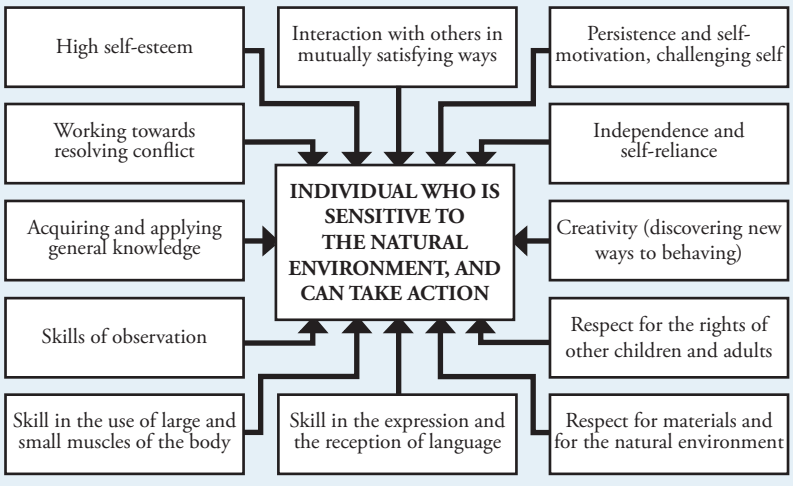
v) Towards Sustainability: Linking Health and Environmental Concerns

i) More Than Just Hands-on Experience with the Outdoor or Natural Environment

Many early childhood educators interpret EE as providing opportunities for students to experience the outdoor environment through play-based approaches often involving natural materials such as sand, mud and water. This hands-on experience assists children's sensory learning and is seen as fundamental for children's construction of knowledge and skill development. Engaging children with the natural environment is seen as a key objective of early childhood education curricula. However, there is no research to indicate that this necessarily contributes to specific EE learning goals. The EE literature suggests that in the early years, critical curriculum approaches which involve democratic problem-solving and reflective strategies are also needed to develop EE knowledge, attitudes and skills[363].

The recently revised '*National Childcare Accreditation Council Quality and Improvement Accreditation System*'[364], identifies 'the natural environment' as one of 35 principles to be assessed for quality, and encourages staff to 'talk frequently with the children about the aesthetics of the environment and encourage the children to notice and respond to beauty in nature, in the built environment and in artistic creations and performances'. It has been argued that while this is insufficient if EE is to be implemented throughout early childhood centres, it is, at least, a starting point for refocussing early childhood curriculum and pedagogical practices towards environmental concerns[365].

■ **Box 2.92**
Environmental skill development in the early years



Elliot and Emmet (1997, p. 89)

ii) Challenging Developmental Psychology Frameworks

Traditionally, the early childhood curriculum has been based upon theoretical frameworks informed by the field of developmental psychology. This has led to a focus on determining and monitoring individual needs and interests as well as on measuring young children's development against the abilities of a fully functioning adult[366]. A major criticism of these frameworks is that they adopt a 'deficit' approach to young children's competencies[367].

Recently, curriculum and pedagogical approaches that embody post-structuralist, post-modernist or critical theoretical paradigms are challenging existing practice[369]. It is becoming more common for children to be viewed as successful, competent learners in their own right, who have their own unique 'childhood cultures'[370]. These cultures are quite different from those of adults, and consequently, may not even be recognisable to many adults.

Such approaches are embedded in broad notions of respect for diversity and inclusiveness and in greater understandings of power relations, especially between children and adults – concepts closely aligned with sustainability. Such re-conceptualisation has also renewed a focus on children's rights, social justice and equity issues as these relate to the lives of young children, their families and communities. The new frameworks use 'educational processes which create a more just and wise world'[371].

These recent developments provide opportunities in early childhood education to broaden and deepen social justice concepts as well as embrace ideas about intergenerational equity (see Box 2.94)[372].

An exemplar of such reconceptualised practice can be found at Campus Kindergarten where staff demonstrate that much of the ongoing motivation and inspiration for its *Sustainable Planet Project* comes from the children. As Box 2.95 exemplifies, these approaches are more closely aligned with learning for sustainability approaches. They position the child within the community and learning within community concerns for the environment.

Box 2.93
Developmental Approaches

Burman and Canella[368] believe that developmental approaches that see the child as a 'becoming adult' privilege adults and oppress children.

Box 2.94
Rethinking Social Justice

'Rethinking and expanding social justice is important so that today's children, as well as those yet to be born, grow into cultures that are both ecologically and socially sustainable. To neglect this is to short-change our children and to be oblivious to the needs of their children.'

Davis and Elliott (2003, p.8)

Box 2.95
Sustainable Planet Project

'The [children's] interest in water conservation was sparked during the recent drought when children brought to the attention of staff, their concerns about water use in the sandpit. A whole centre project developed, organised by the preschoolers. The children did some initial research, read articles in the local paper, and revisited a project about water and water issues that they had been involved in the previous year… As the project proceeded, the children were able to critically analyse and change their own and others' behaviours - they'd learnt that water was precious, noticed they were using a lot of it, recognised the community concern about water use and decided to do something about it. Consequently, they became very careful with water use.'

Davis and Elliott (2003, p. 15)

iii) Early Childhood Centres Extending the Influence

Box 2.96
Broadening Focus

'Early childhood settings have become a significant facilitator of knowledge, skill, attitudes, and relationships around children. This represents a changed focus for early childhood settings - from being child-centred to being family and community centred.'

Hayden, J. and Macdonald, J. (2000, p.33)

Box 2.97
Easter Bilby Adventure - Bunyaville Environmental Education Centre

This half day program engages preschoolers in an enjoyable interactive forest experience, involving drama and storytelling, 'critical' thinking and problem solving on behalf of the endangered bilby. Children develop empathy for the Bilby's plight, understand issues related to habitat destruction, and are encouraged to take action by supporting the Save the Bilby Appeal and by taking appropriate environmental action in their preschool, school or home environment.

'When we are running our Easter Bilby programs with preschoolers, we are always conscious of teaching to two audiences. There are two sets of messages - delivered at appropriate levels - to the children AND to the parents and class teachers.'

Rowntree (2003)[374]

Parent and carer participation in early childhood settings is growing in Australia and there is a variety of policies at both government and service level that encourage this involvement[373]. Their participation occurs at a number of levels. Indeed, of necessity, programs for young children must involve interactions with parents and carers; at a minimum, young children must be delivered to and collected from the program setting. Parents and carers (and other community members) may volunteer their skills for specific activities, contribute to service policy development, or be actively involved in service management (see Box 2.96). In some early childhood services there may be parent and carer-run management committees.

Overall, early childhood settings are recognising the potential of their role in parent and carer (community) education. The regular presence of additional adults in early childhood settings means that early childhood staff have regular opportunities to raise issues and discuss topics of relevance to parents and carers and their children (see Box 2.97).

Indeed, it is often at a child's centre that parents and carers find out about parenting and health matters, obtain access to information about community services, and develop supportive networks with other parents and carers. The 'child care and family support hub', established in Queensland, is a recent initiative where a single entry point for a broad range of early childhood services is established contributing to community development and education[375] (see Box 2.98). These hubs offer great potential for promoting learning for sustainability.

The 'child care and family support hub' strategy is consistent with community capacity building which aims to support communities to develop their future economic, social and environmental well-being. The hub brings together services that aim to meet the diverse needs of children and families within a community, including targeted services arising from the needs of the local community. These are focused on child care and early childhood services and can also include family support services, parenting support, child health, community activities and education services. While trial hubs have been mainly organised around the provision of early childhood health and welfare services, there is no reason why future hubs would not more directly focus on sustainability matters and concerns and include EE as part of a hub's educational services[376].

Box 2.98
Early Childhood Education as Community Education

The newly instigated *Mount Morgan Child and Family Support Hub* aims to bring together services to meet the diverse needs of children and families and to ensure that specialist support services are responsive to community needs. 'It is envisaged that the service will:

- provide parent information and family support;
- co-ordinate visits from specialist services (e.g. child health services);
- attract, integrate and expand the range of services to the community;
- improve the usage of community infrastructure and resources;
- provide support to community groups and act as an advocate; and
- develop a data base of services and potential responses in relation to children and family issues.'

Government of Queensland (2004)

iv) Change Towards Sustainability within Early Childhood Education

Box 2.99
Examples of Policy Initiatives[378]

1. Education Queensland Preschool Curriculum Guidelines identify 'the environment' within one of six foundation learning areas. The focus is on environmental understanding within a framework of 'thinking and communicating'.
2. Local councils are seeking to meet Agenda 21 by implementing initiatives that impact on council operated early childhood centres.

Examples of Centre and Extension Education Initiatives[379]

1. Campus Kindergarten Qld created its *Sustainable Planet Project* in 1997 and works to build sustainable practices into everyday routines. The aim of the project is to educate children and the community to be empowered and responsible citizens now and in the future.
2. Bairnsdale Early Learning Centre Victoria created 'Woolly Wombats' and embeds an environmental ethic into its daily practice.
3. St Kilda and Balaclava Kindergarten Victoria has a program committed to promoting environmental awareness, making genuine efforts to reuse and recycle waste materials.
4. A range of extension education programs for early childhood education have been developed by zoos and museums (see Perth Zoo's *Butterfly Magic*).

Examples of Individual Initiatives[380]

1. Earthmothers Victoria is a group of mothers who established their own group when they felt their environmental values were not reflected in mainstream mother's groups.

Change towards sustainability needs to be multi-focused, reflecting the diverse range of organisational structures, services and programs in the early childhood sector. Hence, change is being enacted at the policy and centre level, but also at the 'grassroots' where localised, energetic and passionate groups and individuals are effective initiators of change (see examples in Box 2.99).

Julie Davis and Sue Elliott[381] argue that although these initiatives are often small-scale and appear to lack cohesion and impact, each of these initiatives has the capacity to nourish existing actions and generate new energy for change across the sector. This view of change, based on complexity theory, is increasingly being recognised and advocated for by a growing number of change theorists[382] and educational change experts[383]. They argue that local, small-scale, often voluntary, incremental changes - rather than large-scale bureaucratic reform - need to be interpreted, not as reform failures, but as important accomplishments with transformational value and the potential for 'showing the way'[384].

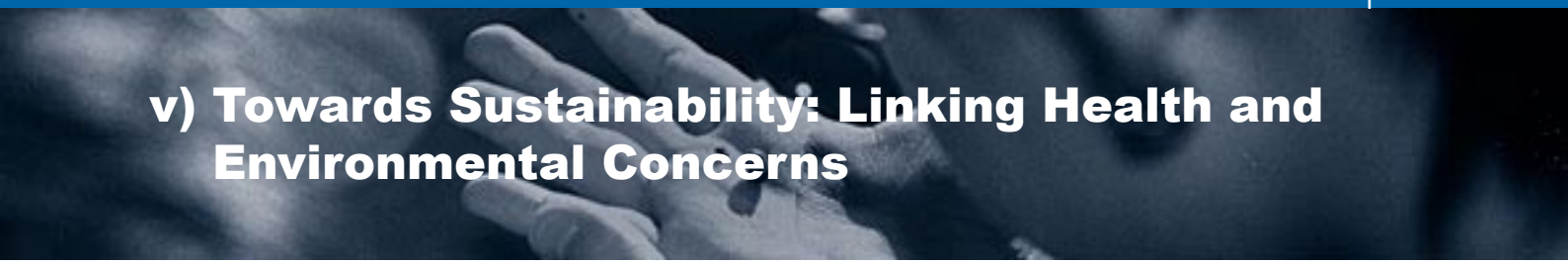
Box 2.99
(continued...)

2. Ecological Futures is a small business created in Qld that supplies Early Childhood EE resources. Its aim is to increase awareness and knowledge about sustainability in the early childhood sector.
3. The video *Weaving Webs* was the result of passionate parents and educators wanting to raise awareness about the need to educate for the environment.

However, in order to 'scale up', Julie Davis and Sue Elliott[385] argue, such change approaches require major capacity building efforts across the sector so that innovation is extended beyond the original initiatives. Rather than large scale bureaucratic solutions, possibilities for capacity-building include:

- strengthening networks that encourage collaboration with a broad range of people;
- developing inventories and case studies of innovation that give recognition and confidence to the innovators and inspiration to those wishing to engage; and
- providing a wide range of internal and external professional development opportunities[386].

They conclude that as most current initiatives are conducted by volunteers, scaling up will require appropriate funding for the establishment of network coordinator positions, the conduct of research, and ongoing professional development[387].



v) Towards Sustainability: Linking Health and Environmental Concerns

Another issue gathering attention in early childhood education is the growing recognition of links between human health and environmental health. For example, there is increasing concern about children's health and exposure to potentially harmful chemical cleaners used as everyday cleaning agents in many homes and child care centres[377]. A recent initiative in some early childhood centres in Qld and NSW is the adoption of the concept of 'health promoting' child care settings where socio-ecological models of health (derived from the WHO health promoting schools approach) have been instigated as a way of creating social change. These early childhood centres recognise the importance of healthy environments for healthy bodies, and take a holistic, action-oriented approach to children's health and development. With shared socio-ecological foundations and transformative perspectives, it would seem that liaison between health promotion advocates and those concerned with the advancement of learning for sustainability is an area for new synergies and renewed action for healthy and sustainable futures.

The challenges of learning for health and sustainability in early childhood are great. However, a number of recent initiatives suggest that small steps are being taken to move these areas of learning from the fringes of early childhood education (see Box 2.100).

Box 2.100
Sustainability Concepts Begin to Enter Into Early Childhood Education

The new *Early Childhood Society, Environment and Health Education* unit offered to teachers at Queensland University of Technology has a strong futures orientation across its subject offerings. Its rationale states:

> 'This unit focuses on social and cultural education, Environmental Education and health and physical education. It explores contemporary issues, both global and local, and has a strong futures focus. It emphasises integrated critical inquiry approaches to teaching and learning aimed at encouraging young people to be proactive in shaping peaceful, healthy, just and sustainable futures.'

Queensland University of Technology (2004)

The Early Childhood Teachers' Association in Queensland, conducted a series of half day conferences in 2002 which addressed 'Sustaining Relationships: Children and the environment'. These presentations focused on sustainability issues, futures education and the need for educational change in the early childhood sector.

2.6 Overview of EE in Teacher Education

Box 2.101
Reorientating Teacher Education

'The administrations and faculties of institutions of teacher education have the potential to bring about tremendous change, because they create the teacher education curriculum, train new teachers, provide professional development for practising teachers, consult with local schools, and often provide expert opinion to regional and national ministries of education. Because of this broad influence in the curriculum design, implementation and policy setting of educational institutions, faculty members of teacher education institutions can bring about change that will promote sustainable development.'

UNITWIN/UNESCO (2000)

Box 2.102
Changes in Teacher Education?

'A review of research on the provision of Environmental Education within teacher education reveals that not much has changed in the years since [the Tbilisi Conference, 1977].'

Fien and Tilbury (1996, p38)

Across Australia, 250 000 teachers are responsible for the education of 3.5 million students[388]. The education of these teachers, both pre-service and in-service, is vital to the delivery of quality and innovative programs in schools. The continuum of teacher education begins with initial teacher education but also includes one-day workshops, seminars, internships, mentoring as well more formal university based/certified professional development[389].

The need for improved EE in teacher education was recognised as early as 1977 in the Tbilisi Declaration, which proposed that EE become an obligatory part of initial and ongoing teacher education. In 1990, UNESCO-UNEP identified teacher education as the 'priority of priorities' to improve the effectiveness of EE[390] and in 2000, UNESCO established the UNITWIN/UNESCO *Chair for Reorienting Teacher Education to Address Sustainability*. It targeted teacher education institutions from across the globe as key agents of change in towards sustainability (see Box 2.101).

In Australia, however, the teacher education goals set out in international agreements[391] such as the Tbilisi Declaration[392] or the UNESCO global initiatives on reorienting teacher education towards sustainability are yet to be effectively recognised in national education policy. This, reflected in the dearth of teacher education programs in EE, has resulted in a lack of competencies amongst teachers to effectively teach EE in schools[393].

The Australian Government Department of the Environment and Heritage's[394] national action plan '*Environmental Education for a Sustainable Future*'[395]has identified 'more professional development opportunities for teachers in the school sector' as a key area of need in EE[396]. It proposed the establishment of a fellowship program for teachers to assist with their professional development needs.

State and Territory education departments do not require their teachers to have education or professional development in EE, although Victoria's EE policy does recognise the need for professional development of teachers to offer effective EE in schools[397]. The Queensland Board of Teacher Registration has also supported teacher education in EE through its development of core competencies for teachers in EE (see 'Core Competencies for EE and Learning for Sustainability' on page 57) but again education or professional development in this area is not mandated.

At present, practicing teachers have limited opportunities to engage in comprehensive professional education or development courses in EE. In Australia, only a limited number of teacher education institutions offer EE courses to prospective teachers[398]. At these institutions EE is offered as an elective unit or as a small component of a core unit in Education degrees. While some may include EE concerns, teacher education programs generally fail to adequately prepare teachers to effectively achieve the goals of learning for sustainability in the classroom[399]. This means that when entering schools few teachers have the competencies in education and learning for sustainability approaches.

2.7 The EE Experience in Teacher Education: Principles to Practice

This section explores the following key themes:

i) Initial Teacher Education: Searching for an Interdisciplinary and Whole-School Approach to EE;

ii) Limited Opportunities for the Professional Development of Teachers in EE;

iii) Revisiting Higher Education for Professional Development in EE;

iv) The Challenge of Teaching for Sustainability;

v) Core Competencies for EE and Learning for Sustainability; and

vi) Key Multipliers and Strategic Partnerships in Teacher Education in EE

i) Initial Teacher Education: Searching for an Interdisciplinary and Whole-School Approach to EE

Box 2.103
Bachelor of Applied Science/ Bachelor of Education

'Southern Cross University offers a combined B.App.Sc/B.Ed degree in a four year program that provides students with accreditation for high school teaching in NSW and other States. 'It is based on the environmental science and education degrees, with a minor in science and majors in biology and geography. This allows graduates to teach in high school curriculum areas of Science and Human Society in its Environment, as well as become an educator in other non-school Environmental Education settings, with many opportunities to take part in environmental science laboratory and fieldwork as well as practical classroom teaching.'

Southern Cross University (2002)

Box 2.104
Bachelor of Education in Primary Education

The University of Technology, Sydney offers EE as an Advanced Study elective in its Bachelor of Education in Primary Education. The subject focuses on initial teachers' understanding the 'nature of the total environment' and developing an awareness of human interactions with, and impacts on, the environment. It considers the need for primary students to develop 'knowledge, skills and attitudes' for informed 'participation in environmental decision-making'. The subject engages a variety of strategies to enable initial teachers to develop appropriate cross-curricular learning programs for EE.

University of Technology, Sydney (2003)

Initial teacher education involves a minimum two years at a higher education institution[400].

Prospective teachers can attain qualifications through a number of routes:

- 3-4 year undergraduate bachelor education program;
- 4-5 year double degree bachelor programs, includes an education degree.
- 1-2 year 'end-on' graduate teacher education program with graduates from another discipline[401].

EE is not mandatary for prospective teachers engaging in initial teacher education. In fact, many teacher education institutions view EE as adding to a 'number of pressures on an already over-crowded teacher education program'[402]. Prospective teachers now have to engage with an increasingly diverse curriculum that incorporates issues such as student behaviour management, quasi-legal issues, equity and citizenship themes[403]. EE is not considered a priority and is at best an elective, or a single topic in a core education unit[404].

Despite international agreements stating that teacher education in EE needs to have an interdisciplinary and whole-school approach[405], EE in initial teacher education in Australia is found as a small component in science or social science units or courses (see Boxes 2.103 and 2.104). Courses for secondary teachers reflect the subject boundaries found within the school curriculum as well as the discipline divides found within university faculties, which often make interdisciplinarity difficult[406]. This results in a lack of understanding amongst teachers of the interconnectedness of issues of the environment, society, economy and politics and its implications for EE.

The primary teacher education courses offer more opportunities for EE cross-curricular learning (see Box 2.104). However, Education faculties that provide, often optional, teacher education in this area, tend to rely on departments from other divisions (mostly environmental science or geography) to teach prospective teachers about environmental concerns. These units or courses are not tailored specifically to the needs of teachers. They may develop teachers' environmental literacy but not the knowledge and skills required to develop competencies in EE. Furthermore, a review of the publicly available information of teacher education programs in Australia, suggests that there are no opportunities for prospective teachers to learn whole-school approaches to EE that would take it beyond the school curriculum.

ii) Limited Opportunities for the Professional Development of Teachers in EE

Professional development programs are designed for practising teachers to update or develop new professional knowledge or skills. They may consist of workshops[407], seminars[408] or mentoring programs[409] and can also be linked to opportunities such as postgraduate education[410], and action research[411] as well as study tours[412] and industry placements[413].

In Australia, 60% of teachers view professional development as a very high priority in their working lives, yet up to one fifth of teachers experience one-day, or less, of professional development during school hours per year[414]. As with initial teacher education, in-service professional development programs are highly competitive as teachers strive to keep up-todate with emerging issues and shifts in educational theory and practice. EE is forced to compete with more high profile programs in the area of information and communication technology and literacy[415].

Where they exist, professional development courses for teachers in EE have been ad hoc and often lacked focus[416]. This, coupled with limited opportunities for EE in initial teacher education, means that very few teachers have had any professional development in EE[417].

A handful of school-based EE programs run by education groups, state agencies and NGOs, include professional development workshops to assist with the implementation of their programs in schools. The *Sustainable Schools Program* and the *Waste Wise Program* (see Box 2.105), for example, provide training opportunities for teachers in EE.

The *Waste Wise Schools Program* includes a one-day professional development workshop for teachers on matters relating to waste reduction and management issues for schools. Teachers who complete the program can attain accreditation that counts towards a *Graduate Certificate in Education* (professional development) or *Master of Education* program, providing an incentive for participation by teachers[419].

While professional development programs such as these are a step in the right direction, they tend to develop teachers' knowledge and skills surrounding a specific issue of concern such as waste or water, and develop teacher competencies in implementing the specific program. However, teachers do not gain an understanding of EE or learning for sustainability outside of the program. Education regarding pedagogical components of EE such as envisioning, 'critical reflective thinking', values clarification and systemic thinking are almost always absent from the training initiatives for teachers.

Box 2.105
Waste Wise School Program - Professional Development[418]

The *Waste Wise Schools Program* is funded by EcoRecycle Victoria and managed in consultation with the Gould League. It is an action-based waste education program for schools, which is accompanied by teacher development workshops on waste, waste management and program implementation.

In its first six years the program trained 1035 teachers in 83, free, one-day workshops and more than 70 waste and recycling educators.

Professional development one-day workshops cover:

- How to develop and introduce effective waste and litter reduction strategies in the school.
- How to easily incorporate waste and litter education into school curriculum at all levels and in many key areas.
- How to make full use of Waste Wise Schools Kit and other support services of the Waste Wise Schools program.

iii) Revisiting Higher Education for Professional Development in EE

Box 2.106
Master of Environmental Education

'Environmental education helps bring individuals and groups to a better understanding of the interrelationships between humans and environments. EE encourages people to develop caring and committed attitudes that will foster the desire and the ability to act responsibly in their relationships with environments. This program provides a professional development program for environmental educators in schools and field study centres and in community education settings.'

Griffith University (2003)

Master of Environmental Education

'The Master of Environmental Education is offered jointly by the Graduate School of the Environment and the School of Education. This course explores the role and scope of education in the attainment of environmental and sustainable development goals. Students will learn to identify principles of good practice in order to plan and evaluate programs in Environmental Education and education for sustainability… at various local, national and international levels, within formal, informal and non-formal education.'

Macquarie University (2002)

Box 2.107
ESS715 Trends and Issues in Environmental Education

'The unit includes a number of case studies of innovative Environmental Education programs in different countries. These include nature interpretation activities, teaching through participatory research approaches, and whole-school/whole-year approaches. The case studies are designed to provide an overview of world trends in Environmental Education and help students develop skills in curriculum development and evaluation in Environmental Education. Issues such as the debate over sustainable development as a focus for Environmental Education, and the nature of research in Environmental Education are selected for in-depth study.'

Deakin University (2004, p14)

GSE 827 Education for Sustainable Development

'This unit explores the role and scope of education (as a capacity building process) in the attainment of sustainable development goals. After reviewing the international literature and reflecting upon interpretations of education for sustainable development, students examine a number of case studies from around the world. Students are required to identify principles of good practice and to develop a framework for planning and evaluating programs in education for sustainable development.'

Macquarie University (2004)

Recently a handful of Australian Universities have been offering elective units and/or external units (see Box 2.106 and 2.107) in EE and Education for Sustainable Development which address both content and methodologies.

Students who enrol in these courses include community or industry-based environmental educators, as well as school teachers and staff from EE centres. The post graduate qualifications offered by these universities deal more holistically with EE content and pedagogy. They are not, however, tailored to the school curriculum and so require teachers to make the links themselves between their new knowledge and skills and the specific school work they are involved in.

While, post-graduate education can provide teachers with qualifications that can assist in professional advancement, teacher attendance to these courses remains relatively low. Consistently, formal post graduate education places additional pressures on already over-worked teachers, thus it is unrealistic to expect a large quantity of practising teachers to undertake these courses.

iv) The Challenge of Teaching for Sustainability

Over the years, UNESCO has been calling for the reorientation of teacher education to reflect the paradigm shifts needed to bring about effective learning for sustainability[420]. The need for this shift, and the components associated with the new paradigm, are outlined in Volume 1 of this series. Teacher education programs underpinned by this paradigm would introduce teachers not only to a systemic view of economy, environment and education, but also develop their experiential, hermeneutic and critical knowledge which would result in socially useful and empowering curricula[421]. A focus on this system view not only needs to be part of teacher education curriculum but also of professional development packages and resources as it is a fundamental shift in approach in which many experienced educators are untrained.

However, many in Australia argue that teacher education continues to be underpinned by expert-led, instructive teaching methods and a fragmented curriculum, which are inconsistent with the learning for sustainability paradigm. In fact, in Australia, no initial teacher education courses[422] and only some post-graduate courses make explicit reference to approaches such as learning for sustainability[423], education for sustainability[424], sustainability education[425] or the socially critical pedagogy[426] associated with the new paradigm.

The *critical* pedagogical approach to EE is significantly different from traditional teaching styles[427] (see Box 2.109). It utilises a process of communicative action based on shared understanding and democratic dialogue[428]. Through it, teachers become transformative thinkers, capable of influencing development of curricula and pedagogy[429].

Ian Robottom[430] suggests that teachers and teacher educators should be encouraged through professional development to critically question the relationship between theory, practice and circumstances - emancipating them from traditional technocratic and often unquestioning approaches. He recommends action research as a suitable methodology to bridge the gap between theory and practice. His work in teacher education has been very influential in EE not just in Australia but also overseas[431].

Action research is congruent with learning for sustainability principles (see Volume 1 in this series). In action research, theory is not separated from practice as the teacher is the researcher and practitioner. Action research can assist teachers in professional development by enabling them to understand and challenge the reasons for their actions, and the institutional structures and relationships that create them[433] (also see 'Action Research' on page 29). The process of involving teachers as researchers empowers them and confers ownership of their

Box 2.108
Education Reorientation

'To effectively and completely reorient education to address sustainability, all disciplines in a teacher preparation institution can and should be involved in the reorientation process.'

UNWIN/UNESCO (2000)

Box 2.109
'Critical' Pedagogy

'Teacher education for sustainability should be a process of communicative rather than strategic action. Teachers should learn through critical pedagogy in universities, school classrooms and the community and should thereby develop skills in planning and delivering a wide range of experiential and democratic teacher and learning activities of the type now used in moral, social, developmental and Environmental Education.'

Huckle (1996, p109)

Box 2.110
Components of Professional Development

'Active participation and critical reflection are essential components of professional development [in EE].'

John Fien (2001 p79)

Box 2.111 Pedagogical Principles For Teacher Education Practice In EE

Robottom[432] has constructed five pedagogical principles for teacher education practice in EE:

1. *Participatory and practice-based*. Teacher education programs need to consider the process of learning required to construct knowledge through experience, dialogue and reflection.
2. *Enquiry-based*, encouraging teachers to adopt a research approach to curriculum planning and teaching skills. This will problematise current practices in EE and schooling, enabling teachers to analyse and critique, offering potential for improvement.
3. *An ideological critique* of values and assumptions, which inform policies, resources and practice. Exposing these values and assumptions enables teachers to reflect upon their practices, empowering them to create changes in accordance with the EE objectives they favour.
4. *Community-based* and involves students in the active investigation and amelioration of communities' issues of sustainability.
5. *Collaborative,* building teachers' abilities to influence the development of transformative practices in EE.

Box 2.112 OECD CERI's Environment and Schools Initiative[435]

The OECD CERI's *Environment and Schools Initiative (ENSI)* is an international example of a successful professional development program for teachers. The initiative, launched in 1986, was targeted at schools across Europe and Australia and aimed to develop students' environmental awareness and dynamic qualities such as initiative, interdependence, commitment and readiness to accept responsibility[436]. The initiative identified teachers as core agents of change in this innovative educational process. Through the process teachers were asked to[437]:

- interpret and realise the general aims of the project in the context of their environmental initiatives;
- systematically reflect upon their own activities in order to improve them, and contribute to knowledge of environmental initiative work; that is, engage in action research.

own professional practices as they have an understanding of the justifications, opportunities and limitations for change within the context of the institution, and in challenging the institution[434]. This is important if teacher education is to reorient structures and practice towards learning for sustainability.

Action research has been used for the professional development of teachers in EE for over two decades. Internationally, programs such as the OECD's *Environment and Schools Initiative (ENSI)* and the UNESCO Griffith University project Learning for *Sustainable Environment Project* have used action research for the development of teacher understanding and skills in EE.

The action research component of the *ENSI* is innovative as it engages and supports teachers in evaluating their work with students, and in communicating and contributing to professional knowledge. It helps bridge the gap between EE theory and practice. Research has shown that the impact of the *ENSI* projects has not only been in a shift in student-teacher relationships towards those that are more democratic, but that this approach to teacher education has been instrumental in developing intra- and trans-national partnerships and whole-school approaches to EE innovation (see 'Action Research' on page 29 for further information).

The *Learning for a Sustainable Environment Project* was established by UNESCO-APIED and Griffith University in the early 1990s and resulted in a teacher education for sustainability manual. It used action research as a tool for professional development assisting teachers from across the Asia- Pacific region to develop teachers' capacities in EE[439] (see Box 2.113). The use of action research methodology in this process of teacher education modelled: the principles of EE and learning for sustainability; of partnerships, democratic decision-making and learning; and of active participation and 'critical reflection'[440]. The project was innovative in that it highlighted the context specific nature of curriculum development, teacher education and reflective practitionerbased research in learning for sustainability. This methodology assisted teachers to reorient systems and practice towards sustainability[441]. The project also developed a network of teacher education institutions across the Asia-Pacific, and highlighted the need for involvement by policy makers in the teacher education process.

Box 2.113
The Learning for a Sustainable Environment - Innovations in Teacher Education Project[438]

This is an action research project for teacher education in the Asia-Pacific, which began in 1994. It aimed to assist teacher educators to 'include the educational purposes and innovative teacher and learning strategies of Environmental Education in their programs'.

The project developed in three stages:

1. Development of a framework of principles relating to a) EE and b) professional development;
2. Using action research, adapt and translate the framework for local use. Participants evaluated and reported on the process, considering personal and professional development, positive influences of the process, issues related to the process and recommendations for improving the process;
3. Develop national networks for supporting EE in teacher education, including the development of an on-line series of teaching modules.

'The aim of this process was…to use the process of curriculum writing, sharing and critique as a practical and reflective strategy for professional development'

Fien (2001a, p79)

v) Core Competencies for EE and Learning for Sustainability

Competency frameworks inform teacher education and assessment models providing guidance in EE provision and standards. Different from simply skills or knowledge, competency involves 'competent performance of effective action [through the] mobilization of knowledge, cognitive and practical skills'[442].

Three models of competencies exist[443]:

- **The behaviourist construct:** Competencies are primarily skill-oriented. They outline a description of the performance required in a particular environment or setting, and can be easily demonstrated and assessed. As such, they stress the teacher's performance over their intentions, motivation or understanding of the competency.

- **The generic construct:** Competencies involve a collection of capabilities that are linked conceptually. To achieve this competency, teachers must develop an aggregate of defined skills, knowledge, understanding and motivation. Higher order skills and the acquisition of personal and professional goals are acknowledged in this construct. It also requires both the education and training of a teacher, and focuses on general abilities rather than the reductionist approach offered in the behaviourist construct.

- **The cognitive construct:** This construct assumes that competency is about potential rather than behaviour. It engages teacher's abilities to improve performance by coordinating cognitive abilities with management and action qualities. That is, it asks teachers to adapt what they have learned in a controlled environment, to practice. This construct is unique in that it uses competencies to enhance cognitive structures, and is underpinned by a process-oriented approach.

Initial competency models in EE such as those developed by Stapp[444] in 1975, and later adopted by UNESCO-UNEP's *International Environmental Education Programme* for further development internationally, supported behaviourist constructs. Later, however, many criticised this approach due to its narrow interpretation, which emphasises skill acquisition, ignoring the significance of the pedagogy underpinning performance[445].

In the cognitive construct, however, positive and innovative change is seen as a validation of competency or success. OECD-CERI's *Environment and Schools Initiative* (see Box 2.112) is based upon a cognitive construct model that encourages teachers to find innovative solutions to their problems, engaging them in 'critical reflection' during practice.

Several standards have been developed for teachers' competencies in EE. Of particular relevance to EE are '*The Standard for Initial Teacher Education in Scotland*'[446], '*Guidelines for Initial Preparation of Environmental Educators*'[447], '*Wisconsin's Model Academic Standards for Environmental Education*'[448] and the recommendations from UK's '*Learning to Last*'[449]. The recent OECD report '*Key Competencies for a Successful Life and a Well Functioning Society*'[450] is also relevant as it recognises competencies critical to the achievement of sustainability. More recently, in 2004, the European Union commissioned a large research project involving 6 countries across Eurpe on developing compentencies in education and learning for sustainability. The project is to be coordinated by ENSI[451].

In Australia, There have been several attempts to define the EE competencies needed by a teacher[452]. The set of competencies outlined by the Queensland Board of Teacher Registration[453] were perhaps considered the most innovative as they not only identified the integral role of EE in initial teacher education but also the need for change within institutions providing teacher education. The majority of EE competencies (Competency Set 2) outlined by the Queensland Board of Teacher Registration are mostly generic or cognitive constructs (see Box 2.114).

The development process of these competencies is also in question. Anecdotal evidence suggests that teacher-education institutions in Queensland largely ignored the competencies outlined by the Board. This suggests that they lacked involvement in defining the competencies and that the Board did not recognise existing demands and pressures already placed on initial teacher education programs. This finding provides an important lesson in the importance of process and partnerships when developing comprehensive guidelines and principles for teacher competencies in EE.

Box 2.114
Competencies for Initial Teacher Education

'The environmentally educated teacher who has developed these two sets of competencies will be able to:

Competency Set 1: Environmental Studies

- understand the major concepts and principles of ecology as the basis for developing similar competencies in students;
- understand concepts and principles of social ecology as a basis for developing similar competencies in students;
- monitor environmental quality, investigate environmental issues and evaluate alternative solutions to them in order to develop, select and implement curricular materials and strategies which will develop similar competencies in students; and
- take positive action for the purpose of protecting and improving the quality of life and the quality of the environment (if indeed one can be separated from the other) as a basis for developing similar competencies in students

Box 2.114
(continued...)

Competency Set 2: Environmental Education

- apply a knowledge of educational philosophy to the selection or development of curricular programs and strategies to achieve both general education and Environmental Education goals;
- utilise current theories of learning, thinking, moral reasoning, the knowledge-attitude-action relationship and political socialisation in selecting, developing and implementing curricular strategies to effectively achieve Environmental Education goals;
- apply the theory of transfer of learning in selecting, developing and implementing curricular materials to ensure that learned knowledge, attitudes and cognitive skills will be transferred to the learner's choices and decision-making concerning lifestyles and actions;
- effectively infuse appropriate Environmental Education curricula and methods into all disciplines to which the teacher is assigned;
- develop and use effective means of planning for instruction; and
- effectively evaluate the results of Environmental Education curricula and methods in both cognitive and affective domains.'

Government of Queensland (1993, p21)

vi) Key Multipliers and Strategic Partnerships in Teacher Education in EE

Box 2.115
Quality EE

'Professional development opportunities for teachers are fundamental to improving the quality of Environmental Education in the school education sector.'

Department of Education, Science and Training (2000, p9)

Box 2.116
EE Imperatives

'The *Environmental and Development Education Project for Teacher Education* invited teacher educators to consider the imperatives of education for sustainable living, to critique, trial and evaluate the workshop modules in *Teaching for a Sustainable World*, and to interact with members of the Environmental Education and development education communities in Australia in order to find ways of addressing the global crisis of development, environment and sustainability.'

Fien (1995, p22)

Teachers, teacher educators and teacher education institutions are key multipliers for EE and essential to the successful implementation of learning for sustainability in schools. However, change at the institutional levels is difficult to achieve. To access schools, education authorities and/or universities, democratic and strategic partnerships between government, schools, institutions and the EE community are crucial.

In Australia, and internationally, several collaborative partnerships have been established through teacher education programs in EE. These include:

- Australian Government and Griffith University's *Environmental and Development Education Project for Teacher Education*[454];
- UNESCO ACIED & Griffith University's *Learning for a Sustainable Environment - Innovations in Teacher Education Project* (Asia-Pacific region)[455];
- OECD-CERI's *Environment and Schools Initiative* professional development action research program (Europe and Australia)[456];
- New Zealand's *National Professional Development Program in EE*[457]; and
- WWF-China's *Environmental Educators Initiative*[458].

In Australia, Griffith University has played an important role in the collaborative development of tools and manuals for the development of teachers and teacher educators in understanding the content and pedagogy of EE. The *Environmental and Development Education Project for Teacher Education*[459] established by the Australian Government with Griffith University in the early 1990s, for example, was the first project of its kind in Australia to engage teacher education institutions, as well as government departments and NGOs from across Australia in developing workshop modules for initial teacher education (see Box 2.116). The manual development process had a dual purpose as it not only produced an EE resource but also served as professional development for teacher educators. Following its initial publication, the manual has been published by UNESCO as '*Teaching for a Sustainable World*'[460]. However, neither document's impact on teacher education institutions have been documented.

New Zealand's national *Professional Development Program in EE*[461] formed part of the strategy to implement the Ministry of Education's '*Guidelines for Environmental Education in schools*'[462]. In four years the program has reached approximately 20% of New Zealand's teachers[463]. Workshops were used to assist these teachers in planning Environmental Education programs for their schools based

upon the Guidelines. Teachers were encouraged to keep journals of the changes implemented in their schools, providing a unique opportunity for the exchange of dialogue concerning the process. Since 2000, many of the participating schools have gone on to become *Enviro-Schools*[464].

China's *Environmental Educators Initiative*[465] (see Box 2.117) has also been innovative in its approach to teacher education. WWF China founded the project and in a unique approach was highly prominent in influencing the development of China's national school education policy on learning for sustainability. This initiative, now in its 10th year, is funded by Beyond Petroleum (BP) and facilitated by WWF-UK. Through it, WWF-China developed an innovative partnership with the National Ministry of Basic Education and with China's three main teacher education universities - Beijing Normal, East China Normal (Shanghai) and South-West Normal (Chongqing) - as well as with the People's Education Press (PEP) who publish all school textbooks in China.

The project adopts a 'critical' approach to EE in the curriculum and trains teachers in envisioning, 'critical reflective thinking', ecopolitics, values clarification and EE research. It has covered issues as wide ranging as consumerism, pollution and globalisation[466]. The initiative based upon regional workshops across China (from Tibet to Shanghai) has developed Chinese teacher educators' capacities in EE, and continues to support their professional development through financing a distance-education *Masters Programme in Education for Sustainability* from South Bank University (London).

WWF China's *Environmental Educators Initiative* has built partnership alliances with decision-makers at the highest level within the school education system across the provinces in its first six years. It has assisted the National Department of Basic Education to introduce alternative and active pedagogies in teacher education institutions and to reform teaching and learning strategies within pilot schools. These achievements were accomplished by working strategically with key institutional partners, building EE capacities, supporting existing EE agendas and by identifying and working within a clear set of EE parameters[467]. There are no similar initiatives in Australia.

Box 2.117
China's Approach to Professional Development of Teachers in EE

The WWF China Program's *Environmental Educators' Initiative* (EEI) builds partnerships and capacity to institutionalise EE into the school education system in China.

'Phase 1 of WWF China Education Programme had some notable outcomes:

- the building of a cadre of expertise in EE in China - both in the partner institutions and in the WWF China Program - for the implementation of the Initiative; the setting up of three EECs in Beijing Normal, East China Normal and South-West China Normal Universities - each with about 10 pilot schools for training purposes - as models for the infusion of EE into the teacher training curriculum;
- the development and publication of a teacher training manual on learning for sustainability by EECs;
- the development and publication of a book of teaching materials in EE linked to the school curriculum *Education for Sustainability: Model Lessons for Grade 1-9* produced by the PEP; and
- the development of a Certificate and Master Degree in EE/EFS in China.'

Aitchison (2002)

2.8 Summary of Needs and Recommendations

In Australia, the school education sector continues to be the dominant focus of Environmental Education thought and practice. This document provides a review of Environmental Education in this sector and its contribution to sustainability in Australia. It forms part of a series, prepared by the Australian Research Institute in Education for Sustainability (ARIES) for the Australian Government Department of the Environment and Heritage. The report consolidates and builds upon previous studies and emerging trends in school education. It provides a snapshot of the current context and experiences within primary and secondary education, teacher education and early childhood education to inform future work in this area.

Environmental Education remains a non-mandatory component of schools (with the exception of NSW) and still struggles for acceptance in mainstream curriculum in Australia. Across the States and Territories, curriculum policy and guidelines documents have been slow to react to sustainability and only few have recently begun to take on the language of, and concepts associated with it. As such, for most teachers and school managers, Environmental Education remains a low priority. In early childhood there are also very few examples of Environmental Education and current approaches tend to focus on a hands-on approach to the nature, rather than on learning for sustainability. While some teacher education and professional development courses may include Environmental Education concerns, these programs generally do not adequately prepare teachers to effectively use learning for sustainability approaches to Environmental Education in the classroom.

Whole school approaches, which involve staff, students and community in learning for change towards sustainability, are beginning to emerge. *Sustainable Schools*, for example, encourages schools to consider their pedagogical approaches, curricula, infrastructure and management policies in light of sustainability principles and processes. Such initiatives are beginning to shift approaches to Environmental Education within schools from singular, teacher led, knowledge centred activities to student centred, action-oriented, systemic approaches to learning for sustainability. The involvement of the school community through partnerships is becoming increasingly important. As schools look outside their grounds, Environmental Education Centres are becoming influential in guiding schools and communities towards local change for sustainability.

In the future, in order to strengthen it's contribution to sustainability, school based Environmental Education will need to:

- Build the capacity of educators (including early childhood educators) in learning for sustainability approaches;
- Establish whole of school approaches to learning for sustainability, which consider the management, curriculum, pedagogical approaches and infrastructure of the school; and
- Develop strategic networks between educators, teacher educators and the schools communities to work towards change for sustainability.

Recommendations

The research undertaken by ARIES has revealed a number of key needs in the areas of primary and secondary schools, early childhood education as well as teacher education. The following recommendations have been derived from these key needs. The recommendations identify practical steps at a policy, practice and research level that could strengthen the contribution of Environmental Education towards sustainability within the school education sector.

Policy:

1. A national Environmental Education **statement and accompanying framework**, for schools, early childhood centres and teacher education institutions, is required to ensure that students receive a quality and consistent learning experience in Environmental Education and sustainability. The framework would need to reflect nationally agreed education goals as well as pedagogical principles in the area of learning for sustainability.

2. The Federal Government, in collaboration with teacher education and registration boards in each State and Territory, to provide a **framework for teacher education** in learning for sustainability approaches to Environmental Education. The teacher learning for sustainability framework would be based upon research findings and aligned with the national statement for Environmental Education in Schools.

3. A **national grant scheme** should be established for schools to develop programs (such as *Sustainable Schools*) that adopt whole-school approaches to Environmental Education and model sustainability in their management and operations.

4. All States and Territories should be provided with incentives to develop (or update) their own **mandatory State policies for Environmental Education and sustainability in schools**. The State policies should reflect the school and curriculum objectives as well as pedagogical principles outlined in the national framework for Environmental Education in schools (see recommendations 1 and 2).

5. Schools should be provided with incentives to develop their own **school policy and action plan for Environmental Education and sustainability**. These documents should adopt a whole-school approach and be developed in partnership with its stakeholders. Incentives could range from providing guidelines on how to develop school policy and action plans in this area to professional development for executive staff and principals.

6. Provide a case to boards of studies and curriculum and examination authorities for a **stronger curriculum and syllabus focus** on Environmental Education. This should focus particularly in KLAs, core senior secondary courses and learning for sustainability approaches to Environmental Education, and also indicate **accountability mechanisms** to ensure its adoption by teachers in class.

7. Provide incentives for **Environmental Education Centres to develop their own centre policy** incorporating learning for sustainability approaches to Environmental Educaiton and to model sustainability in their own operations and management.

Practice:

8. Federal government, in collaboration with States and Territories, to provide **guidelines for schools on partnerships** so that schools can move beyond networking, towards partnerships that are crosssectoral and multi-stakeholder. These guidelines should be informed by research and provide support to schools in navigating partnership legalities, policies and resource issues.

9. Develop a **guide to assist citizen science programs** to make the shift from promoting environmental awareness to learning for sustainability. The guide is to be developed using learning for sustainability approaches to Environmental Education and should build upon evaluations of citizen science programs. The guide is to be targeted at citizen science organising bodies as well as teachers engaged in these programs. The guide can also assist funding bodies in ensuring that resources are allocated to programs that contribute towards sustainability outcomes.

10. Provide incentives and support for teachers in the KLAs of English, Mathematics, the Arts, Health and Physical Education as well as Science and Studies of the Society so that **cross-curricular infusion is strengthened**. Incentives could include resource materials, which identify specific learning outcomes within KLAs and have the potential to contribute to learning for sustainability.

11. Capture and **document case studies of action research and mentoring** for sustainability for use in teacher education. These case studies should assist with developing an understanding of how these approaches contribute to learning for sustainability.

12. Based on findings from the Youth and Sustainable Consumption Research Project (refer to Box 2.80 on page 35) **develop resources for teachers** in partnership with professional Environmental Education associations to address this issue.

13. Working from action research data (see recommendation 29), develop a set of **criteria for the evaluation of effective Environmental Education** programs, resources and professional development courses offered by outdoor and nature-based Environmental Education providers (including Environmental Education Centres).

14. Fund a national program in **learning for sustainability approaches to Enviromental Education** for teacher educators

who are environmental educators (similar to that undertaken in New Zealand or China).

15. Introduce incentives for teacher education providers to **develop core units on learning for sustainability** in school education including early childhood.

16. Develop a **mentoring program for teachers and managers working in Environmental Education Centres** to help them explore learning for sustainability approaches and how it influences their work. A national network that links those working on the issue together could support the mentoring.

17. Allocate resources for **strengthening multi-stakeholder networks or hubs** – including government agencies, parents and carers, teachers, teacher educators and early childhood teacher educators.

18. Develop and offer **short courses for teachers and early childhood educators** in learning for sustainability approaches, as well as for others associated with this area including government agencies, parents and carers, teacher educators and early childhood teacher educators. This course could be supported by a mentoring scheme.

19. Build capacity in **teacher education institutions by offering grants for research** projects in learning for sustainability across the curriculum. The grant would be offered to Heads of Departments and would involve a minimum of three teacher educators from different specialisms within the same Department.

20. Fund mentoring programs on learning for sustainability approaches to Environmental Education, **linking teachers and teacher educators** who are experienced in Environmental Education, futures education, multicultural education, global education and citizenship education.

Research:

21. Commission research, which builds upon the work undertaken by OECD- CERI's *Environment and Schools Initiative*, on the potential of **Environmental Education as a catalyst for school development and quality education** outcomes.

22. Fund research that will lead to the identification of **core competencies for teachers** in learning for sustainability and provide advice on how to develop these competencies. This research will be presented to the Australian Council of Deans of Education as well as to teacher quality advisory panels, teacher education registration boards, etc.

23. Undertake longitudinal research into the **impact of pedagogical approaches** in school-based and early childhood education on learning for sustainability.

24. Commission research to outline the **types of partnerships necessary** to bring about change for sustainability, and how these partnerships can be developed. The research could develop indicators of effective partnerships for sustainability. Implications for Environmental Education planning and policy would be identified.

25. Commission research that explores how States and schools can **shift the practice of Environmental Education towards more systemic approaches** to school curriculum, pedagogy, teacher education and school-community partnerships.

26. Commission research to explore the development and implementation of an **accountability mechanism/tool for Environmental Education in schools**. School principals will use the tool as a framework to report against in their school's annual report.

27. Undertake meta-evaluation research that identifies lessons learnt on the variety of processes developed in Australia in the area of **school buildings and grounds, and document examples of good practice**. This research would inform the national framework and State and Territory Environmental Education policies in schools (see recommendaiton 1).

28. Commission research into the **current and potential role of intercultural perspectives** on learning for sustainability. The research should draw upon experiences in Canada and South Africa where Environmental Education and learning for sustainability are critically linked to indigenous knowledge and intercultural understanding.

29. Commission **action research that engages outdoor and naturebased Environmental Education** providers (including Environmental Education Centres) in exploring and questioning the outcomes of current nature-based Environmental Education programs, and exploring the potential of experiential learning and action learning approaches to strengthen the contributions of nature-based programs to sustainability.

Endnotes

[1] Andrew and Malone (1995)
[2] This figure is based on an analysis of books published in Australia since 1994 with the words 'Environmental Education' in the title. Kinetica and BookFind searches were used to produce a list of the publications.
[3] EE has been easier to implement in the community and industry sectors compared to the school sector, because they have been quicker to respond. Structures within the school education sector have been a major barrier for EE. See: Posch (1993); Gough (1997); Tilbury and Turner (1997)
[4] The NSW Government EE Policy for Schools (2001a) encourages EE approaches that develop a better quality of life for present and future generations, based on the principles of Ecological Sustainable Development. Essential Learnings in SA, Tasmania and NT use the terms futures thinking and interdependence commonly associated with sustainability. See: Government of South Australia (undated a); Government of Queensland (1993); Government of the Australian Capital Territory (1997); Curriculum Council Western Australia (1998a); Government of Victoria (1998); Government of the Australian Capital Territory (2000a); NSW Government (2001a); Government of Tasmania (2004)
[5] Curriculum Corporation (2003a); Heck (2003); Smith (2004)
[6] Government of Canada (2002)
[7] Manitoba Education and Training (2000)
[8] Sustainable Development Education Panel (2003)
[9] Department of Education and Skills, UK (2003)
[10] Sustainable Development Education Panel (2003)
[11] Learning and Skills Development Agency (2002)
[12] UNESCO (2000)
[13] Government of Canada (2002); Sustainable Development Education Panel (2003); Parliamentary Commissioner for the Environment (2004)
[14] Jickling (1992)
[15] Tilbury (2004b)
[16] Linke (1980); Gough (1997); Curriculum Corporation (2003a)
[17] The age when students commence and complete school can vary.
[18] Elliott (2003)
[19] Department of Education, Science and Training (2003)
[20] Department of Education, Science and Training (2003)
[21] Gough (1997). This is not unique to Australia. Posch (1990) and Tilbury and Turner (1999) argue that this is also the case across Europe.
[22] NSW Government (2001a)
[23] Department of the Environment and Heritage (2000)
[24] MCEETYA (1999)
[25] NSW Government (2001a)
[26] Coad (2003); Curriculum Corporation (2003a); Heck (2003); Smith (2004)
[27] Government of the Australian Capital Territory (1997)
[28] Government of the Australian Capital Territory (2000a)
[29] NSW Government (2002e)
[30] NSW Government (2001a)
[31] Government of the Northern Territory (1997)
[32] Government of the Northern Territory (2003)
[33] Government of Queensland (1988)
[34] Government of Queensland (1993)
[35] Government of South Australia (undated, a.)
[36] Government of Tasmania (2004)
[37] Malcolm et al (1992)
[38] Government of Victoria (1998)
[39] Curriculum Council Western Australia (1998 a)
[40] NSW Government (2001a)
[41] Tilbury and Henderson (2003)
[42] Coad (2003); Curriculum Corporation (2003a); Heck (2003); Department of the Environment and Heritage (2004c)
[43] Gough (1997)
[44] Gough (1997); Heck (2003)
[45] Heck (2003)
[46] Gough (1997); Heck (2003)
[47] Government of the Northern Territory (2003)
[48] Government of the Northern Territory (2003); Government of South Australia (undated, a.)
[49] Government of Queensland (1993); Curriculum Council of Western Australia (1998); Government of the Australian Capital Territory (2000); NSW Government (2002d) ; Government of the Northern Territory (2003); Government of Victoria (2004); Government of Tasmania (2004); Government of South Australia(undated, b)
[50] Curriculum Corporation (2003a)
[51] Gough (1997)
[52] Gough (1997); Fien (2001b).
[53] Gough (1997); UNESCO (2002b)
[54] Department of the Environment and Heritage (2004c)
[55] Curriculum Corporation (2003a)
[56] Curriculum Corporation (2003a)
[57] Curriculum Corporation (2003a)
[58] Curriculum Corporation (2003a)
[59] Curriculum Corporation (2003a)
[60] Curriculum Corporation (2003a)
[61] Curriculum Corporation (2003a)
[62] Curriculum Corporation (2003a)
[63] Rickinson (2001)
[64] Curriculum Corporation (2003a)
[65] Heck (2003)
[66] Curriculum Corporation (2003a)
[67] Curriculum Corporation (2003a)
[68] Tilbury (1995); Fien and Tilbury (1998)
[69] Tilbury (2003a); Wilson-Hill (2003)
[70] Curriculum Corporation (2003a); Heck (2003)
[71] UNESCO-UNEP (1978)
[72] Curriculum Corporation (2003a)
[73] Curriculum Corporation (2003a).
[74] Fien (1993); Tilbury (1995); Huckle (1996); Sterling (1996); Fien (2001a); Sterling (2001); Tilbury (2003)
[75] Curriculum Corporation (2003a)
[76] Curriculum Corporation (2003a)
[77] Curriculum Corporation (2003a)
[78] Tilbury and Turner (1997); Tilbury et al (2003b); Tilbury (2004b)
[79] Curriculum Corporation (2003a)
[80] Heck (2003)
[81] Curriculum Corporation (2003a).
[82] Gough (1997) Heck (2003)
[83] Smith (2004)
[84] Coad (2003). Ms Sue Coad was a member of the National Environmental Education Council from 2000 to 2003. Currently she is the Principal of Aldgate Primary School in South Australia. Sue Coad has a Diploma, Graduate Diploma and Graduate Certificate in Teaching.
[85] Sterling (2001)
[86] Coad (2003)
[87] Gough (1997)

[88] The review does not seek to dissect the EE experience into isolated parts, instead, it identifies key 'hooks' that help us hang the experience of what is happening within the school education sector. These themes do not identify the outcomes or impact of EE in the school education sector since this is beyond the scope of the report. Empirical evaluation and longitudinal research is required to identify the achievements and changes resulting from EE.
[89] Leach and Fairhead (2002)
[90] Coastal Zone Australia (2003)
[91] Bäckstrand (2002)
[92] Coastal Zone Australia (2003)
[93] Department of the Environment and Heritage (2004d)
[94] Waterwatch Australia (2004)
[95] See: http://www.saltwatch.org.au/
[96] Sydney Water (2002)
[97] Western Australian Museum (2003)
[98] Airwatch Australia (2004)
[99] Penuel and Means (in press)
[100] Sydney Water (2002)
[101] NSW Government (2001b)
[102] Penuel and Means (in press)
[103] Department of the Environment and Heritage (2004d)
[104] UCAR/CSU (2004); Penuel and Means (in press)
[105] Sydney Water (2002); Department of the Environment and Heritage (2004d); Saltwatch see http://www.saltwatch.org.au/, Waterwatch see: http://www.vic.waterwatch.org.au/
[106] Sydney Water (2002)
[107] OzGreen (2003)
[108] OzGreen (2003)
[109] Ramsey and Rickson (1977); Lucas (1979).
[110] UNCED (1992)
[111] UNESCO (2002a)
[112] Webler et al. (1995); Lyons et al. (2001)
[113] Damme (1998) Tilbury (2003)
[114] Clarke and Illman (2001)
[115] Federico et al. (2003)
[116] Sustainable Development Education Panel (2003)
[117] National Environmental Education Committee - Jamaica (1998)
[118] Sustainable Development Education Panel (2003)
[119] Sterling (1996, 2002)
[120] Sterling (2004) personal communication via email. Stephen Sterling is a leading EE thinker and well known internationally.
[121] Sterling (2004) personal communication through the email. Stephen Sterling is a leading EE thinker and well known internationally.
[122] UNESCO-UNEP (1978, pp1-9)
[123] UNCED (1992, Ch 36); UNESCO (1997, 2002a)
[124] Sterling (1993)
[125] Lovelock (1979)
[126] Capra (1996)
[127] Sterling (2002)
[128] Sustainable Development Education Panel(2003, p9)
[129] Tilbury (1993)
[130] Capra (1982)
[131] Bamford (1999)
[132] Posch (1990); Tilbury and Turner (1997)
[133] Lewis, Neil and Gurry (2003) for further information about the program,
[134] Sterling (2004) pers. com.
[135] Sterling (2004) pers. com.
[136] Gould League (2004); Department of the Environment and Heritage (2004a)
[137] Van Matre (1979); Van Matre & Johnson (1988); Van Matre (1990)
[138] Cornell (1978)
[139] Tanner (1980, 1998a, 1998b)
[140] Palmer (1993); Palmer and Suggate (1996)
[142] Gough, S. (1999)
[141] Chawla (1988)
[143] Gough, A. (1999)
[144] Gough, A. (1999)
[145] Payne (1999)
[146] Gough, A. (1999); Gough, S. (1999); Payne (1999); Gough, N. (2002); Garlick (2003)
[147] Law (2003)
[148] Lee (1994)
[149] Lee (1994)
[150] NSW Government (2002e)
[151] Kolb (1984)
[152] Kolb (1984)
[153] Law (2003)
[154] Law (2003)
[155] Law (2003)
[156] Koo (1999)
[157] Antonacopoulou (2002)
[158] Beaty (1999)
[159] STREAM (2003)
[160] Henton et al (1979)
[161] ILT Team (2004)
[162] UNCED (1992)
[163] United Nations (2002)
[164] Hopkins and McKeown (2002); UNESCO (2002a)
[165] UNESCO (2003)
[166] Department of Education and Skills, UK (2003)
[167] Department of the Environment and Heritage (1992); Government of Canada (2002); Parliamentary Commissioner for the Environment (2004)
[168] National Environmental Education Committee - Jamaica (1998); Government of Canada (2002); IGES (2002); Department of Education and Skills, UK (2003); Parliamentary Commissioner for the Environment (2004).
[169] United Nations (2002, 2003c, 2003e)
[170] Poncelet (2001); Tilbury (2004a).
[171] MCEETY (1999,p2)
[172] Department of the Environment and Heritage (2000)
[173] Department of the Environment and Heritage (2000)
[174] NSW Government (2002e)
[175] Government of Victoria (1998); NSW Government (2001a); NSW Government (2002)
[176] Government of Victoria (1998)
[177] NSW Goverment (2001a)
[178] NSW Government (2002e)
[179] NSW Government (2004b)
[180] Tilbury (2004c)
[181] NSW Government (2004b)
[182] Department of the Environment and Heritage (2004b)
[183] New Zealand Association for Environmental Education conference: Christchurch New Zealand, January 2004.
[184] Tilbury (2004a)
[185] OECD CERI (1995); Richardson (1998); Juniper and Moore (2002);Bhandari and Abe (2003); United Nations (2003d).
[186] Prahalad and Ramaswamy (2001)
[187] Howard (2002); Kilpatrick et al. (2002)

[188] Smith (2004) personal communication via email. Syd Smith is the Director of EE within the NSW Department of Education and Training.
[189] The 21st Century Education Foundation (2001)
[190] Kilpatrick et al. (2002)
[191] Gould League (2003)
[192] Department of the Environment and Heritage (2004b)
[193] NSW Government (2004c)
[194] Smith (2004) personal communication via email. Syd Smith is the Director of EE within the NSW Department of Education and Training.
[195] Kilpatrick et al. (2002)
[196] Schoor in Kilpatrick et al. (2002)
[197] OECD ENSI (2001)
[198] Learning through Landscapes (2004)
[199] Boston Schoolyard Funders Collaborative (2003)
[200] Evergreen (2003)
[201] Bermuda Aquariums, Museums and Zoos (2001)
[202] Sveriges Lantbrunks Universitet (2004)
[203] Enviroschools Foundation (2004)
[204] Bermuda Aquariums, Museums and Zoos (2001); OECD ENSI (2001); Boston Schoolyard Funders Collaborative (2003); Evergreen (2003); Learnscapes (2003); Enviroschools Foundation (2004); Learning through Landscapes (2004); Sveriges Lantbrunks Universitet (2004)
[205] Elliott (1999); Skamp and Bergmann (2001a); Learnscapes (2003)
[206] Government of Queensland (1993); Government of Victoria (1998); NSW Government (2001a)
[207] Government of Queensland(1993); Government of Victoria (1998); NSW Government (2001a)
[208] NSW Government (2004a)
[209] Skamp and Bergmann (2001a); Learnscapes (2003)
[210] Learnscapes (2003); NSW Government (2004c)
[211] Lucas (1997a); Malone and Tranter (2003)
[212] Lucas (1997b)
[213] Davis in Skamp and Bergmann (2001a)
[214] Tschapka (2004) personal communication via email. Johannes Tschapka completed his PhD in Australian exploring the use and effectiveness of Learnscapes.
[215] Learnscapes (2003); OECD ENSI (2001)
[216] Smith (1975)
[217] Gough, A. (2004) personal communications.
[218] Gould League (2001)
[219] Gough, A. (2004) personal communications
[220] NSW Government (1998)
[221] VAEE (2004); CERES (2004); Department of the Environment and Heritage (2004a)
[222] This term was identified as a key component of EE in the 1970's (see Greenall 1981; Linke 1977,1980; Lucas 1979) but did not emerge in practice.
[223] It took a decade before shifts in EE approaches called for by the EE literature were reflected in environment and education policies.
[224] Clean Up Australia Day (2004)
[225] See: http://www.planetark.com/index.cfm
[226] Hungerford et al. (1990, 1992); Winther et al. (1994)
[227] Tilbury (1995)
[228] Jickling (1992)
[229] Jickling (1992); Jickling and Spork (1998)
[230] Hungerford and Volk (1984, 1990)
[231] Winther, Volk and Hungerford (1994)
[232] Government of Queensland (1993, 1988)
[233] Government of Queensland (1993)
[234] NSW Government (2001a)
[235] Government of the Australian Capital Territory (1997)
[236] Sterling (2004) personal communications
[237] Sterling (2002)
[238] Jensen and Schnack (1997)
[239] Jensen (2002)
[240] OECD ENSI (2000)
[241] Posch (1990); Kyburz-Graber and Robottom (1999); OECD ENSI (2000); Schattenmann (2000)
[242] OECD CERI (1991); Losito and Mayer (1995); Mayer (1995); Posch (1995)
[243] Jensen and Schnack (1997)
[244] Jensen and Schnack (1997); Breiting and Morgensen (1999)
[245] Wilson-Hill (2003)
[246] Arnstein (1969)
[247] Hart (1997)
[248] Driscoll (2002)
[249] Wilson-Hill (2003)
[250] Tilbury (1995); Fien and Tilbury (1998); Tilbury et al. (2003b)
[251] Wilson-Hill (2003)
[252] Wilson-Hill (2003)
[253] UNCED (1992); UNESCO (2002a)
[254] Tilbury (1995); Janse van Rensburg (2000)
[255] Wilson-Hill (2003)
[256] Greenall-Gough and Robottom (1993); Wals (1996); Tilbury and Turner (1997); Janse van Rensburg (2000).
[257] Robottom (1987a); Huckle (1991); Tilbury (1995).
[258] Kemmis and McTaggart (1982); Carr and Kemmis (1986); Kemmis and McTaggart (1882); Elliot (1991); McKernan, (1996); Tilbury, (1999); Janse van Rensburg (2000).
[259] Robottom (1987a); Huckle (1991); Tilbury (1995).
[260] Tilbury (1995).
[261] Tilbury (1993); Tilbury (1995).
[262] Tilbury (1995).
[263] Tilbury (1995).
[264] Tilbury (1995).
[265] Greenall-Gough and Robottom (1993); Fien et al. (1997); Janse van Rensburg (2000).
[266] Tilbury (1999a, p59-63).
[267] Tilbury (1999a).
[268] Tilbury (1999a); Schreuder (1994a); Schreuder (1994b); De Lange and Schreuder (1996); Schreuder (1997).
[269] Tilbury (1999a)
[270] Greenall-Gough and Robottom (1993)
[271] Fien et. al (1997); Fien (2001); Tilbury (2001)
[272] Fien et al. (1997)
[273] Fien et al. (1997)
[274] Greenall-Gough and Robottom (1993); Tilbury and Turner(1997); Janse van Rensburg (2000)
[275] Greenall-Gough and Robottom (1993)
[276] Greenall-Gough and Robottom (1993)
[277] Fien and Tilbury (1996); Fien et al. (1997); Fien (1999a); Fien (1999b)
[278] Greenall-Gough and Robottom (1993)
[279] Robottom (1987b); Greenall-Gough and Robottom (1993); Robottom and Hart (1993); Kyburz-Graber and Robottom (1999); Robottom (2003)
[280] OECD ENSI (2000)
[281] Kyburz-Graber and Robottom (1999); OECD ENSI (2000)
[282] OECD ENSI (2000)
[283] OECD ENSI (2000)
[284] OECD ENSI (2000)
[285] OECD ENSI (2000)
[286] Kyburz-Graber and Robottom (1999); OECD ENSI (2000)

[287] NSW Government (2002e); Government of Queensland (1993)
[288] NSW Government (2002a)
[289] Government of Queensland (2003a)
[290] Zoos Victoria (2003)
[291] Zoos Victoria (2003)
[292] Zoos Victoria (2003)
[293] Museum Victoria (2002)
[294] Government of South Australia (undated, d)
[295] WA Gould League Inc (undated,)
[296] Government of the Australian Capital Territory(2000b)
[297] See section 'Experience, Experiential and Action Learning' on page 17 of this document
[298] NSW Government (2002a); Government of Queensland (2003a)
[299] NSW Government (2002a); Government of Queensland (2003a)
[300] Institute for Earth Education (2001)
[301] Darlington and Black (1996)
[302] Gough (1997)
[303] Gough (1997)
[304] Institute for Earth Education (2001)
[305] Gough (1993)
[306] Gough (1993)
[307] Darlington and Black (1996)
[308] NSW Government (2002b)
[309] Webb (1989)
[310] NSW Government (2002a)
[311] Wackernagel and Rees (1996)
[312] Government of Queensland (2003b)
[313] Government of South Australia (undated, d)
[314] Mackenzie (2004) personal communication via email. Cam Mackenzie is the Principal of Bunyaville Environmental Education Centre, QLD.
[315] NSW Government (2002a)
[316] NSW Government (2001a)
[317] NSW Government (2002c)
[318] Kenway et al (2003)
[319] Kenway et al (2003)
[320] Bentley (2004) personal communication via email. Matthew Bentley is the Project Manager of the Youth and Sustainable Consumption project.
[321] UNEP-UNESCO (2001)
[322] Abraham et al (1990); Huckle (1990); Pepper (1990); Tilbury (1993;1995; 2003; 2004b); Fien (1993); Huckle and Sterling (1996); UNESCO (2002a)
[323] Kenway et al (2003), Tilbury (2004b)
[324] Fien (1993); Tilbury (1993, 2001); Huckle (1996, 1997); Sterling (1996)
[325] UNECE (2004, p6.)
[326] Tilbury (2004b)
[327] Tilbury (2004b).
[328] Tilbury (1995)
[329] WWF United Kingdom (1993)
[330] This theme is explored in greater depth in Volume 1 in this series as it is key to understanding the shift towards learning for sustainability within EE
[331] Tilbury and Henderson (2003)
[332] Tilbury and Henderson (2003)
[333] Read Tilbury and Henderson (2003) for deeper examination of this 'critical' paradigm and its links with adjectival education.
[334] See the work of John Fien, Annette Gough and Ian Robottom and Daniella Tilbury amongst others in the early 1990s, who advocated for education for the environment through promoting socially critical approaches.
[335] Hicks and Holden (1995); Tilbury and Henderson (2003)
[336] Tilbury and Henderson (2003)
[337] Adapted from Tilbury and Henderson (2003)
[338] Curriculum Corporation (2002)
[339] Tilbury and Henderson (2003)
[340] Curriculum Corporation (2002b)
[341] Holt (2001)
[342] Tilbury and Henderson (2003)
[343] Wiltshire et al. (1994)
[344] Government of Victoria (2001)
[345] Department of the Environment and Heritage (2000)
[346] NSW Government (2002e)
[347] Fien and Gerber (1988)
[348] Geography Teachers Association of Victoria (1988)
[349] Calder and Smith (1993)
[350] Fien (2001)
[351] NSW Government (2002e)
[352] In some Australian States, early childhood is designated from birth to 8 years, and therefore includes the first years of schooling.
[353] National Investment for the Early Years (undated)
[354] NSW Commission for Children and Young People and Commission for Children and Young People (undated)
[355] Rutter (2002, pp 30-31)
[356] Mustard & McCain (1999)
[357] Mustard & McCain (1999, p2)
[358] Department of Education, Science and Training (2000)
[359] Department of Education, Science and Training, (2000, p21)
[360] NSW Government (2003)
[361] NSW Government (2003)
[362] Davis and Elliot (2003)
[363] Tilbury (1993)
[364] National Childcare Accreditation Council (2001, p76)
[365] Davis and Elliott (2003).
[366] MacNaughton (2003)
[367] Davis and Elliot (2003)
[368] Burman (1994); Canella (1997)
[369] MacNaughton (2003, p75)
[370] Campus Kindergarten (2003)
[371] Macnaughton and Williams (2004, p371)
[372] Davis and Elliott (2003)
[373] Department of Education, Science and Training (2000, p48)
[374] Rowntree (2003) personal communication via email. Noeleen Rowntree conducts Environmental Education programs for the early years at Bunyaville Environmental Education Centre, Qld.
[375] Government of Queensland (2002)
[376] Government of Queensland (2002)
[377] Gordon Community Children's Centre (1993); Immig (2000)
[378] Davis and Elliot (2003); NSW Government (2003)
[379] Davis and Elliot (2003); NSW Government (2003)
[380] Davis and Elliot (2003); NSW Government (2003)
[381] Davis and Elliot (2003)
[382] Stacey (2000)
[383] Hargreaves (1997); Fullan (1999)
[384] Davis and Elliott (2003)
[385] Davis and Elliott (2003)
[386] Davis and Elliott (2003)
[387] Davis and Elliott (2003)
[388] Department of Education, Science and Training (2003)
[389] Department of Education, Science and Training (2003)
[390] UNESCO-UNEP (1990, p1)
[391] Cutter-Mackenzie and Tilbury (2002)
[392] UNESCO-UNEP (1978)

[393] Spork (1992); Gough (1997), Greenall (1981), Murdoch (1989) and Phipps (1991) in Cutter-Mackenzie and Tilbury (2002).
[394] Previously known as Environment Australia
[395] Department of the Environment and Heritage (2000)
[396] Department of Education, Science and Training (2000, p7)
[397] Government of Victoria (1998), Fien (1995)
[398] Fien (1995)
[399] Wilke, Peyton & Hungerford (1987); Tilbury (1992); Oulton & Scott (1995); Brinkman & Oulton (1996); Scott (1996).
[400] Department of Education, Science and Training (2003)
[401] Department of Education, Science and Training (2003)
[402] Government of Queensland (1993, p.1)
[403] These are a list of the priority professional development needs identified by practicing teachers in Department of Education, Science and Training (2001)
[404] McConnell (2001), University of Technology Sydney (2003), Jenkins (1999/2000)
[405] Southern Cross University (2002)
[406] Fien and Tilbury (1996)
[407] For example: Stephen Sterling workshop on Systems Thinking hosted by AAEE NSW January 2004
[408] For example :Gould League Victoria Sustainable Schools Seminar April 2004
[409] For example:, the Our Environment: It's a Living Thing NSW 2003 Mentoring Program offered by NSW Environmental Protection Authority, Australian Association of Environmental Education (NSW), Macquarie University and Nature Conservation Council of NSW.
[410] For example: Murdoch University Environmental Science Postgraduate Certificate Program
[411] For example: Science in Schools Program supported by Deakin University 2002
[412] For example: Churchill Fellowship opportunities
[413] For example: Churchill Fellowship opportunities
[414] Department of Education, Science and Training (2001)
[415] Department of Education, Science and Training (2001)
[416] Gough (2004)
[417] Fien (1995)
[418] Gould League (2003)
[419] Gould League (2003)
[420] Fien and Tilbury (1996)
[421] Huckle (1996)
[422] Gough (2004)
[423] NSW Government (2002e)
[424] Commonly used by the IUCN: World Conservation Union and Canadian Government. See also Fien (1993, 1997); Hart (1997); Huckle and Sterling (1996); Lang (1999/2000)
[425] Sterling (2001)
[426] Fien and Tilbury (1996); Huckle (1996)
[427] Robottom (1987a, 1987b).
[428] Huckle (1996)
[429] Huckle (1996)
[430] Robottom (1987a, 1987b)
[431] Fein and Tilbury (1996); Fien et. al. (1997), OECD-ENSI (2000, 2001a, 2001b)
[432] Robottom (1987a, 1987b)
[433] Robottom (1987c)
[434] Robottom (1987c)
[435] OECD ENSI (2000)
[436] OECD (1991)
[437] OECD (1991)
[438] Fien et al. (1997), Fien (2001); Tilbury (2001); Singh (2001).
[439] Fien and Tilbury (1996)
[440] Tilbury (2002)
[441] Fien (2001a); Tilbury (2001) ;Singh (2001)
[442] Rychen D.S. and Salganik, L.H. (eds.) (2003).
[443] SFien and Tilbury (1996); Tilbury (1993)
[444] Stapp (1975)
[445] Hyland (1993), in Fien and Tilbury 1996)
[446] Quality Assurance Agency for Higher Education (2000)
[447] Simmons (2000)
[448] Fortier et al (1998)
[449] Sustainable Development Education Panel (2003)
[450] OECD (2003)
[451] ENSI (2004) personal communication via email.
[452] Government of Queensland (1993); Wilke et al (1987)
[453] Government of Queensland (1993)
[454] Fien (1995)
[455] See 'Towards Critical Teacher Education' in this report for further information. See also Fien and Tilbury (1996); Fien (1999a & b).
[456] See 'Towards Critical Teacher Education' in this report for further information. See also Kyburz-Graber & Robottom (1999)
[457] Law (2003)
[458] WWF China (2004)
[459] Fien (1995)
[460] UNESCO (2002b)
[461] Law (2003)
[462] Te Kete Ipurangi (2003); Stewart (2001)
[463] Bolstad, Cowie and Eames (2004)
[464] Te Kete Ipurangi (2003)
[465] WWF China (2004)
[466] Fien and Tilbury (1998); Tilbury (2003).
[467] Tilbury (1999b); Aitchison (2002)

References

Abraham, J. Lacey, C and Williams, R. (1990) *Deception, Demonstration and Debate*, Sussex: WWF and Kogan Press.

Airwatch Australia (2004) *Airwatch Australia*. Available at: http://www.airwatch.gov.au/default.pasp [Accessed 18 February 2004].

Aitchison, H. (2002) *Mainstreaming Environmental Education in China*, China: WWF China.

Andrew, J. and Malone, K. (1995) 'The first ten years: A review of the Australian Journal of Environmental Education', *Australian Journal of Environmental Education* 11: 131- 162.

Antonacopoulou, E. (2002) 'Revisiting the what, how and why of managerial learning: Some new evidence'. *SKOPE Research Paper* 25. Centre on Skills, Knowledge and Organisational Performance, Oxford University and Warwick University.

Arnstein, S. (1969) 'A ladder of citizen participation', *Journal of American Institute of Planners*. July: 216 – 224.

Bäckstrand, K. (2002) 'Civic science for sustainability: Reframing the role of scientific experts, policymakers and citizens in environmental governance', Paper Presented for the 2002 Berlin Conference on the Human Dimensions of Global Environmental Change *Knowledge for Sustainability Transition: The Challenge for Studies of Science and Environment*, Berlin: December 6th - 7th 2002.

Bamford, B.E. (1999) 'From environmental education to ecopolitics: Affirming changing agendas for teachers'. *Educational Philosophy and Theory* 31 (2): 157 - 173.

Beaty, L. (1999) 'Consultation through action learning', *New Directions for Teaching and Learning* Jossey-Bass Publishers 79: 51-59.

Bermuda Aquariums, Museums and Zoos (2001) *Learning Through Landscapes Bermuda*. Available at: http://www.bamz.org/education/teachers.htm#learning [Accessed 9 March 2004].

Bhandari, B. and Abe, O. (2003) 'United Nations Decade on Education for Sustainable Development: Framework for a Draft International Implementation Scheme'. *Education for Sustainable Development in Nepal: Views and Visions*, Japan: IGES.

Bohm, D. (1980) *Wholeness and the Implicate Order*, London: Ark Paperbacks.

Bolstad, R. Cowie, B and Eames, C. (2004) *Environmental Education in New Zealand schools: Research into current practice and future possibilities*. New Zealand: Ministry of Education

Boston Schoolyard Funders Collaborative (2003) *The Boston Schoolyard Initiative*. Available at: http://www.schoolyards.org [Accessed 9 March 2004].

Breiting, S. and Morgensen, F. (1999) 'Action competence and environmental education', *Cambridge Journal of Education* 29 (3): 349-353.

Brierley, J. (1987). *Give me a child until he is seven: Brain studies and early childhood education*. East Sussex: Falmer Press.

Brinkman, F.G. and Scott, W.A.H. (1996) 'Reviewing a European Union initiative on environmental education within programmes of initial teacher education', *Environmental Education Research* 2(1): 5-16.

Burman, E. (1994) *Deconstructing Development Psychology.* London and New York: Routledge.

Calder, M. and Smith, R. (1993) *A Better World For All: Development education for the classroom.* (2nd edition), Canberra: AusAID.

Camp, S. O'Donoghue, R. and Schreuder, D. (1996) 'Some Perspectives on Low-cost Water Monitoring in South Africa' in Stapp (ed) *International Case Studies on Water Quality Monitoring*, Iowa: Kendall and Hunt Publishing Company.

Campus Kindergarten (2003) *Big art small viewer: Celebrating children as artists*, Brisbane: Campus Kindergarten.

Canella, G. (1997) *Deconstructing Early Childhood Education: Social justice and revolution.* New York: Peter Lang.

Capra, F. (1982) *The Turning Point*, London: Wildwood House.

Capra, F. (1996) *The Web of Life*, London: Harper Collins.

Carr, W. and Kemmis, S. (1986) *Becoming Critical: Education, knowledge and action research*, London: Falmer Press.

Centre for Education and Research in Environmental Strategies (CERES) (2004) *Sustainable Schools Program*. Available at: http://www.ceres.org.au/education/External_programs/sustainable_school.html [Accessed 23 February 2004].

Chawla, L. (1998) 'Research methods to investigate significant life experiences: Review and recommendations', *Environmental Education Research* 4 (4): 383-398.

Clark, F. and Illman, D. (2001) 'Dimensions of civic science', *Science Communications* 23(1): 5-27.

Clean Up Australia (2004) *Clean Up Australia Schools*. Available at: http://www.cleanup.com.au/Main.asp?Requesttype=Doc&DocID=112&CatID=22 [Accessed: 24 January 2004].

Coad, S. (2003) 'Sustainability education: A curriculum imperative', *EQ Australia*, Curriculum Corporation, Autumn(1): 35 - 37.

Coastal Zone Australia (2003) *Citizen Science - Theme 2*. Available at: http://www.coastal.crc.org.au/citizen_science/index.html [Accessed 8 February 2004].

Cornell, J. (1998) *Sharing Nature with Children*. 2nd edition. Navada: Dawn Publications.

Curriculum Corporation (2002) *Global Perspectives: A Statement on Global Education for Australian Schools*, Carlton: Curriculum Corporation.

Curriculum Corporation (2003a) *Environmental Education Review – Formal Education Sector (Schools)*, Australian Government Department of Environment and Heritage. Available at: http://www.deh.gov.au/education/nap/council/summary-1.html [Accessed 11 March 2004].

Curriculum Corporation (2003b) *Discovering Democracy: Civics and Citizenship Education*. Available at: http://www.curriculum.edu.au/democracy/aboutdd/rel_sa.htm [Accessed 5 January 2003].

Curriculum Council of Western Australia (1998a) *Curriculum Framework for Kindergarten to Year 12 Education in Western Australia*, Perth: Curriculum Council of Western Australia.

Curriculum Council of Western Australia (1998b) *Society and Its Environment: Learning Area Statement, Curriculum Framework*. Perth: Curriculum Council of Western Australia.

Cutter, A. (2002) *The Value of Teachers' Knowledge: Environmental Education as case study*. Paper presented at the annual meeting of the American Educational Research Association, 1-5 April, New Orleans, USA.

Cutter-Mackenzie, A. and Tilbury, D. (2002) 'Meeting commitments for a sustainable future: Environmental education in pre-service teacher education', in Knight, B.A. (ed) *Reconceptualising Learning in the Knowledge Society*. Queensland: Post Pressed.

Damme, S. (1998) 'The "outcomes" challenge: An action research approach to evaluation in community program development'. *The Action Evaluation Project*, The Aria Group. Available at: http://www.aepro.org/inprint/conference/damme.html [Accessed 1 March 2004].

Darlington, P. and Black, R. (1996) 'Helping to protect the earth – The Kosciusko National Park education program', *Australian Journal for Environmental Education*, 12: 3-8.

Davis, J. & Elliott, S. (2003). *Early Childhood Environmental Education: Making it mainstream*. Canberra: Early Childhood Australia.

Davis, J. and Cooke, S. (2002) 'Health promotion and sustainability: An argument for integration', unpublished paper at *Health Promoting Schools Conference*, Gold Coast, May.

De Lange, I. and Schreuder, D. (1996) 'The Schools Water Project: A case study in environmental education for social change' in Stapp (ed) *International Case Studies on Water Quality Monitoring*, Iowa: Kendall and Hunt Publishing Company.

Deakin University (2004) *Graduate Certificate of Education, Mater of Education, Course Guide*. Available at: http://education.deakin.edu.au/rags/frame.asp?Page=Courses/postgradmasters.htm#education [Accessed: 29 April 2004].

Department of Education and Skills, UK (2003) *Sustainable Development Action Plan for Education and Skills*. London: United Kingdom Government.

Department of Education, Science and Training (2000) OECD *Thematic Review of Early Childhood Education and Care Policy: Australian Background Report*. Canberra: Australian Government.

Department of Education, Science and Training (2001) *PD 2000 in Australia: A National Mapping of School Teacher Professional Development*, McRae, D. Ainsworth, G. Groves, R. Rowland, M. and Zbar, V., Canberra:. Australian Government.

Department of Education, Science and Training (2003) *Australian Teacher's: Australian Future - Advancing Innovation, Science, Technology and Mathematics, Committee for the Review of Teaching and Teacher Education*, Canberra: Australian Government.

Department of the Environment and Heritage (1992) *National Strategy for Ecologically Sustainable Development*. Canberra: Australian Government.

Department of the Environment and Heritage (2000) *Environmental Education for a Sustainable Future: National Action Plan*, Canberra: Australian Government.

Department of the Environment and Heritage (2004a) *Sustainable Schools*. Australian Government. Available at: http://www.deh.gov.au/education/nap/neen/projects.html#sustainable

Department of the Environment and Heritage (2004b) *Environmental Education Grants Program*. Australian Government. Available at: http://www.deh.gov.au/education/nap/funding.html [Accessed 18 February 2004].

Department of the Environment and Heritage (2004c) *Environmental Education: National Environmental Education Council*. Australian Government. Available at: http://www.deh.gov.au/education/nap/council/activities.html [Accessed 12 March 2004].

Department of the Environment and Heritage (2004d) *GLOBE Australia Department of Environment and Heritage*. Australian Government. Available at: http://www.deh.gov.au/education/globe/ [Accessed: 18 February 2004].

Dewey, J. (1916) *Democracy and Education. An introduction to the philosophy of education*. New York: Free Press.

Dighe, J. (1993) 'Children and the earth', *Young Children*, 48(3): 58-63.

Driscoll, D. (2002) *Creating Better Cities with Children and Youth: A manual for participation*. London: UNESCO.

Eames, C. and Bolstad, R. (2004) 'The role of partnerships in environmental education in New Zealand Schools: Some findings from a recent research project', Paper presented to the 2004 New Zealand Association for Environmental Education conference *Partnerships for the Planet*, Christchurch College of Education, 14th -17th January. Christchurch.

Elliott, B. Jeppesen, M. Vance, P. and Romanowski, N. (2002) *Education Queensland's Charter for Sustainability*. Brisbane: Education Queensland.

Elliott, J. (1991) *Action Research for Educational Change*. Milton Keynes: Open University Press.

Elliott, J. (1999) 'Sustainable society and environmental education: Future perspectives and demands for education systems', *Cambridge Journal of Education*, 29 (3): 325-340.

Elliott, S. and Emmett, S. (1997) *Snails Live in Houses Too: Environmental Education for the Early Years* (2nd ed.) Melbourne: RMIT Publishing.

Enviroschools Foundation (2004) *Enviroschools: Learning for a Sustainable Future*. Available at: http://www.enviroschools.org.nz/ [Accessed 9 March 2004].

Evergreen (2003) *Learning Grounds*. Available at: http://www.evergreen.ca/en/lg/lg.html [Accessed 9 March 2004].

Federico, C. Cloud, J. Byrne, J. and Wheeler, K. (2003) 'Kindergarten through 12 grades: Education for Sustainability'. *ELR News Analysis*, 2002 – 2003. Washington: Environmental Law Institute.

Fien, J (1997) 'Stand up, stand up and be counted: Undermining myths of environmental education', *Australian Journal of Environmental Education* 13: 21-26.

Fien, J. (1993) *Education for the Environmental: Critical curriculum theorising and environmental education*, Melbourne: Deakin University.

Fien, J. (1995) 'Teaching for a sustainable world: the environment and development education project for teacher education', *Environmental Education Research* 1 (1): 21-33.

Fien, J. (1999a) 'The action research network approach' in Fien, J. (ed.) *Learning for a Sustainable Environment*. Bangkok: UNESCO Asia Pacific Centre for Educational Innovation for Development.

Fien, J. (1999b) 'Evaluating the action research network as a strategy for regional collaboration in teacher education' in Fien, J. (ed.) *Learning for a Sustainable Environment.* Bangkok: UNESCO Asia Pacific Centre for Educational Innovation for Development.

Fien, J. (2001a) 'Education for a Sustainability: Reorientating Australian schools for a sustainable future'. *Tela: Environment, Economy and Society* Issue 8, Brisbane: Australian Conservation Foundation, Australian Association of Environmental Education, Trust for Young Australians.

Fien, J. (2001b) 'The learning for sustainable environment project: A case study of an action network for teacher education', *Australian Journal of Environmental Education*, 17: 77-86.

Fien, J. and Gerber, R. (Eds) (1988) *Teaching Geography for a Better World*. Edinburgh: Oliver & Boyd.

Fien, J. and Tilbury, D. (1996) *Learning for a Sustainable Environment: An Agenda for Asia and the Pacific*, Bangkok: UNESCO Asia Pacific Centre for Educational Innovation for Development.

Fien, J. and Tilbury, D. (1998) 'Education for sustainability: Some questions for reflection', *Roots: Education for Sustainability*. Richmond: Education Programme Botanic Gardens Conservation International. 17: 20-24.

Fien, J. and Tilbury, D. (2002) 'The global challenge of sustainability' in Tilbury, D. Stevenson, R.B. Fien, J. Schreuder, D (eds.) *Education and Sustainability: Responding to the global challenge*. Gland: IUCN Commission on Education and Communication.

Fien, J. Heck, D. and Ferreira, J. (1997) *Learning for a Sustainable Environment: A Professional Development Guide for Teachers*, Brisbane: Griffith University.

Fortier, J.D. Grady, S.M. and Lee, S.A. (1998) *Wisconsin's Model Academic Standards for Environmental Education*. Milwaukee: Wisconsin Department of Public Instruction. Available at: www.dpi.state.wi.us/dpi/standards/pdf/envired.pdf [Accessed 7 April 2004].

Freire, P. (1972) *Pedagogy of the Oppressed*, Harmondsworth: Penguin.

Freire, P. (1995) *Pedagogy of Hope. Reliving Pedagogy of the Oppressed*, New York: Continuum.

Fullan, M. (1999). *Change forces: The sequel*, London: Falmer Press.

Garlick, D. (2003) *Significant Life Experiences of Urban, Environmentally Active, Australian Young People (18 – 25): The implications for environmental education in Australia*, Unpublished Master Thesis, Brisbane: Griffith University.

Geography Teachers Association of Victoria (1988) *New Wave Geography*, Melbourne: Jacaranda Press.

Gordon Community Children's Centre (1993) *Playing for Keeps: Environmentally responsible practices for early childhood learning*, Geelong: Gordon Technical College.

Gough, A. (1993) *Founders in Environmental Education*, Melbourne: Deakin University Press.

Gough, A. (1997) *Education and the Environment: Policy, trends and the problems of marginalisation*. Melbourne: The Australian Council for Educational Research.

Gough, A. (1999) 'Kids don't like wearing the same jeans as their mums and dads: so whose 'life' should be in significant life experience research?' *Environmental Education Research* 5(4): 383 - 403.

Gough, A. (2004) *Teacher Education*, Commissioned report submitted to Macquarie University.

Gough, A. and Sharpley, B. (2002) 'Science with a difference and a twist - stories of primary students' environmental science interest and action.' *American Educational Research Association (AREA) Annual Meeting*, New Orleans, USA: AERA.

Gough, N. (1992) *Blueprints for Greening Schools: Principles, policies and practices for environmental education in Australian secondary schools*, Victoria: Gould League of Victoria Inc.

Gough, N. (2002) 'Ignorance in environmental education research', *Australian Journal for Environmental Education* 18: 19 - 26.

Gough, S. (1999) 'Significant life experiences research: A view from somewhere', *Environmental Education Research* 5 (4): 353 - 364.

Gould League (2001) *Flora For Fauna for Schools*. Available at: http://www.floraforfauna.com.au/schools/ [Accessed 23 February 2004].

Gould League (2003) *Wastewise Schools*. Available at: http://www.gould.edu.au/wastewise/about/evaluation.htm [Accessed 23 February 2004].

Gould League (2004) *Sustainable Schools Victoria*. Available at: http://www.gould.edu.au/article.asp?id=6834 [Accessed 25 February 2004].

Government of the Australian Capital Territory (1997) *Environment Education Curriculum Support Paper*, Canberra: Department of Education and Training

Government of the Australian Capital Territory (2000a) A*CT Curriculum Frameworks and Across Curriculum Perspective Statements*. Department of Education and Community Services. Available at: http://www.decs.act.gov.au/publicat/acpframeworks.htm [Accessed: 11 March 2004].

Government of the Australian Capital Territory (2000b) *Birrigai Environmental Education Centre*. Department of Education and Community Services. Available at: http://www.birrigai.act.edu.au/ [Accessed: 11 March 2004].

Government of Canada (2002) *A Framework for Environmental Learning and Sustainability in Canada*. Ottawa: Government of Canada.

Government of the Northern Territory (1997) *Environmental Education Policy Statement* 2nd Edition, Northern Territory: Board of Studies.

Government of the Northern Territory (2003) *Essential Learnings, Northern Territory Curriculum Framework*, Darwin: Department of Employment, Education and Training.

Government of Queensland (1988) 'Policy Statement No. 20: Environmental Education in Queensland State Schools'. Supplement to the *Education Office Gazette*, 19th February 1988. Brisbane: Department of Education.

Government of Queensland (1993) *Environmental Education: An Agenda for Preservice Teacher Education in Queensland*. Toowong, Qld: Queensland Board of Teacher Registration.

Government of Queensland (1993) *P-12 Environmental Education Curriculum Guide*, Brisbane: Department of Education.

Government of Queensland (2001) *Queensland School Reform Longitudinal Study*, Unpublished Paper, Queensland: Department of Education.

Government of Queensland (2002) *An Outcomes Approach to the Queensland Years 1 to 10 Curriculum Key Learning Area Outcomes*, Brisbane: The Office of the Queensland School Curriculum Council.

Government of Queensland (2002). *Child Care and Family Support Hub Strategy: Funding Round Information Paper*. Brisbane: Department of Families.

Government of Queensland (2003a) *Outdoor and Environmental Education Centres*. Department of Education. Available at: http://www.education.qld.gov.au/schools/environment/outdoor [Accessed: 12 March 2004].

Government of Queensland (2003b) *Toohey Forest Environmental Education Centre*. Department of Education. Available at: http://www.toohforeeec.eq.edu.au/ [Accessed: 12 March 2004].

Government of Queensland (2004). *Child Care and Family Support Hub Strategy*. Department of Families. Available at: http://www.families.qld.gov.au/childcare/hub/strategy.html [Accessed 18 February 2004].

Government of South Australia (undated a) *SACSA Framework: Learning Areas - Science*. Department of Education and Children's Services. Available at: http://www.sacsa.sa.edu.au/index_fsrc.asp?t=LA [Accessed: 12 March 2004].

Government of South Australia (undated b) *SACSA Framework: Accountability and Assessment*. Department of Education and Children's Services. Available at: http://www.sacsa.sa.edu.au/index_fsrc.asp?t=AA [Accessed: 12 March 2004].

Government of South Australia (undated c) *Essential Learnings, South Australia Curriculum and Standards Accountability (SACSA) Framework*. Department of Education and Children's Services. Available at: http://www.sacsa.sa.edu.au/index_fsrc.asp?t=EL [Accessed 11 March 2004].

Government of South Australia (undated d) *Arbury Park Outdoor Centre*. Department of Education and Children Services. Available at: http://www.arburypark.sa.edu.au/ [Accessed: 12 March 2004].

Government of Tasmania (2004) *Essential Learning Framework 1*, Office for Curriculum, Leadership and Learning, Department of Education. Available at: http://www.education.tas.gov.au/ocll/publications/default.htm [Accessed 11 March 2004].

Government of Victoria (1998) *Investing in the Future: Environmental Education in Victorian Schools*. Melbourne: Department of Education.

Government of Victoria (2001) *Guidelines for Managing Cultural and Linguistic Diversity in Schools*. Melbourne: Department of Education, Employment and Training.

Government of Victoria (2003) *Assessment*. Department of Education. Available at: http://www.vcaa.vic.edu.au/assessment.html [Accessed: 12 March 2003].

Government of Victoria (2004) *Curriculum Standards Framework II*, Victorian Curriculum and Assessment Authority. Available at: http://www.vcaa.vic.edu.au/prep10/csf/aboutcsf2.html [Accessed: 11 March 2004].

Gray, D. (2001) 'Work-based learning, action learning and the virtual paradigm', *Journal of Further and Higher Education*. 25(3): 315-324.

Greenall Gough, A. and Robottom, I. (1993) 'Towards a socially critical environmental education: Water quality studies in coastal schools', *Journal of Curriculum Studies*. 25(4): 301-316.

Greenall, A. (1981) *Environmental Education in Australia: Phenomenon of the Seventies - A Case Study in National Curriculum Action*. Canberra: Curriculum Development Centre.

Greenman, J. (1988) *Caring Spaces, Learning Places: Children's environments that work*. Redmond, WA: Exchange Press.

Griffith University (2003) *Master of Environmental Education, Faculty of Environmental Science* Available at: http://www.gu.edu.au/faculty/ens/ [Accessed 28 April 2004].

Griffith University (2004) *Professional Development for Teachers*. Available at: http://www.griffith.edu.au/text/centre/ecocentre/education_teachers.htm [Accessed 5 April 2004].

Griffith University and the Department of the Environment, Sport & Territories (1997) *Teaching for a Sustainable World: International Edition*, Canberra: Department of the Environment, Sport and Territories.

Hargreaves, A. (1997) 'Cultures of teaching and educational change' in M. Fullan (ed.) *The Challenge of School Change: A collection of articles*. Cheltenham: Hawker Brownlow.

Hart, R. (1997) *Children's Participation: The theory and practice of involving young citizens in community development and environmental care*. London: Earthscan and UNICEF.

Hayden, J. and Macdonald, J. (2000) 'Health promotion: A new leadership role for early childhood professionals', *Australian Journal of Early Childhood*. 25(1): 32-39.

Heck, D. (2003) 'The state of environmental education in the Australian school curriculum', *Australian Journal of Environmental Education* 19: 115-124.

Henton, J. Marotz-Baden, R. and Kieren, D. (1979) 'Problem solving in the classroom.' *The Family Coordinator*, Presented to the Education Section of the National Council on Family Relations Annual Meeting, October 1979.

Hicks, D and Holden, C. (1995) *Visions of the Future: Why we need to teach for tomorrow*, Chester: Trentham Books.

Holt, J. (2001) 'Discovering Democracy in Australia', *Prospects* 31(3): 307 - 318.

Hopkins, C., and McKeown, R. (2002) 'Education for sustainable development: An international perspective' in Tilbury, D. Stevenson, R.B. Fien, J. and Schreuder, D. (eds) *Environmental Education for Sustainability: Responding to the Global Challenge*. Gland, Switzerland and Cambridge, UK: IUCN Commission on Education and Communication.

Howard, J. (2002) 'Exploring the relationship between conservation agencies and schools', *Australia Journal of Environmental Education* 18: 27-33.

Huckle, J. (1990) 'Environmental education: teaching for a sustainable future', in B Doufour (ed.) *The New Social Curriculum*, Cambridge: Cambridge University Press.

Huckle, J. (1991) 'Education for sustainability; Assessing pathways to the future', *Australian Journal of Environmental Education* 7: 49-50.

Huckle, J. (1996) 'Teacher Education' in Huckle, J. and Sterling, S. (eds) *Education for Sustainability*, London: Earthscan.

Huckle, J (1997) 'Towards a critical school geography', in Tilbury, D. and Williams, M. (eds) *Teaching and Learning Geography*, London: Routeledge: 241-244.

Huckle, J. and Sterling, S. (1996) *Education For Sustainability*, London: Earth Scan Publications

Hungerford, H. and Volk, T. (1984) 'The challenges of K-12 environmental education' in: Sacks A. B. (eds.) *Monographs in environmental education and environmental studies*, Vol. 1. Troy, OH: North American Association for Environmental Education.

Hungerford, H.H. and Volk, T.L. (1990) 'Changing learner behavior through environmental education.', *Journal of Environmental Education* 21 (3): 8-21.

Hungerford, H.R. Litherland, R.A. Peyton, R.B. Ramsey, J.M. and Volk, T.L. (1992) *Investigating and Evaluating Environmental Issues and Actions: Skill development modules*. Champaign, IL: Stipes Publishing Company.

Hungerford, H.R. Volk, T.L. and Ramsey, J.M. (1990) *Science-Technology-Society: Investigating and evaluating STS issues and solutions*. Champaign, IL: Stipes Publishing Company.

IGES (2002) *Regional Strategy on Environmental Education in the Asia-Pacific*. Hayama, Kanagawa, Japan: Institute for Global Environmental Strategies.

ILT Team (2004) *Mentoring as a Tool for Workplace Change: Outcomes and lessons learnt from the It's a Living Thing Education for Sustainability Professional Development Program*. Unpublished Paper, Sydney: Macquarie University.

Immig, J. (2000) *The Toxic Playground: A guide to reducing the chemical load in schools and childcare centres*, Sydney: Total Environment Centre.

Institute of Earth Education (2001) *Institute of Earth Education* Available at: http://www.eartheducation.org [Accessed: 12 March 2004].

Janse van Rensburg, E. (2000) 'The learning for sustainability project: An overview of the conceptual framework' In E. Janse van Rensburg, and H. Lotz Sisitka (2000) *Monograph: Learning for Sustainability: An environmental education professional development case study informing education policy and practice*. Johannesburg: Learning for Sustainability Project.

Jaritz, K.E. (1996) 'Environmental education in teacher training: a case study at seven German colleges and universities and its outcome', *Environmental Education Research* 2(1): 51-62.

Jenkins E. W. (1999) 'School science, citizenship and the public understanding of science.', *International Journal of Scientific Education* 21 (7): 703– 710.

Jenkins, K. (1999/2000) 'Listening to secondary initial teachers: Implication for teacher education.', *Australian Journal of Environmental Education* 15/16: 45-56.

Jensen B. (2002) 'Knowledge, action and pro-environmental behaviour', *Environmental Education Research* 8(3): 325 - 334.

Jensen, B. and Schnack K. (1997) 'The action competence approach in environmental education.', *Environmental Education Research* 3(2): 163-178.

Jickling, B. and Spork, H. (1998) 'Education for the environment: A critique', *Environmental Education Research* 4(3): 309 - 327.

Jickling, R. (1992) 'Why I don't want my children to be educated for sustainable development', *Journal for Environmental Education* 23 (4):5-8

Jones, P. (2000) 'Action learning for citizenship education', *Pastoral Care in Education* 18 (4): 19-26.

Juniper, C. and Moore, M. (2002) 'Synergies and best practices of corporate partnerships for sustainability', *Corporate Environmental Strategy* 9 (3): 267-276.

Kemmis, S. and McTaggart, R. (1982) *The Action Research Planner* Waurn Ponds, Victoria: Deakin University.

Kenway, J. Bullen, E. and Robb, S. (2003) *Reshaping Education in Globalising, Tribalising, Hybridising Times*, South Australia: Hawke Research Institute.

Kilpatrick, S. Johns, S. Mulford, B. Falk, I. and Prescott, L. (2002) *More than an Education Leadership for Rural School-Community Partnerships*. A report for the Rural Industries Research and Development Corporation. Hobart: University of Tasmania.

Kolb, D. A. (1984) *Experiential Learning: Experience as a Source of Learning and Development*, San Francisco: Jossey-Bass.

Koo, L. C. (1999) 'Learning action learning', *Journal of Workplace Learning*, 11 (3): 89-94.

Kyburz-Graber, R. and Robottom, I. (1999) 'The OECD-ENSI project and its relevance for teacher training concepts in environmental education', *Environmental Education Research* 5(3): 273 - 291.

Lang, J. (1999/2000) 'Tracing changes in teacher environmental education understanding', *Australian Journal of Environmental Education* 15/16: 57-64.

Law, B. (2003) *Experiential Education as a Best Practice Pedagogy for Environmental Education in Teacher Education*. PhD Thesis submitted to Australian Environmental Studies, Faculty of Environmental Sciences. Brisbane: Griffith University.

Leach, M. and Fairhead, J. (2002) *Manners of Contestation: 'Citizen science' and 'indigenous knowledge' in West Africa and the Caribbean*. UK/USA: UNESCO.

Learning and Skills Development Agency (2002) *Learning to Last: Skills, sustainability and strategy*, London: Learning and Skills Development Agency.

Learning Trough Landscapes (2004) *Learning through Landscapes: The UK School Grounds Charity*. Available at: http://www.ltl.org.uk/ [Accessed 9 March 2004].

Learnscapes (2003) *The School Learnscapes Trust*. Available at: http://www.learnscapes.org/ [Accessed: 7 February 2004].

Lee,K. (1994) *The Compass and the Gyroscope*. Washington DC: Island Press.

Lewis, R. Neal, R. and Gurry, T. (2003) *Hands On For Habitat: Exploring Australia's Threatened Species - Resource Pack - Teacher's Guide*. Ryebuck Media Pty. Ltd. with Ausralian Government Department of Environment and Heritage. Canberra: Australian Government.

Linke, R. (1980) *Environmental Education in Australia. Sydney*: Allen and Unwin.

Linke, R. (ed) (1977) *Education and the Human Environment: UNESCO Seminar Report*. Canberra: Curriculum Development Centre.

Losito, B. and Mayer, M. (1995) *Environmental Education and Educational Innovation*, ENSI Italian National Report, Frascati: CEDE.

Lovelock, J. (1979) *Gaia: a New Look at Life on Earth*. Oxford: OUP.

Lucas, A. (1979) *Environment and Environmental Education: Conceptual Issues and curriculum implications*, Melbourne: Australian International Press and Publications.

Lucas, B. (1997a) 'Learning through landscapes: The importance of school grounds', *Australian Journal of Environmental Education* 13: 85 – 88.

Lucas, B. (ed) (1997b) *School Grounds: A Guide to Good Practice*. London: The Stationary Office.

Lyons, M., Smuts, C. and Stephens, A. (2001) 'Participation, empowerment and sustainability: (How) Do the links work?' *Urban Studies* 38 (8): 1233-1251.

Mac Naughton, G. (2003) *Shaping Early Childhood: Learners, Curriculum and Contexts* Open University Press: Maidenhead.

Mac Naughton, G. and Williams, G. (2004) *Techniques for Teaching Young Children: Choices in theory and practice*. Frenchs Forest: Pearson Education.

Macquarie University (2002) *Master of Environmental Education: Graduate School of the Environment*, Course Description available to prospective students [unpublished].

Macquarie University (2004) GSE 827: *Education (and Capacity Building) for Sustainable Development*, Available at: http://www.gse.mq.edu.au/Units/sus_dev/Education/Edu_sd.htm [Accessed 8 April 2004].

Malcolm, S. Murray, P. and Hughes, B. (Eds.) (1992) *Learning To Care for Our Environment: Victoria's Environmental Education Strategy*, Melbourne: Victorian Environmental Education Council.

Malone, K. and Tranter, P. (2003) 'School grounds as sites for learning: Making the most of environmental opportunities', *Environmental Education Research* 9 (3): 283-303.

Manitoba Education and Training (2000) *Education for a Sustainable Future: A Resource for curriculum developers, teachers and administrators*, Winnipeg, Manitoba: Manitoba Education and Training.

Mayer, M. (1995) 'Quality indicators and innovation in environmental education', in OECD Centre for Educational Research and Innovation (ed) *Environmental Learning for the 21st Century*, Paris: OECD.

McConnell, B. (2001) 'Teacher education in environmental education – Does it work?' *Australian Journal of Environmental Education* 17: 35 – 41.

MCEETYA (1998) *Australia's Common and Agreed Goals for Schooling in the Twenty First Century: A Review of the 1989 common and agreed goals for schooling in Australia (The Hobart Declaration) - A Discussion Paper*, Canberra: Ministerial Council on Education, Employment, Training and Youth Affairs.

MCEETYA (1999) *National Goals for Schooling in the Twenty-First Century (The Adelaide Declaration)*, Canberra: Ministerial Council on Education, Employment, Training and Youth Affairs.

MCEETYA (2000) *2000 National Report of Schooling in Australia* Canberra: Ministerial Council on Education, Employment, Training and Youth Affairs.

McKernan, J. (1996) *Curriculum Action Research: A handbook of methods and measures for the reflective practitioner*, second edition. London: Kogan Page.

Museum Victoria (2002) *Education Programs, Melbourne Museum*. Available at: http://melbourne.museum.vic.gov.au/education/ [Accessed: 12 March 2004].

Mustard, F. and McCain, M. (1999). *The Early Years Study: Reversing the Real Brain Drain*. Toronto: Ontario Children's Secretariat.

National Childcare Accreditation Council (2001) *Quality Improvement and Accreditation System Sourcebook*. Surrey Hills, NSW: National Childcare Accreditation Council.

National Environmental Education Committee, Jamaica (1998) *The National Environmental Education Action Plan for Sustainable Development in Jamaica (1998 – 2010)*, Kingston, Jamaica: NEEC Secretariat.

National Institute for Educational Research (1993) *Environmental Education and Teacher Education in Asia and the Pacific*, Tokyo: NIES, Section for International Cooperation in Education and Section for International Cooperation in Research.

National Investment for the Early Years (undated) *National Investment for the Early Years*. Available at: http://www.niftey.cyh.com/ [Accessed: 12 March 2004].

Newhouse, N. (1991) 'Implications of attitude and behaviour: research for environmental conservation', *Journal of Environmental Education* 22 (1): 26-32.

NSW Commission for Children and Young People and Commission for Children and Young People (undated) *A Head Start for Australia: An Early Years Framework*. Sydney: NSW Commission for Children and Young People.

NSW Government (1989) *Environmental Education Centres Policy Statement*, Sydney: NSW Department of Education and Training.

NSW Government (1998) *Eco-Schools Program: 1998 Update*. Sydney: Curriculum Support Directorate, NSW Department of Education and Training.

NSW Government (1998) *Geography Stages 4–5: Syllabus*, Sydney: Board of Studies.

NSW Government (2001a) *Environmental Education Policy for Schools*, Sydney: Curriculum Support Directorate, NSW Department of Education and Training.

NSW Goverment (2001b) *Urban Stormwater Program Evaluation PART B: Evaluation of the Stormwater Trust Grants Scheme*. Sydney: NSW Environmental Protection Authority.

NSW Government (2002a) *Environmental Education Unit*. NSW Department of Education and Training Available at: http://www.curriculumsupport.nsw.edu.au/enviroed/index.cfm [Accessed: 12 March 2004].

NSW Government (2002b) *Envirothon Competition*. NSW Department of Education and Training Accessed at: http://www.schools.nsw.edu.au/events/statecompetitions/envirothon/index.php [Accessed: 12 March 2004].

NSW Government (2002c) *Field of Mars Environmental Education Centre*. NSW Department of Education and Training Available at: http://www.fieldofmare. schools.nsw.edu.au/EEpolicy.html [Accessed: 12 March 2004].

NSW Government (2002d) *Learning and Teaching*. NSW Department of Education and Training.Available at: http://www.schools.nsw.edu.au/learning/index.php [Accessed: 12 March 2004].

NSW Government (2002e) *Learning for Sustainability: NSW Environmental Education Plan 2002 - 2005*, Sydney: NSW Council for Environmental Education.

NSW Government (2003a) *Guidelines to Preparing your Application: Eco Schools Grants Program*. Sydney: Environmental Trust.

NSW Government (2003b) *Patches of Green*. NSW Environment Protection Authority. Available at: http://www.epa.nsw.gov.au/whocares/patchesofgreen.htm [Accessed 20 December 2004]

NSW Government (2004a) *EcoSchools Grants*. NSW Environment Protection Authority. Available at: http://www.epa.nsw.gov.au/envtrust/ecoschools.htm [Accessed 7 February 2004].

NSW Government (2004b) *Sustainable Schools Project*. NSW Department of Education and Training. Available at: http://www.curriculumsupport.nsw.edu.au/enviroed/index.cfm?u=2&i=13 [Accessed: 12 March 2004].

NSW Government (2004c) *The Schools Learnscapes Trust*. NSW Department of Education and Training. Available at: http://www.curriculumsupport.nsw.edu.au/enviroed/index.cfm?u=4&i=140 [Accessed 8 March 2004].

Organisation for Economic Co-Operation and Development (OECD) (1991) *Environment, Schools and Active Learning*, Paris: Centre for Educational Research and Innovation.

Organisation for Economic Co-Operation and Development (OECD) (1995) *Environmental Learning for the 21st Century*. France: OECD Centre for Educational Research and Innovation.

Organisation for Economic Co-Operation and Development (OECD) (2003) *Key Competencies for a Successful Life and a Well Functioning Society*, Germany: Organisation for Economic Cooperation and Development.

Organisation for Economic Co-Operation and Development (OECD), Environment and School Initiatives (ENSI) (2000) *From the Pilot… to the Mainstream: Generalisations of good practice in Environmental Education, An OECD-ENSI Strategy Workshop*. December 9-12, 1999, Hadeland, Norway: Ministry of Education, Research and Church Affairs.

Organisation for Economic Co-Operation and Development (OECD), *Environment and School Initiatives* (ENSI) (2001a) Environment and Schools Initiative. Available at: http://www.ensi.org/ [Accessed: 8 February 2004].

Organisation for Economic Co-Operation and Development (OECD), Environment and School Initiatives (ENSI) (2001b) *Learnscape Trails in Schools*. Available at: http://www.ensi.org/projects/learnscape/default.htm [Accessed 9 March 2004].

Orr, D. (1999) 'Rethinking education', *The Ecologist*. 29 (3): 232-234.

Oulton, C.R. and Scott, W.A.H. (1995) 'The "environmentally educated" teacher: An exploration of the implications of UNESCO-UNEP's ideas for initial teacher education programs', *Environmental Education Research* 1(2): 213-231.

OzGreen (2003) *MyRiver*. Available at: http://www.myriver.org.au/ [Accessed 8 February 2004].

Paechter, C. (1998) 'Schooling and the ownership of knowledge', *Curriculum Studies* 6 (2): 161-176.

Palmer, J. and Suggate, J. (1996) 'Influences and experiences affecting the pro-environmental behavior of educators', *Environmental Education Research* 2 (1): 109-121.

Palmer, J.A. (1993) 'Development of concern for the environment and formative experiences of educators', *Journal of Environmental Education* 24 (3): 26-30.

Papadimitriou, V (1995) 'Professional development of in-service primary teachers in environmental education: An action research approach', *Environmental Education Research* 1(1): 85-98

Papadimitriou, V. (1996) 'Environmental education within a science course in the initial education of primary teachers', *Environmental Education Research* 2(1): 17-25.

Parliamentary Commissioner for the Environment (PCE) (2004) *See Change: Learning and education for sustainability*. Wellington: PCE.

Payne, P. (1999) 'The significance of experience in SLE research', *Environmental Education Research* 5 (4): 365 – 381.

Penuel, W. and Means, B. (in press) *Implementation Variation and Fidelity in an Inquiry Science a Program: An analysis of GLOBE data reporting patterns*, California: SRI International.

Pepper, D. (1990) 'Values' in *Greenprint for Action: Core Module 3*. Cambridge: National Extension College and NALGO Education.

Planet Ark (2004) *Info for schools, National Tree Day*. Available at: http://www.planetark.com/treedaypage.cfm?pageid=6 [Accessed 24 January 2004].Poncelet, E. C. (2001) 'Personal transformation in multi-stakeholder environmental partnerships', *Policy Sciences* 34: 273 - 301.

Posch, P. (1990) 'The Project "Environment and Schools Initiative".' *ENSI Series*. 10. Vienna: OECD/CERI Project AARGE.

Posch, P. (1993) 'Research issues in environmental education', *Studies in Science Education* 21: 21 - 48.

Posch, P. (1995) 'Professional development in environmental education: Networking and infrastructure' in OECD Centre for Educational Research and Innovation (ed) *Environmental Learning for the 21st Century*, Paris: OECD.

Prahalad, C. and Ramaswamy, V. (2001) The Collaboration Continuum: Understanding the full goals and complexity of collaboration before moving forward. *Optimize, Ideas Action Results*. Nov 2001.

Quality Assurance Agency for Higher Education (2000) *The Standard for Initial Teacher Education in Scotland - October 2000*. Available at http://www.qaa.ac.uk/crntwork/benchmark/itescot/individual%2Dtext%2Ddocs/aspects_textonly.htm#1 [Accessed 7 April 2004].

Queensland University of Technology (2004) *EAB013 Early Childhood Society, Environment and Helath Education Unit Outline*. Available at: http://www.courseshbk.qut.edu.au/cgibin/WebObjects/CoursesHbk.woa/wa/selectUnitFromCourseDetails?unitID=EAB013# [Accessed 20 November 2004]

Ramsey and Rickson (1977) 'The effects of environmental action and environmental case study instruction on the overt environmental behaviour of eight-grade students', *Journal of Environmental Education*. 13 (1): 24-30.

Richardson, W. (1998) The Why, Where and How of Partnership, A speech given at *Grantmakers in Health National Conference*. California.

Rickinson, M. (2001) 'Learners and learning in environmental education: A critical review of the evidence', *Environmental Education Research*, 7 (3): 207 - 320.

Rivkin, R. (1996) 'Healthy habitats for children', *Early Childhood Education Journal* 23(4), 235-238.

Robottom, I. (1987a) 'The dual challenge for professional development in environmental education' In A Greenall (ed). *Environmental Education – Past, Present and Future*, Proceedings of the Third National Environmental Education Seminar and Workshop, AGPS, Canberra: 72-83.

Robottom, I. (1987b) *Environmental Education: Practice and Possibility*, Victoria: Deakin University Press.

Robottom, I. (1987c) 'Towards Inquiry-Based Professional Development' in Robottom, I (ed) *Environmental Education: Practice and Possibility*, Melbourne: Deakin University Press

Robottom, I. (2003) 'An action research-based approach to professional development in environmental teacher education - Australia/South Africa' In Kyburz-Graber, R. Posch, P. and Peter U. (eds.) *Interdisciplinary Challenges in Teacher Education in the Light of Environmental Education*. Innsbruck/ Wien: Studienverlag.

Robottom, I. and Hart, P. (1993) *Research in Environmental Education: Engaging the Debate*. Geelong: Deakin University Press.

Rutter, M. (2002) 'The interplay of nature, nurture and developmental influences: The challenge ahead for mental health', *Archives of General Psychiatry*, 59(11): 996-1000.

Rychen D.S. and Salganik, L.H. (Eds.) (2003) *Key Competencies for a Successful Life and a Well-Functioning Society*. Göttingen, Germany: Hogrefe & Huber.

Rychen, D.S. / Salganik, L.H. (Ed.) (2003) Key Competencies for a successful life and a well functioning society. Switzerland: OECD: DeSeCo.

Saltwatch (2004) *Saltwatch*. Available at: http://www.saltwatch.org.au/saltwatch/index.asp [Accessed 18 February 2004].

Saul, D. (2000) 'Explaining EE: Thinking critically, thinking culturally', *Journal of Environmental Education* 31(2): 5-7.

Schattenmann, B. (2002) 'Comenius 1.' presented to Thematic Conference on '*Umweltbildung als Motor fur Schulentwicklung*', *'Environmental Education as a driving force for school development' and COMENIUS 1 Contact Seminar*. Reichenau Austria 6th-9th December 2002.

Schreuder, D. (1994a) 'The Schools Water Project (SWAP): A case study of an action research and community problem solving approach to curriculum innovation', *Australia Journal of Environmental Education* 100: 35-46.

Schreuder, D. (1994b) 'Schools Water Project in South Africa', *GREEN Newsletter (Global Rivers Environmental education Network)* 1(2): 6-11.

Schreuder, D. (1997) 'Issues of Inequity, Health and Water: Reflections on the Schools Water programmes in post-apartheid South Africa', *Health Education Research: Theory and practice*, 12(4): 461-468.

Scott, W.A.H. (1996) 'The environmental education teacher: synthesis of an implementation theory for initial courses', *Australian Journal of Environmental Education* 12: 53-60.

Shallcross, T. O'Loan, K. and Hui, D. (2000) 'Developing a school focused approach to continuing professional development in sustainability education', *Environmental Education Research* 6(4): 363-382.

Simmons, D. (ed.) (2000) *Guidelines for the Initial Preparation of Environmental Educators*, Rock Spring, GA: North American Association for Environmental Education.

Singh, M. (2001) 'Networking action research: Theorising experiential learning for a sustainable environment', *Australian Journal of Environmental Education* 17: 95 – 104.

Skamp, K. and Bergmann, I (2001a) 'Facilitating learnscape development, maintenance and use: Teachers' perception and self-reported practices', *Environmental Education Research* 7 (4): 333-358.

Skamp, K. and Bergmann, I. (2001b) 'Teachers' Perceptions of the Value and Impact of Learnscapes: Implications for Practice'. Paper presented to *The Future is Here*, AAEE/VAEE/MESA 2001.

Smith, J. (1975) *Bringing School Grounds Alive*. Wattle Park, SA: Wattle Park Teachers Centre.

Smith, M. (2001) David A. Kolb on experiential learning. *The Encyclopaedia of Informal Education*. Available at: http://www.infed.org/biblio/b-explrn.htm [Accessed 18 February 2004].

Smith, S (2004) *The State of Environmental Education and Education for Sustainability in NSW Schools; Their role in curriculum development in NSW* Submission on behalf of the NSW Council for Environmental Education to the Board of Studies, NSW, Feb 2004.

Southern Cross University (2002) *Combined Bachelor of Applied Science / Bachelor of Education degree* Available at: http://www.scu.edu.au/schools/esm/courses/combined_degree.html [Accessed: 29 April 2004]

Spork, H. (1992) 'Environmental education: A mismatch between theory and practice', *Australian Journal of Environmental Education* 8:147-166.

Stacey, R. (2000). *Strategic Management and Organisational Dynamics: The challenge of complexity* (3rd ed.). Harlow, UK: Pearson Education.

Stapp, W. (1975) 'Pre-service teacher education', in McInnes, N and Albrecht, D (eds) *What Makes Education Environmental?*, Louisville and Washington, USA: Data Courier Inc. and Environmental Educators Inc.

Sterling, S. (1993) 'Environmental education and sustainability - A view from holistic ethics'. in: Fien, J. and Trainer, T. (ed.) *Environmental Education - A pathway to sustainability*. Australia: Griffith University and Deakin University.

Sterling, S. (1996) 'Education in Change' in: Huckle, J. and Sterling S. (eds.) *Education for Sustainability*. London: Earthscan Publications.

Sterling, S. (2001) *Sustainable Education: Re-visioning learning and change*. Devon, UK: Green Books.

Sterling, S. (2002) 'Linking Thinking, Education and Learning' in '*Linking Thinking*' Prepublished draft Scotland: World Wildlife Fund.

Sterling, S. (2004) 'Higher education, sustainability and the role of systemic learning' in: Cocoran, P.B. and Wals, A. *Higher Education and the Challenge of Sustainability: Contestation, critique, practice and promise*. Dordrecht: Kluvwer Academic Publishers.

Stewart, K. (2001) 'Environmental commitment', *New Zealand Education Gazette* 80(1)

STREAM (2003) *Participatory Action Learning for Freshwater Aquaculture Support to Regional Aquatic Resource Management*. Thailand. Available at: http://www.streaminitiative.org/ [Accessed 17 February 2004].

Sustainable Development Education Panel (1998) *Education for Sustainable Development in the School Sector: A report to DFEE/QCA*. Reading, UK: Council for Environmental Education.

Sustainable Development Education Panel (2003) *Learning to Last: The government's sustainable education strategy for England*. London: Draft Presented to Ministers February 2003.

Sveriges Lantbrunks Universitet (2004) *Skanande Uterum*. Available at: http://www-uterum.slu.se/ [Accessed 9 March 2004].

Sydney Water (2002) *Streamwatch*. Available at: http://www.streamwatch.org.au/main.jsp [Accessed 29 February 2004].

Tanner, T. (1980) 'Significant life experiences: A new research area in environmental education', *Journal of Environmental Education*. 11(4): 20-24.

Tanner, T. (1998a) 'Choosing the right subjects in significant life experiences research', *Environmental Education Research* 4(4): 399-416.

Tanner, T. (1998b) 'On the origins of SLE research, questions outstanding, and other research traditions', *Environmental Education Research* 4 (4): 419-424.

Te Kete Ipurangi (2003) *Environmental Education – Professional Development: Pilot Schools*. Available at: http://www.tki.org.nz/r/environ_ed/sustainable_future/professional_development_e.php [Accessed: 24 May 2004].

The 21st Century Education Foundation (2001) *Building Bridges Through Partnerships*. Available at: http://www.buildbridges.net/partnerships/index.htm [Accessed 1 March 2003].

Thomas, I. (2004) 'Tertiary or terminal: a snapshot of sustainability education in Australia's universities'. Paper presented at *Effective Sustainability Education Conference: What works? Why? Where next? Linking Research and Practice*. University of New South Wales, Sydney, 18-20 February.

Thomsen, D. (undated) *Community-Based Research: An opportunity for collaboration and social change. Summary of study and guidelines for citizen/expert collaboration*. Available at: http://www.coastal.crc.org.au/citizen_science/publications.html [Accessed 1 March 2004].

Tilbury, D. (1992) 'Environmental education within initial teacher education: The priority of priorities', *International Journal of Environmental Education and Information* 11(4): 267-280.

Tilbury, D. (1993) *Environmental Education: Developing a model for initial teacher education*. PhD Thesis, Cambridge: University of Cambridge.

Tilbury, D. (1994) 'The international development of environmental education: A basis for a teacher education model?' *Environmental Education and Information*, 13(1): 1-20.

Tilbury, D. (1995) 'Environmental education for sustainability: Defining the new focus of environmental education in the 1990s', *Environmental Education Research* 1(2): 195-113.

Tilbury, D. (1999a) 'WWF-South Africa – The School Water Action Project' in Fien, J. (ed.) Education and Conservation: *An Evaluation of the Contributions of Education Programmes within the WWF Network* - Reference Volume. Unpublished report.

Tilbury, D. (1999b) 'The Environmental Educators' Initiative for China - WWF-China' In Fien J (Ed) (1999) *Education & Conservation: Case Studies of Good Practice*, Unpublished Report.

Tilbury, D. (2001) 'Sustaining innovation in education: Experiences in the learning for a sustainable environment project', *Australian Journal for Environmental Education* 17: 87-93.

Tilbury, D. (2002) 'Active citizenship: Empowering people as cultural agents through geography' in Gerber, R. and Williams, M. *Geography, Culture and Education*, London: Kluwer Geolearn Series.

Tilbury, D. (2003) 'The world summit, sustainable development and environmental education', *Australian Journal of Environmental Education* 19: 109 - 113.

Tilbury, D. (2004a) 'Education for sustainable development: Redefining partnerships for a new decade.' Paper presented to the 2004 New Zealand Association for Environmental Education conference *Partnerships for the Planet*, Christchurch College of Education, 14th -17th January. Christchurch.

Tilbury, D. (2004b) 'Environmental education for sustainability: A force for change in higher education', in Blaze-Corcoran, P. and Wals, A. (eds) *Higher Education and the Challenge of Sustainability: Problematics, promise and practice*. Dordrecht: Kluwer Academic Press.

Tilbury, D. (2004c) Notes from the OECD ENSI *Annual General Meeting*, Gissen: 2004.

Tilbury, D. Goldstein, W. and Ryan, L. (2004) 'Towards environmental education for sustainable development: The contributions of NGOs in the Asia-Pacific region'. *International Review for Environmental Strategies*. Japan: Institute for Global Environmental Strategies. 4 (1).

Tilbury, D. and Henderson, K. (2003) 'Education for intercultural understanding in Australian schools', *Australian Journal for Environmental Education* 19: 81 - 95.

Tilbury, D. and Turner, K. (1997) 'Environmental education for sustainability in Europe: Philosophy into practice', *Environmental Education and Information* 16 (2): 123 – 140.

Tschapka, J. (2002) *Kid`s Views on Learnscapes*, Vienna: Austrian Federal Ministry of Education, Science and Culture.

United Nations (2002) *Plan of Implementation of the World Summit on Sustainable Development*. Available at: http://www.johannesburgsummit.org/html/documents/undocs.html [Accessed 18 February 2004].

United Nations (2002) *Report of the World Summit on Sustainable Development*, Johannesburg, South Africa, 26 August-4 September 2002, A/CONF.199/20*.

United Nations (2003a) *Johannesburg Summit 2002*. Available at: http://www.johannesburgsummit.org/ [Accessed 18 February 2004].

United Nations (2003b) *Partnerships for Sustainable Development*. New York: Department of Public Information and the UN Department of Economic and Social Affairs.

United Nations (2003c) *Bali Guiding Principles*. Available at: http://www.un.org/esa/sustdev/partnerships/bali_guiding_principles.htm [Accessed 1 March 2004].

United Nations (2003d) *The Road from Johannesburg: World Summit for Sustainable Development, What was Achieved and the Way Forward*. New York: UN Department of Economic and Social Affairs.

United Nations (2003e) *CSD and Partnerships for Sustainable Development*. Available at: http://www.un.org/esa/sustdev/publications/csd_newsletter/csdup83b.htm [Accessed 1 March 2004].

United Nations (2004) *United Nations Decade in Education for Sustainable Development* (2005-2014) Available at: http://portal.unesco.org/education/ev.php?URL_ID=23350&URL_DO=DO_TOPIC&U [Accessed 18 February 2004].

United Nations Conference on Environment and Development (UNCED) (1992) *Promoting education and public awareness and training, Agenda 21*, United Nations Conference on Environment and Development. Conches: UNCED.

United Nations Economic Commission for Europe (UNCEC) (2004) *Draft UNECE Strategy For Education For Sustainable Development: Addendum* Second regional meeting on education for sustainable development: Rome, 15-16 July 2004, UN Economic and Social Council. CEP/AC.13/2004/8/Add.2

United Nations Educational Scientific and Cultural Organisation (UNESCO) (undated) Quality Eduction, Education for Sustainable Development: United Nations Decade 2005-2014. Available at: http://portal.unesco.org/education/en/ev.php-URL_ID=27542&URL_DO=DO_TOPIC&URL_SECTION=201.html [Accessed 12 April 2004].

United Nations Educational Scientific and Cultural Organisation (UNESCO) (1978) *The Final Report: International Conference on Environmental Education*, Paris: UNESCO

United Nations Educational Scientific and Cultural Organisation (UNESCO) (1997) *Environment and Society: Education and Public Awareness for Sustainability*. Background Paper prepared for UNESCO International Conference, Thessaloniki.

United Nations Educational Scientific and Cultural Organisation (UNESCO) (2000) *The Dakar Framework for Action: Education for All - Meeting our Collective Commitments*. Adopted at the World Education Forum, Dakar, Senegal 26 – 28 April. Paris: UNESCO.

United Nations Educational Scientific and Cultural Organisation (UNESCO) (2002a) *Education for Sustainability, From Rio to Johannesburg: Lessons Learnt from a Decade of Commitment*. Report presented at the Johannesburg World Summit for Sustainable Development. Paris: UNESCO

United Nations Educational Scientific and Cultural Organisation (UNESCO) (2002b) *Teaching and Learning for a Sustainable Future: A mulit-media teacher education programme*. Available at: http://www.unesco.org/education/tlsf [Accessed 8 February 2004].

United Nations Educational Scientific and Cultural Organisation (UNESCO) (2003) *United Nations Decade of Education For Sustainable Development (2005-2014) Framework For The International Implementation Scheme*. Paris: UNESCO.

United Nations Educational Scientific and Cultural Organisation (UNESCO)- United Nations Environmental Programme (UNEP) (1978) *The Tbilisi Declaration. Connect*. III.

United Nations Educational Scientific and Cultural Organisation (UNESCO) - United Nations Environmental Programme (UNEP) (1990) *Environmentally educated teachers: The priority of priorities. Connect*, XV(1): 1-3.

United Nations Environmental Programme (UNEP) -United Nations Educational Scientific and Cultural Organisation (UNESCO) (2001) *Is the Future Yours? UNEP/UNESCO Research Project on Youth and Sustainable Consumption*. Paris: UNEP-UNESCO.

UNITWIN/ United Nations Educational Scientific and Cultural Organisation (UNESCO) (2000) '*Reorienting Teacher Education to Address Sustainability*' UNITWIN/UNESCO Chair at York University International Network March 22, 2000 Available at: http://www.edu.yorku.ca/?content=unChair [Accessed 28 April 2004].

University Corporation for Atmospheric Research (UCAR), Colorado State University (CSU) (2004) *The GLOBE Program*. Available at: http://www.globe.gov/fsl/welcome/welcomeobject.pl [Accessed 8 February 2004].

University of Technology Sydney (2003) *028713 Environmental Education*, Available at: http://www.uts.edu.au/div/publications/subjects/028713.html [Accessed: 8 April 2004].

Van Matre, S. (1979) *Sunship Earth*. Indiana: American Camping Association.

Van Matre, S. (1990) *Earth Education... A New Beginning*. Warrenville, Ill.: The Institute for Earth Education.

Van Matre, S. and Johnson, B. (1988) *Earthkeepers*. Warrenville, Ill.: The Institute for Earth Education.

Victorian Association for Environmental Education (VAEE) (2004) *Sustainable Schools Program*. Available at: http://www.enviroed-vic.org.au/susschools2002.htm [Accessed 23 February 2004].

WA Gould League Inc (undated) *WA Gould League* Available at: http://www.wagouldleague.com.au/index.htm [Accessed: 11 March 2004].

Wackernagel, M. and Rees, W. (1996) *Our Ecological Footprint: Reducing human impact on the earth*, British Columbia: New Society Publishers.

Walker, K. (1995) 'The teaching and learning of environmental education in New South Wales primary schools: A case study', *Australian Journal of Environmental Education* 11: 121-129.

Wals, A. (1996) 'Back-alley sustainability and the role of environmental education', *Local Environment* 1(3): 299-316.

Waterwatch Australia (2004) *Waterwatch Australia: Communities caring for catchments*. Available at: http://www.waterwatch.org.au/ [Accessed 18 February 2004].

Webb. J. (1989) *A Review of Field Studies Centres in Eastern Australia.* Sydney: NSW National Parks and Wildlife Service, Occasional Paper No. 17.

Webler, T, Kastenholz, H. and Renn, O. (1995) 'Public participation in impact assessment: a social learning perspective', *Environmental Impact Assessment Review* 15: 443-463.

Western Australian Museum (2003) *ALCOA Frog Watch*. Available at: http://heini.museum.wa.gov.au/frogwatch/index.html [Accessed: 18 February 2004].

Wilke, R.J. Peyton, R. B. and Hungerford, H.R. (1987) *Strategies for Training of Teachers in Environmental Education*. UNESCO-UNEP International Environmental Education Program, Environmental Education Series No. 25. Paris: UNESCO Division of Science, Technical and Environmental Education.

Williams, R. (1988) *Teacher Education and the Global Environment*, Report to the Education Advisory Committee of the World Wildlife Fund for Nature (UK).

Wilson, R. (1994) 'Pairing early childhood education and environmental education' in Wilson, R. (Ed.), *Environmental Education at the Early Childhood Level*. Troy, OH: North American Association for Environmental Education.

Wilson-Hill, F. (2003) *Children's Participation in Environmental Education - An analysis of Enviroschools a whole school approach to environmental education*. Unpublished Masters Thesis, Brisbane: Griffith University.

Wiltshire, K. McMeniman, M. & Tolhurst, T. (1994) *Shaping the Future. Report of the review of Queensland School Curriculum*. Queensland: Government Printer.

Winther, A. Volk, T. and Hungerford, H. (1994) 'Issue investigation and citizenship action training: An instructional model for environmental education' in: Bardwell, L. Monroe, M. and Tudor, M. (eds.) *Environmental Problem Solving: Theory practice and possibilities in environmental education*. Troy, Ohio: North American Association for Environmental Education.

World Wildlife Fund (WWF) United Kingdom (1993) *What We Consume. Global Environmental Education Programme – Teachers Handbook*, Godalming, Surrey: World Wide Fund for Nature (UK) and Richmond Publishing.

World Wildlife Fund(WWF) China (2004) *Environmental Educators Initiative*, Available at: http://www.wwfchina.org/english/sub_loca.php?loca=14&sub=93 [Accessed 24 May 2004]

Zoos Victoria (2003) *Zoo Education*. Available at: http://www.zoo.org.au/education/ [Accessed: 11 March 2004].

Zuber-Skerritt, O (2002) 'The concept of action learning', *The Learning Organisation* 9 (3): 114-124

Zuber-Skerritt, O. (2001) 'Action learning and action research: paradigm, praxis and programs', in Sankaran, S., Dick, B., Passfield, R. and Swepson, P. (Eds), *Effective Change Management Using Action Research and Action Learning: Concepts, frameworks, processes and applications*, Lismore, Australia: Southern Cross University Press.

Glossary

- **Action Competence**

  Action competence is inherently linked the concept of democracy. In this context actions are viewed not as reactive behaviour or lifestyle changes but rather as an active exercise of democratic participation in society. The action should be undertaken consciously, intentionally and voluntarily. Action competence occurs when citizens:

  - Have a critical and holistic knowledge of the issue;
  - Are committed, motivated and driven;
  - Can envision a sustainable solution; and
  - Have experience taking successful concrete action.

  Action competence is seen by some as crucial outcome for Environmental Education because it brings together the processes and practices of education with the need to develop democratic citizenship skills and values, and with the nature of the ecological, social and environmental crises facing the world.

- **Action Learning**

  Action learning is a process designed to build capacity using a form of reflection and assessment. The improvement of practice is the ultimate goal. The process involves the participants developing an action plan, implementing the plan and reflecting on what they have learnt from this. A facilitator and/or mentor assists the participants in developing their plan and learning from their experiences. Increasingly, it is being used in group settings where a number of people come together to critically reflect upon professional knowledge and improve practice.

- **Action Research**

  Action Research can be used as a collaborative research tool, which is often represented as a four-phase cyclical process of critical enquiry – plan formation, action, outcome observation and reflection. It aims not just to improve, but to innovate practice.

  Action Research provides a valuable process for exploring ways in which sustainability is relevant to the researchers' workplaces and/or lifestyles. It views change as the desired outcome and involves participants as researchers of their own practice. In this way Action Research produces more than just a research document. It results in catalytic change for sustainability. Its focus on critical enquiry and continuous self-evaluation makes it a useful tool for professional development in Environmental Education.

  Critical Action Research aims to change systems and to embed change in practice.

- **Adjectival Education**

  Describes the variety of other education strands such as Peace, Citizenship, Health, Global, Futures and Multi-cultural education, which collectively contribute to broadening the scope of Environmental Education content and methodology. These strands promote cross-curricular learning and the exploration of linkages between society and the environment, local and global dimensions as well as power and politics issues.

- **Agenda 21**

  Agenda 21, is an intergovernmental agreement signed at the United Nations Conference on Environment and Development held in Rio in 1992. This document consisting of 40 chapters provides an agenda for advancing sustainability. It was the first document to examine the interconnectedness of social, economic and environmental issues, focusing on current issues whilst also promoting and examination of future needs. Agenda 21 outlines objectives and actions that can be taken at local, national and international levels and provides a comprehensive blueprint for nations throughout the world who are starting to make the transition to sustainability. Chapter 36 of Agenda 21 accords special significance to the role of education as 'the most effective means that society possesses for confronting the challenges of the future'[a].

- **Carrying Capacity**

  Carrying capacity is the term given to the maximum number of organisms that a given area of habitat can support indefinitely, without degrading the habitat or causing social stresses that result in population decline. The term is often applied by those who have concerns about the ratio of the human population against available resources. However, this application is considered problematic since ethical beliefs and the use of technology add dimensions to the human situation which make it more than a straight-forward calculation.

- **Citizenship Action**

  Citizenship action is defined as those actions undertaken by citizens who have an awareness and understanding of social, economic or environmental issues and have the capacity to actively participate in their resolution. Types of citizen action can include:

- *Persuasion*: working to convince others that a certain action is correct and needed.
- *Consumer Action*: choosing products that are compatible with a particular environmental and social justice philosophy and boycotting products that are not.
- *Political Action*: bringing pressure on individuals or organisations (governmental or non-governmental) to influence decision-making.
- *Education*: facilitating a process of learning to help others reflect on their current actions and build their capacity to contribute ot a better future.

- **Citizen Science**
  Citizen science is a participatory process that attempts to build public understanding of science as well as support for scientific knowledge. It is aimed not only at restoring public confidence in science, but also at reorienting science towards coping with the complexity of sustainability. It can be viewed as a process of social learning. Citizen Science is relevant to all sectors but generally involves school students or general public in an inquiry process which addresses questions or concerns of public interest. Examples of citizen science approaches include GLOBE (*Global Learning and Observations to Benefit the Environment*) and programs such as *Waterwatch*.

- **Community Education**
  Community Education programs are taken to refer to all education programs which fall outside of the school, further and higher education sectors.

- **'Critical Theory'**
  'Critical theory' is a philosophical framework that seeks to radically critique systems of knowledge and power. 'Critical theory' seeks to develop systemic changes as opposed to individual behaviour changes. It emphasizes the importance of engaging people in thinking critically and developing their own responses and actions to issues rather than imposing on them previously constructed actions. 'Critical theory' attacks social practices, which obstructs social justice, human emancipation and ecological sustainability. 'Critical theory' is what underpins learning for sustainability approaches to Environmental Education. For further information see 'Critical Thinking'.

- **'Critical' Thinking**
  'Critical' Thinking is an essential part of learning for sustainability approaches to Environmental Education. It challenges us to examine the way we interpret the world and how our knowledge and opinions are shaped by those around us. 'Critical' thinking leads us to a deeper understanding of interests behind our communities and the influences of media and advertising in our lives. For further information refer to Volume 1 in this series.

- **Earth Education**
  Earth Education is a trademarked and systematic approach to education. It seeks to develops emotional attachments to the earth and promotes the adoption of harmonious lifestyles for the earth through carefully crafted sequential programs. Earth education programs teach four key ecological concepts: the flow of energy, the cycling of matter, the interrelationship of life, and the changing of forms. These principles are promoted through education *in* the environment programs that sharpen the senses, build concepts of the environment and provide opportunities for solitude and commune with nature.

- **Eco-Efficiency**
  Eco-Efficiency was coined by the World Business Council for Sustainable Development (WBCSD) in 1992 and defined as the delivery of competitively priced goods and services that satisfy human needs and promote quality of life. Eco-efficiency progressively reduces ecological impacts and resource intensity throughout the life cycle. The concepts of Eco-Efficiency and Cleaner Production are almost synonymous. The slight difference between them is that eco-efficiency starts from issues of economic efficiency which have positive environmental benefits, while Cleaner Production starts from issues of environmental efficiency which have positive economic benefits.

- **Ecological footprint**
  Ecological footprints document a given individuals's, population's or organisation's consumption and waste production. It is measured in terms of the area of biologically productive land and water required to produce the goods consumed and to assimilate the wastes generated in a single year. The ecological footprint is a valuable resource for environmental educators because it provides a means to compare:

  - various components of individual consumption;

- average consumption and impact patterns amongst countries/organisations; and
- individual and world average impacts.

- **Education *about* the environment**
  Education *about* the environment is the most commonly practiced approach in Environmental Education. It focuses on developing key knowledge and understanding about natural systems and and complex environmental issues as well as developing an understanding of the human interaction with these systems and issues.

- **Education *in* the environment**
  Education *in* the environment is an approach, which provides opportunities for learners to have direct experience in the environment and develop positive attitudes and values towards stewardship of the environment. The approach may foster a value-based environmental concern of the importance and fragility of ecosystems and landscapes. While ecological concepts may be taught through these explorations, the focus is on having positive experiences in a natural setting.

- **Education *for* the environment**
  Education *for* the environment moves beyond education *in* and *about* the environment approaches to focus on equipping learners with the necessary skills to be able to take positive action. The education *for* the environment approach promotes critical reflection and has an overt agenda of social change. It aims to promote lifestyle changes that are more compatible with sustainability. It seeks to build capacity for active participation in decision-making for sustainability. In practice, however, education *for* the environment is often interpreted as the involvement of learners in one-off events or individual actions (e.g. tree planting) although occasionally they can trigger greater change on a social level.

- **Environmental Education**
  Environmental Education within this series refers to the overall field of education which engages learners with their environments, be they natural, built or social. The range of practices and approaches to Environmental Education have evolved significantly since the term was first used in the late 1960s. Initially in the 1970s educators perceived Environmental Education as 'education *about* the environment' which focuses on developing knowledge and understanding (see glossary). Environmental Education then progressed to favour the approach of 'education *in* the environment' (see glossary) which promotes experiencing environment and issues. In the 1990s the practice of teaching 'education *for* the environment' emerged as a dominant force (see glossary) with its focus on participation and action to improve the environment. Currently within Environmental Education one can still find examples of all these approaches in practice. The most recent development in Environmental Education theory and practice is 'learning for sustainability'. This approach challenges current practice in several ways to achieve more systemic change towads sustainability (see glossary).

- **Environmental Education for a Sustainable Future: National Action Plan**
  A national Australian strategy launched in 2000 that outlines a direction for Envirionmental Education in Australia.

  The plan aims to[b]:
  - increase the profile of Environmental Education;
  - implement a national coordinating body for Environmental Education;
  - provide professional development opportunities for teachers and others involved in Environmental Education;
  - develop resources for Environmental Education; and
  - integrate Environmental Education into mainstream education and training activities.

- **Environmental Stewardship**
  Environmental stewardship involves the recognition of our responsibility to maintain and improve, the natural world which we have inherited and which we will bequeath to future generations. Stewardship requires, at least, the preservation and proper management of natural resources. However, it is mostly used to refer to efforts to restore of over-exploited nature.

- **Envisioning and Futures thinking**
  Envisioning a better future is a process that engages people in conceiving and capturing a vision of their ideal future. Envisioning, also known as 'futures thinking', helps people to discover their possible and preferred futures, and to uncover the beliefs and assumptions that underlie these visions and choices. It helps learners establish a link between their long term goals and their immediate actions. Envisioning offers direction and energy and provides impetus for action by harnessing peoples' deep aspirations which motivate what people do in the present.

For further information refer to Volume 1 of this series.

- **Essential Learnings Frameworks**

There are many ways in which curriculum is organised within schooling systems. Essential Learnings provide an organisational framework for the curriculum. The Essential Learnings Frameworks are designed to:

- reduce problems of a crowded curriculum;
- engage learners more deeply in their learning;
- make learning more relevant;
- improve learning across all areas;
- develop higher order thinking;
- support the transfer of learning.

It aims to respond to public concerns about current curriculum frameworks such as a cluttered and compartmentalised curriculum which provides few opportunities for students to explore issues in depth or connect their learning to real-world experience. Essential Learnings is an attempt to trim back the excesses of curriculum to focus on developing deep understandings that students need to develop now and draw upon in the future as active, responsible citizens and life-long learners in a rapidly changing world. In the Essential Learnings frameworks there is a focus on developing student capacity to reflect critically on their own thinking and to have a constructive understanding of their learning.

Essential Learnings frameworks provide opportunities for learning for sustainability in that they focus on key components of learning for sustainability such as critical and systems thinking and in-depth study of a variety of relevant issues. They are also an innovative attempt at reorienting curriculum to focus on futures in an uncertain world.

- **Experiential Learning**

Experiential learning is a constructivist approach to learning that engages participants in reflection, problem solving and decision making in contexts that are personally relevant to them. In experiential learning, participants actively construct their own knowledge, skill, and value from direct experience. Experiential learning draws upon the learners' knowledge, understanding and prior experience and involves them in applying this knowledge to current activities. Experiential learning also provides opportunities for debriefing and consolidation of ideas and skills through feedback, reflection, and the application of the ideas and skills to new situations. Reflection is an essential and ongoing part of the process and becomes the basis for assessing the experience and engaging in further learning activities.

The experiential learning cycle involves four phases:

- *Experience*: Engaging in a particular experience and observing its effects.
- *Processing the experience*: Understanding and analyzing actions, thoughts and feelings, from the experience.
- *Generalising*: Generalising cause and effect relationships behind the action/experience.
- *Applying*: Applying the generalisation to new situations.

The key to experiential learning is that the participants are engaged in a specific and predetermined experience, for example an outdoor or nature based activity. From this experience they develop (or construct) their understanding of particular issues. In comparison, action learning participants are facilitated through a process of identifying an action, implementing it and then reflecting and learning from their own personal experience. For further information refer to 'Action Learning'.

- **Inquiry learning**

Inquiry learning is a learner-centred teaching strategy. It is designed to encourage students to develop their own learning through responding to their own concerns by means of systematic investigation, emphasising higher order thinking skills. Inquiry learning is driven by the questions created by the participants. Participants are responsible for gathering, processing, and analyzing their data, in order to reach their own conclusions.

This negotiated process (between educator and learner) usually involves:

1. *Tuning in*: identifying and defining an issue;
2. *Deciding directions*: formulating questions that require answering;
3. *Organising ourselves*: developing the process of how to investigate the issue;
4. *Finding out*: investigating the issue and collecting data;
5. *Sorting out*: processing and analysing the data;

6. *Drawing conclusions*: students express their understandings and communicate them to others;

7. *Considering action*: students participate in decision-making to identify action to address the issue;

8. *Reflection and evaluation*: students and teachers reflect on the process and evaluate the outcomes.

- **Intergenerational Equity**

Intergenerational equity is the principle that future generations have fair and equal right to the same standard of quality of life and environment as the present generation. This is a core principle of sustainable development.

- **Key learning Areas (KLAs)**

There are many ways in which curriculum is organised within formal schooling systems; Key Learning Areas, are one such organisational construct. KLAs particularly emphasise the description and classification of formal school curriculum into composite fields of knowledge. KLAs were endorsed in 1991, as part of the first '*Australian National Statement and Profile on Education*'. Eight KLAs were identified as being core, and attainment of the significant aspects of knowledge, skills and understandings that characterise each KLA is important.

The eight KLAs are:
- English
- Languages other than English (LOTE)
- Mathematics,
- Science
- Studies of Society and Environment (SOSE)
- Technology
- The Arts
- Health and Physical education

The KLAs were re-endorsed as curriculum organisers by State, Territory and Commonwealth Ministers of Education in the '*Adelaide Declaration on National Goals for Schooling in the Twenty-first Century*' and there are a variety of state and territory interpretations of the construct.

- **Learning Organisation**

A learning organisation is one which is based on the principles of adaptive management and uses these techniques within the workplace. It promotes exchange of information between employees hence creating a more knowledgeable workforce. This produces a very flexible organisation where people will accept and adapt to new ideas and changes through a shared vision. A key component of a learning organisation is that it incorporates the principles of adaptive management.

Adaptive management is a systematic process for continually improving management policies and practices by learning from the outcomes of operational programs. Its most effective form ('active' adaptive management) employs management programs that are designed to explore visions, develop critical and systemic thinking in the workplace.

- **Learning for Sustainability**

Learning for sustainability has crystallized as a result of international agreements and the global call to actively pursue sustainable development. It provides a new orientation for current practice in Environmental Education. This new orientation attempts to move beyond education *in* and *about* the environment approaches to focus on equipping learners with the necessary skills to be able to take positive action to address a range of sustainability issues. Learning for sustainability motivates, equips and involves individuals, and social groups in reflecting on how we currently live and work, in making informed decisions and creating ways to work towards a more sustainable world. Underpinned by the principles of critical theory (see glossary). Learning for sustainability aims to go beyond individual behaviour change and seeks to engage and empower people to implement systemic changes. For further information refer to Volume 1 of this series.

- **Life Cycle Analysis (LCA)**

Life Cycle Analysis is a technique for quantifying and assessing the inputs and outputs affecting environmental performance associated with a product throughout its life cycle from production, through use, to disposal. LCA can assist in identifying opportunities to improve environmental performance.

- **Local Agenda 21**

Chapter 28 of the '*Agenda 21*' document calls on local authorities to work with their local communities to develop a local action plan for sustainable development, or a 'Local Agenda 21.' This process recognises the role communities have to play in shaping their own future and the importance of building partnerships between local government, community, NGO and industry. Empowering local communities to participate actively in the decision making process is a core aim of Local Agenda 21 and seen as essential for the move towards sustainability. For further information refer to 'Agenda 21'.

- **National Environmental Education Council**
  A key element of the Australian Government's National Action Plan for Environmental Education is the establishment of the *National Environmental Education Council*. The Council is a non-statutory body comprised of people from a variety of sectors who provide expert advice to the Government on Environmental Education issues. A key goal of the Council is to raise the profile of Environmental Education and, in particular, how Australians can move beyond environmental awareness to informed action[c].

- **OECD ENSI**
  Environment and Schools Initiatives (ENSI) is an international network of educators from 14 member countries across the OECD and under the umbrella of OECD CERI. *ENSI* cooperatively undertake Environmental Education research and development programs particularly focusing on activities related to sustainability. *ENSI* employs a participatory approach which involves schools, teachers, teacher trainers and students in research with a main focus on action research and development. *ENSI* also promotes international exchange, understanding and collaboration amongst network members and with other international organisations and makes policy recommendations when appropriate. *ENSI* supports educational developments that promote environmental understanding, active approaches to teaching and learning, and citizenship education, through research and the exchange of experiences[d].

- **Participatory Action Research (PAR)**
  Participatory Action Research is a collaborative process in which a group of co-researchers combine inquiry, critical reflection and action. A main component of PAR is that there are no 'experts' and as such all of the group are involved equally in the processes of inquiry and problem solving. PAR seeks to breakdown the traditional hierarchies and power structures experienced between researcher and researched. It is the participants or 'researchers' that have control and ownership of the process, direction of research and ultimately the use of the results.

  The process has been used as a form of group Action Research that encourages more open communication and discussion amongst colleagues regarding a specific task or issue. The group Action Research process invited deeper critical reflection and more effective action. For further information refer to 'Action Research'.

- **Social Capital**
  Social capital represents the degree of social cohesion which exists in communities. It refers to the processes between people which establish networks, norms, and social trust, and facilitate coordination and cooperation for mutual benefit.

- **Sustainable Development and Sustainability**
  The idea of sustainability owes a great deal to the United Nations which in 1983 set up the *World Commission on Environment and Development (WCED)* and promoted quality of life for present as well as future generations. The key goals of sustainability are to live within our environmental limits, to achieve social justice and to foster economic and social progress.

  Issues such as food security, poverty, sustainable tourism, urban quality, women, fair trade, green consumerism, ecological public health and waste management as well as those of climatic change, deforestation, land degradation, desertification, depletion of natural resources and loss of biodiversity are primary concerns for both environmental and development education.

  The issues underlying 'sustainable development', or 'sustainability', are complex and they cannot be encapsulated within the diplomatic language and compromises. Sustainability is open to different interpretations and takes on different meanings not only between cultures but also between different interest groups within societies. Sustainability embraces equality for all, and for this reason a key aim of sustainability is to enable multi-stakeholder groups to define their vision of sustainability and to work towards it. For further information refer to Volume 1 of this series.

- **Systems Thinking**
  Systems thinking is a type of thinking methodology based upon a critical understanding of how complex systems, such as environments and ecosystems, function by considering the whole rather than the sum of the parts. Systems thinking provides an alternative to the dominant way of thinking, which emphasizes analysis and understanding through deconstruction. In comparison, systemic thinking offers a better way to understand and manage complex situations because it emphasizes holistic, integrative approaches, which take into account the relationships between system components and works toward long-term solutions critical to addressing issues of sustainability. Systemic thinking offers an innovative approach to looking at the world and the issues of sustainability in a broader, interdisciplinary and more relational way. Closely related to holistic and ecological thinking, systemic approaches help us shift our focus and attention from 'things' to processes, from static states to dynamics, and from 'parts' to 'wholes'.

- **UN Decade of Education for Sustainable Development (UN Decade of ESD)**
  In December 2002, resolution 57/254 was adopted by the United Nations General Assembly establishing the *United Nations Decade of Education for Sustainable Development (2005-2014)*. The Decade is a culmination of the momentum towards sustainability generated by the *Earth Summit*, '*Agenda 21*' and the *WSSD* and presents an opportunity to focus world attention on learning for sustainability across the globe.

  The United Nations Decade of Education for Sustainable Development aims to:

  - promote education as a prerequisite for the movement to sustainable human societies;
  - integrate sustainable development into education systems at all levels; and
  - strengthen international cooperation towards the development and sharing of innovative education for sustainable development theory, practice and policy.

  The Decade also offers opportunities for researchers, practitioners and education policy-makers, who are often isolated from each other, to join in partnerships and to contribute to a collective and international imperative.

- **Values Clarification**
  An educational approach employing a variety of strategies, which enables learners to clarify and critically examine their own values, particularly those, which are unconscious or inarticulate. This process helps learners uncover how culture, ideology, gender, socio-economic background and religion shapes ones deepest held personal beliefs and values and assists learners in determining how ones own values coincide or conflict with others. Genuine engagement with sustainability requires us to understand how these factors shape our values and thus our view of the world.

- **World Education Forum**
  The *World Education Forum* was held in Dakar, Senegal in 2000. The outcome of this forum was '*The Dakar Framework*' which reaffirms a commitment to achieving basic quality education for all by 2015 and entrusts UNESCO with coordinating and sustaining global momentum towards this aim.

- **World Summit on Sustainable Development (WSSD) and Johannesburg Plan of Implementation**
  The *World Summit on Sustainable Development* was held in Johannesburg, South Africa from August 26 to September 4, 2002. The core goal of the summit was to review the progress made towards sustainability in the ten years since the 1992 *UN Conference on Environment and Development (UNCED)* in Rio. The summit focus was on the status of the implementation of '*Agenda 21*' by identifying further measures required to implement the Rio agreements, areas where more effort was needed and new challenges and opportunities. The *WSSD* reaffirmed commitment to the Rio principles, the implementation of '*Agenda 21*' and to the development goals adopted in the '*UN Millennium Declaration*'. An outcome of the summit was the production of the '*Johannesburg Plan of Implementation*', which is a targeted action plan containing more than 120 goals or targets for sustainable development in conjunction with other UN-sponsored principles.

  The *WSSD* achieved a number of accomplishments, including:

  - reaffirming sustainable development as a central element of the international agenda;
  - focusing attention on the links between poverty, the environment and natural resource use through shared dialogue;
  - negotiating concrete agreements from many participating governments to numerous commitments to implement sustainable development objectives;
  - prioritising energy and sanitation issues
  - according civil society views a prominent role; and
  - boosting partnerships between governments, business and civil society.

  Education was a cross cutting theme at the *WSSD*. The '*Johannesburg Plan of Implementation*' points to the social actions required to achieve sustainable development and to the role of education, capacity building and communication in achieving this goal. It recommended the adoption of the *UN Decade of Education for Sustainable Development* to further opportunities to action sustainable development.

[a] UNESCO (1997) Educating for a Sustainable Future: A transdisciplinary vision for concerted action, para.38

[b] Adapted from http://www.deh.gov.au/education/nap/

[c] Adapted from http://www.deh.gov.au/education/nap/council/

[d] Adapted from http://www.ensi.org/

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