

Whole-school approaches to sustainability:

A review of models for
professional development
in pre-service teacher education

A report prepared by the Australian Research Institute in Education for Sustainability (ARIES)
for the Australian Government Department of the Environment and Heritage.

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Prepared by the Australian Research Institute in Education
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Published by:

Australian Research Institute in Education for Sustainability
Graduate School of the Environment
Macquarie University
North Ryde, NSW 2109

This research was funded by the Australian Government Department of the Environment and Heritage through the Natural Heritage Trust.

ISBN: 1 74138 179 7

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Citation

Ferreira, J., Ryan, L. and Tilbury, D. (2006) *Whole-School Approaches to Sustainability: A review of models for professional development in pre-service teacher education*. Canberra: Australian Government Department of the Environment and Heritage and the Australian Research Institute in Education for Sustainability (ARIES).

Front Cover

Centre for Flexible Learning, Macquarie University, W06041 March 2006

Acknowledgements

We would like to thank those who led the teacher education initiatives reviewed in this report for the additional information they provided. We would especially like to thank Sheila Bennell, Dr Marceline Collins-Figuereroa, Prof. John Fien, Dr Peter Higgins and Dr Tony Shallcross.

We would also like to thank John Huckle, Prof. Sally Inman, Cameron McKenzie, and Dr John Meadows for responding so generously to our inquiries.

The research was peer reviewed by a Key Informant Group to assure validity of findings. We would like to thank those involved in this group: Dr Amy Cutter-Mackenzie (Monash University, Australia), Dr Merce Junyent Pubill (University of Girona, Spain), Dr Barry Law (Christchurch College of Education, New Zealand), Prof. Heila Lotz-Sisitka (Rhodes University, South Africa), Claude Remenyi (Victorian Department of Education, Australia), and Dr Willy Sleurs (EnSI International and Belgium Government).

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Abbreviations

AAEE	Australian Association for Environmental Education
ACTS	Action Research for Change Towards Sustainability
ATSI	Aboriginal and Torres Strait Islander
AuSSI	Australian Sustainable Schools Initiative
AVCC	Australian Vice-Chancellors' Committee
EE	Environmental Education
EEITE	Environmental Education in Initial Teacher Education
EfS	Education for Sustainability
EGCSD	Education for Global Citizenship and Sustainable Development
ELS	Essential Learning Standards
ESD	Education for Sustainable Development
ENACT	Jamaican Environmental Action Programme
ENSI	Environment and Schools Initiative
ICT	Information, Communication and Technology
KLA	Key Learning Area
LSE	Learning for a Sustainable Environment
LfL	Learning for Landscapes (UK)
MCEETYA	Ministerial Council on Education, Employment, Training and Youth Affairs
NEEC	National Environmental Education Council, Australia
NEEC (Jamaica)	National Environmental Education Council, Jamaica
NEEN	National Environmental Education Network, Australia
NGOs	Non-Governmental Organisations
OECD CERi	Organisation for Economic Co-operation and Development, Centre for Educational Research and Innovation
PCE	Parliamentary Commissioner for the Environment, New Zealand
QUT	Queensland University of Technology
RQF	Research Quality Framework
SD	Sustainable Development
SDEP	Sustainable Development Education Panel (UK)
SEEPS	Sustainability Education in European Primary Schools
SOSE	Studies of Society and Environment
SRA	State Registration Authority
STEEP	Sustainable Teacher Environmental Education Project
TLSF	Teaching and Learning for a Sustainable Future
TaLESSI	Teaching and Learning at the Environment, Science and Society Interface
UK	United Kingdom
UNDESD	United Nations Decade of Education for Sustainable Development
UNCED	United Nations Conference on Environment and Development
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UNITWIN	University Twinning and Networking Scheme, UNESCO
WWF	World Wide Fund for Nature

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Executive Summary

Recognising the vital role that teacher education plays in achieving changes in Australian schools, this report investigates ways in which Learning for Sustainability can be mainstreamed in teacher education.

The report begins by outlining the context within which teacher education initiatives are framed. It examines the current structures of pre-service education courses and influences on teacher education institutions. It also reviews thinking and practice in Learning for Sustainability in this sector, identifying whole-school approaches to sustainability as a powerful means of advancing the sustainability agenda in schools.

Whole-school approaches recognise that sustainability is relevant to all aspects of school life including formal and hidden curricula, school leadership and management as well as teacher development. Whole-school approaches encourage schools to practise what they preach.

At present, whole-school approaches to sustainability are not widespread in Australia. There are some efforts to remedy this situation. The Australian Government's *National Environmental Education Statement for Australian Schools* and the Australian Sustainable Schools Initiative are making progress in this area. However, the uptake of these initiatives is dependent on teachers who are knowledgeable about sustainability and have the capacity to implement whole-school approaches. Unfortunately, pre-service teacher education in Australia does not prepare teachers well for this task.

In their initial training, teachers may learn about sustainability in science, geography, or studies of society and environment curricula. However, sustainability does not feature in educational leadership, management, psychology or sociology classes thereby limiting the potential for whole-school approaches. This study recognises the need to address this and find an effective mechanism to bring about change within pre-service teacher education programs so that Learning for Sustainability becomes an integral part of initial training.

The research set out to review Environmental Education or Education for Sustainability initiatives targeted at this level. The report essentially seeks to identify the models of professional development that underpin these initiatives and to review their effectiveness in achieving change at this level.

Key questions of this study include:

Q. What professional development models have been used in pre-service teacher education to bring about innovation and change?

Q. How have these models involved and motivated professionals to engage with change?

Q. Which models are conceptually congruent with the goals of Learning for Sustainability?

Q. What are the critical success factors of the different models?

Q. Which models are most effective for mainstreaming whole-school approaches to sustainability within pre-service teacher education?

The goal of this research was not to review good practice but rather to identify strategies that could lead to changes within pre-service teacher education. The study examined seven initiatives, both national and international, that sought to effect change in pre-service teacher education. It identified three models of professional development underpinning these initiatives. These were: the Collaborative Resource Development and Adaptation model; the Action Research model; and the Whole-of-System model. The models differ in a range of ways, most notably in the way in which they attempt to effect change.

Several factors were also identified as influencing the success of the initiatives reviewed such as: the nature and length of funding; the range and quality of partnerships and networks; the curriculum focus; the teaching and learning processes used; the levels and incentives for engaging participants in professional development; the use of evaluation as a tool for learning and ongoing improvement; and the context in which the initiative occurs.

The report concludes by recommending an approach to professional development that combines the best features of the Action Research and the Whole-of-System models with the range of critical success factors the research identified. The proposed approach seeks to simultaneously engage key stakeholders within a system, including teacher education accreditation agencies, policy makers, planners and practitioners, in the process of change to ensure that there is compatibility and thus less resistance to any proposed change in the system. In addition, it utilises iterative action research cycles in order to enable stakeholders to explore the relevance of sustainability to their work. This is important to attain commitment to, and ownership of, the innovation process across the system, and, in this way, to mainstream Learning for Sustainability in teacher education in Australia.

1.0 Overview and Context

[Education is] a key instrument for bringing about changes in the knowledge, values, behaviours and lifestyles required to achieve sustainability ... Education for sustainable development (ESD) implies providing the learners with the skills, perspectives, values and knowledge to live sustainably in their own communities.¹

Education for Sustainability: From Rio to Johannesburg
UNESCO (2002, p. 2)

‘Institutions of teacher education fulfil vital roles in the global education community; they have the potential to bring changes within educational systems that will shape the knowledge and skills of future generations. Often education is described as the great hope for creating a more sustainable future; teacher education institutions serve as key change agents in transforming education and society so that such a future is possible.’

Guidelines and Recommendations for Reorienting Teacher Education to Address Sustainability
UNESCO (2005, p. 6)

Box 1.1

Mainstreaming Learning for Sustainability

The term mainstreaming is used in this report to refer to the inclusion of Learning for Sustainability within pre-service teacher education to such an extent that it becomes part of its core. To this end, mainstreaming necessarily goes beyond the mere addition of Learning for Sustainability into the curriculum, but implies a widescale adoption of not only the content, but also its associated processes within the pre-service teacher education system.

Box 1.2

Models of Professional Development

This phrase has been used throughout the report to refer to a variety of generic approaches to professional development that have been used within pre-service teacher education programs. The models identified here are particularly revealing with regard to effecting change. Each model has a uniquely different process and set of assumptions about the way change happens, particularly within teacher education institutions and the way professional development is offered.

Teachers hold the key to change in schools. This has been recognised by international agencies such as UNESCO who have identified the professional development of teachers in Learning for Sustainability as ‘the priority of priorities’.¹ Indeed, over the past 15 years many documents have been written about the need to *reorient teacher education towards sustainability*.² These all identify teacher education as a key strategy that is yet to be effectively utilised to embed Learning for Sustainability³ in schools.⁴

There have been some teacher education initiatives in the area of environment or sustainability but these have mostly appealed to the ‘converted’ – involving those who have been working in Environmental Education or already have an interest in sustainability. This has been the case with the UNESCO *Reorienting Teacher Education towards Sustainability* initiative;⁵ the UNESCO and Griffith University *Teaching and Learning for a Sustainable Future* project⁶ and the OECD’s *Teacher Education and School Development* (ENSI) project.⁷ Although these initiatives have taken an interdisciplinary approach and built the knowledge and skills of a select group of teachers, they have not succeeded in mainstreaming sustainability in pre-service teacher education (see Box 1.1). There has been no teacher education initiative that has strategically set out to mainstream sustainability into the core of teacher education programs.

However, pockets of good practice have emerged as a result of previous initiatives. There is a need to reflect upon the models of professional development (See Box 1.2) underpinning these initiatives and to examine their assumptions about curriculum and institutional change. For example, previous studies have shown that participation in one-off workshops or the introduction of cutting edge resources and ‘kits’ do not lead to substantive, long term change.⁸ A review of the key design features and implementation strategies of such initiatives may assist in explaining the relative success of these projects. Studying other initiatives outside the field that have brought innovation within teacher education institutions would also be valuable. These may assist in identifying institutional and sectoral constraints facing attempts at change, and assist in identifying opportunities and incentives for change.

1.1 This Report

This document is divided into the following sections: overview and context; professional development initiatives and models; research findings and implications; critical success factors; and recommendations.

The *overview and context* section presents an overview of teacher education in Australia and the place of Learning for Sustainability in pre-service teacher education. It examines whole-school approaches to sustainability and their implications for the initial professional development of teachers.

The section on *professional development models and initiatives* reviews initiatives that have sought to address Learning for Sustainability within teacher education. It identifies the assumptions and strategies

underpinning these models in an attempt to assess their effectiveness in achieving change.

The *research findings and implications* provide a summary of the key themes and learnings emerging from the review of models and initiatives. This discussion is supported by the *Teacher Professional Development Initiatives* table (see Appendix 1). This highlights key features of the initiatives reviewed and provides a quick reference guide to each initiative.

Critical success factors are also identified. These serve to capture the variables that influence the effectiveness of the models in achieving their aims.

The *recommendations* section provides strategic ways forward identified through the research.

The text featured within the page margins either expands on key points in the main text or provides details, evidence and quotations to support the research findings.

1.1.1 The Research Aim

This research seeks to identify and appraise the models underpinning a range of pre-service professional development initiatives developed nationally and internationally. Its intention is to learn from these experiences and identify effective models for mainstreaming sustainability in pre-service teacher education programs in Australia as well as the factors that impact on their level of success in mainstreaming change.

1.1.2 Research Process

This research was undertaken through a systematic review of relevant literature, including journals, theses, evaluations, initiative websites and program documentation. Correspondence also took place with the leaders of national and international programs featured in this report as well as with related stakeholders in order to source further information. In many cases the initiative leaders were also able to validate our appraisal of their initiatives by responding to specific questions.

It is important to note that this research did not collect empirical data but instead reviewed program documentation and articles associated with these initiatives. The research was guided by the advice of a *Key Informant Group* consisting of experienced educators who work within the teacher education sector and/or have expertise in Learning for Sustainability.

The *Key Informant Group* played a critical role in:

- identifying professional development initiatives to review;
- assisting with constructing the context in which these programs emerged;
- assisting with identifying the lessons learnt; and
- assuring the validity of findings contained in this report.

Box 1.3

Modes of Teacher Professional Development

Pre-service or initial teacher education are terms used to refer to the professional preparation of new teachers.

In some countries, students spend a large portion of their initial training working as 'apprentices' in schools, the term '**initial teacher education**' is used to describe this process.

In Australia, however, the term '**pre-service teacher**' education is used to describe the professional development that occurs through attending courses from an accredited university. Prospective teachers must attain a qualification from the university *before* they can register for work at the early childhood, primary, middle and secondary levels. In Australia, pre-service courses in education range in length from one to four years depending upon the level prospective teachers will work at and their prior formal qualifications. They also include a component of time in schools.

'**In-service teacher education**' is the term used to refer to the ongoing education and training of practising teachers. This is mandatory in some states in Australia such as Queensland. In-service tends to occur during pupil-free days or on an afternoon a week over several weeks. In-service topics commonly address new curriculum and professional skills. There has been some debate about the effectiveness of current models of in-service, which tend to be school-driven but also *ad hoc* and uncoordinated. The current focus on professional standards apparent in Australia reflects this debate.

'**Continuing professional development**' or 'continual professional learning' is a broader term that can be used to refer to the gambit of professional development opportunities available to teachers including in-service training as well as other further and higher degrees including the graduate certificates, diplomas and masters degrees. Such opportunities enable teachers not only to keep up to date with the profession but also to further their career and improve their qualifications.

Key questions underpinning this study include:

Q. What professional development models have been used in pre-service teacher education to bring about innovation and change?

Q. How have these models involved and motivated professionals to engage with change?

Q. Which models are conceptually congruent with the goals of Learning for Sustainability?

Q. What are the critical success factors of the different models?

Q. Which models are most effective for mainstreaming whole-school approaches to sustainability within pre-service teacher education?

1.1.3 Research Limitations

This research does not represent an exhaustive study of all initiatives that exist throughout the world but instead captures a range of efforts. For example, it does not review all Environmental Education or Education for Sustainability programs or indeed evaluate the ones that are featured. Neither does it intend to include all initiatives that attempt to mainstream concepts across teacher education. Instead the focus is on showcasing the different models that underpin a range of initiatives.

While the search for appropriate initiatives was not restricted to Environmental Education or sustainability-focussed programs, the majority of initiatives featured here are sustainability-related. A range of programs, particularly in the areas of information, communication and technology (ICT), multicultural and Aboriginal and Torres Strait Islander (ATSI) perspectives were examined. However, none of these provided examples of new models that had not already been used in Environmental Education and Education for Sustainability. Given that the research focus here is on mainstreaming whole-school approaches to sustainability in pre-service teacher education, the initiatives reviewed are those that have a sustainability focus.

The research has been limited by the degree to which programs have documented their experiences in print and what is available for public access. Many programs have extensive information available electronically or in hard copy but this is often aimed at a general audience or to serve a particular funding agency agenda. Few programs have undertaken extensive evaluation or research into their achievements and long term impacts. The research was also limited to easily accessible, English-language documents and by a short timeframe.

1.2 Teacher Education in Australia

The professional development of teachers in Australia occurs at the pre-service level and also as in-service (see Box 1.3). The latter remains largely voluntary and is not an effective means of ensuring that all teachers have an understanding of, and skills in, Learning for Sustainability. However, all teachers are obliged to undertake pre-service education in order to become accredited teachers and develop appropriate knowledge and skills in their profession. Pre-service teacher education is the focus of this research as it offers the greatest

- largely untapped⁹ - opportunity for the education of teachers in Learning for Sustainability in Australia.

Pre-service teacher education, which must be obtained through an accredited university course, is currently offered in 38 institutions in Australia,¹⁰ with around 15,000 graduands each year (see Box 1.4).¹¹

A 2002 study identified approximately 400 initial teacher education programs in Australia.¹² These prepare teachers for the early childhood, primary, middle years and secondary levels of teaching, and reflect various responses to curriculum and education policy over the years (See Section 1.2.1). However, there are common components to pre-service teacher education programs regardless of where they are offered.

A typical pre-service teacher education program (Box 1.5 provides a sample program from the largest teacher education institution in Australia) consists of five key areas:

- **Curriculum content** - subjects deemed to be core curriculum such as literacy and numeracy or indigenous perspectives;
- **Teaching and learning methodologies** - often termed pedagogy, the science or art of teaching in ways that meet the diverse needs of students and develop cognitive abilities;
- **Professional studies** - issues that are common to the profession such as educational, psychological and philosophical theories of teaching, learning and behaviour management;
- **Elective subjects** - these allow students in some programs to have a degree of specialisation;
- **Teaching practice** - regardless of the mode of delivery, all students must also undertake a minimum period of teaching practice (variously called professional practice, field studies, teaching practicum) in schools.

The default framework underpinning teacher education programs in Australia is that which is best termed ‘the core and elective framework’. Here students are required to undertake a range of subjects that are considered ‘core’ and then electives to further develop their interest or specialisation.

The prominence of the core and elective framework raises several issues for those seeking to mainstream Learning for Sustainability approaches in pre-service teacher education. This framework means that there are various options for Learning for Sustainability approaches:

- a) struggle to be recognised as core curriculum alongside literacy and numeracy; or
- b) be offered as an elective, which results in a small number of student teachers specialising in Learning for Sustainability; or
- c) mainstream across the teacher education program so that a genuine ‘whole-school approach’ to sustainability can be developed; or
- d) a combination of the above.

Box 1.4

The number of students training to be teachers fluctuates according to demand. Both state education departments and teacher education faculties attempt to anticipate demand in order to avoid either shortages or surpluses of teachers entering the teacher labour market.

Box 1.5

Sample Four Year Degree Program (Core)

QUT - Bachelor of Education (Primary)

Year One Units/Courses

Teaching and Learning: Teaching in New Times
Learning Networks
Foundation Studies 2: Scientific and Quantitative Literacy
Foundation Studies 3: Wellness and Active Citizenship
Curriculum: Language and Literacies 1
Culture Studies: Indigenous Education
Curriculum: Mathematics 1

Year Two Units/Courses

Teaching and Learning 2: Development and Learning
Field Studies 1: Development and Learning in the Field
Curriculum: Information and Communication Technologies
Curriculum: Science
Curriculum: Studies of Society and Environment
Elective studies 1
Curriculum: Health & Physical Education
Curriculum: Music, Visual Arts & Media/Dance and Drama

Year Three Units/Courses

Curriculum: Language and Literacies 2
Elective Studies 2
Elective studies 3
Curriculum: Dance and Drama/Music, Visual Arts & Media
Teaching and Learning 3: Practising Education
Field Studies 2: Practising Education in the Field
Curriculum: Mathematics 2
Curriculum: Design and Technology Education

Year Four Units/Courses

Teaching and Learning 4: Inclusive Education
Field Studies 3: Immersion in Inclusive Educational Practices
Curriculum: Integrated Primary and Middle Years Curriculum Project
Curriculum: Assessment and Reporting
Teaching and Learning 5: Professional Work of Teachers
Field Studies 4: Professional Work of Teachers - Induction into the Field
Internship (Primary)
Elective studies 4

Electives may be undertaken in a variety of specialisms such as: Research, Science, SOSE, Inclusive education, International and Comparative Education, Indigenous Studies and Environmental Education.

1.2.1 Variations in Pre-Service Teacher Education Courses

Length

Universities must consult with state education authorities and seek approval from teacher registration bodies regarding both program length and program development. Teacher education programs range in length from one year to four years (see Box 1.6):

- One or two year ‘graduate’ programs require an undergraduate degree in an area related to a school curriculum key learning area. These graduate degrees assume some subject specific content knowledge and tend to focus on the ‘process’ of teaching.
- Four or five year double degree in a curriculum related area such as science or the arts, and in education. Such programs are offered to undergraduate students.
- Four year undergraduate education programs that teach both subject specific knowledge and the process of teaching. Just over half of all teacher education programs offered in Australia are of this type.¹³

There has been much debate recently over what the minimum length of training should be. In Queensland, for example, the length of a postgraduate teaching qualification was shortened from two years to one year in 2006. This brings it in line with most other states in Australia. The length of such postgraduate programs has obvious implications for the inclusion of Learning for Sustainability, especially if universities attempt to add a discrete Learning for Sustainability subject into an already overcrowded teacher education curriculum.

Level

Teacher education programs prepare students to teach at early childhood/early years, primary, middle years or secondary levels. Early childhood, primary and middle years courses tend to be generalist degrees where teachers are required to deliver the whole range of key learning areas (KLAs) or essential learning standards (ELSS), including, for example, Maths, English, Science and Studies of Societies and Environment (SOSE). Alternatively, secondary teachers are required to be specialists in one or two discipline areas and become experts in their specialisms. Therefore, secondary preparation programs allow for a greater degree of discipline specialisation, in line with the requirements of state curricula.

Mode of delivery

Teacher education programs are delivered internally (on-campus), externally (off-campus) or in mixed mode (some on-campus and some off-campus study). Off-campus study is often facilitated through web-based learning. The vast majority of courses (82%) within teacher education programs are offered in the internal mode.¹⁴

Box 1.6

Teacher preparation courses in Australia are at least four years in duration. This includes two years of content and pedagogical studies and at least the equivalent of two years of professional practice. Most preparation courses for primary teachers are four year undergraduate degree programs, while secondary teachers may choose from a four year degree program, a double degree in a relevant content area and education or a 1-2 year end-on graduate diploma following an undergraduate degree in a relevant content area

For example:

Primary

University of New England Armidale B. Ed. (prim) 4 years undergraduate
QUT Kelvin Grove B.Ed. (prim) 4 years undergraduate

Secondary

Flinders University B.Ed. (secondary science) 4 years undergraduate
Edith Cowan University- Mt Lawley B. A (education) /B. Sc. 4 years Double Degree
Vic Monash Grad. Dip (secondary) 1 year Graduate Degree

1.2.2 Current Trends in Pre-Service Teacher Education Programs

The dominance of economic values: There are a number of broader educational and social issues which have influence over teacher education departments and universities more widely and which help explain the difficulties in mainstreaming Learning for Sustainability within these institutions. Education systems that support existing and dominant social practices can present a dilemma to those attempting to bring about sustainability as they often contradict the outcomes sought through Learning for Sustainability.¹⁵ The dominance of economic values such as efficiency, accountability, quality control and production are creating changes in everything from the purposes of education, to curriculum, funding, management, and the role of schools and teachers.¹⁶ This managerial approach to education emphasises precise ‘learning outcomes’ and ‘performance measurements’ that judge success and failure on the basis of how far predetermined outputs are achieved. Such approaches to education prioritise particular concepts such as competition and economic rationalism that are sometimes interpreted as conflicting with those advocated by Learning for Sustainability. Such approaches also affect both what teacher education institutions teach and how they teach it.

Focus on core content: There is an increasing trend to identify certain areas of knowledge as core, with the most common calls for these to be in the areas of literacy, numeracy, and science.¹⁷ The focus on core content is part of a conservative return to the basics agenda partly in response to community concerns about declining literacy and numeracy standards. This trend may decrease the focus on other disciplines particularly in the social science area. Should this trend continue, Learning for Sustainability would need to be seen as a core area if its content and approaches are to be successfully integrated into the teacher education curriculum. This trend also pressures teacher education institutions to provide for the needs of schools in current structures, rather than innovate on current practice to mainstream new ideas and bring about change. Some environmental educators claim that this conservative agenda demonstrates a pressure applied on teacher education institutions to serve the economic goals and skill requirements of business.

Teacher training as an apprenticeship: An international trend in teacher education is towards increased periods of professional practice – that is, teaching practice for trainee teachers in schools.¹⁸ The question is: how much teaching practice is needed to provide a quality program of professional preparation given that time spent in school reduces the amount of university training prospective teachers receive?¹⁹ In Australia, this is evidenced by increased practicum length in schools, and in some universities seeking to create partnerships between students and schools that last through the period of study, such as the Queensland University of Technology (QUT) Cluster School model.²⁰ There have also been some moves internationally to return to an apprenticeship model of teacher training, most notably in the United Kingdom.²¹ Proponents argue that such training would be based in practice – as opposed to theory; and would provide ‘real-world’ training.²² There are concerns, however, that such an approach will not only lead to an institutionalising of any poor practices that currently occur in schools and a ‘dumbing down’ of the profession,

‘In contrast to the partnership model, the model of teacher education, which underpins school centred training would seem to be an apprenticeship model in which students learn their craft on the job and by working alongside experienced teachers. Theory is largely divorced from this model of training...’

Inman (1996, p. 47)

Thinking Futures: Making space for Environmental Education in Initial Teacher Education

‘The learning for sustainability approach examines how people, organisations and institutions can live in sustainable ways. It is about empowering people to contribute to a better future through mindset changes, critical reflection and building of new skills. It goes beyond awareness raising, the challenging of values and attitudes, problem-solving or the development of action skills usually associated with EE.’

Tilbury and Cooke (2005)

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

‘Learning for sustainability ... provides a new orientation for current practice in Environmental Education [that] attempts to move beyond education *in* and *about* the environment approaches to focus on equipping learners with the necessary skills to take positive action to address a range of sustainability issues ... learning for sustainability aims to go beyond individual behaviour change and seeks to engage and empower people to implement systemic changes.’

Tilbury and Cooke (2005)

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

but will also reproduce current systems that are not necessarily compatible with a Learning for Sustainability approach.²³

De/re-politicisation of the curriculum: There is also an identifiable backlash against perceived left-wing learning in universities generally.²⁴ The criticism is that many courses offered in universities deal with social issues such as globalisation, trade liberalisation, or the war in Iraq, with a 'left-wing' perspective.²⁵ The term 'cappuccino'²⁶ courses has also been used to describe how such courses are viewed by detractors.

Box 1.7

Part of the intellectual challenge of sustainable development ... is that it involves learning how to solve complex, multidimensional problems. Education can give students and future leaders the intellectual tools for doing that. To be most effective and relevant, education cannot isolate learners from the context of the larger world in which they must ultimately function. Sustainability can be used as an integrating force in education ... if sustainability and its foundation in scientific, environmental, technological, economic, societal, and ethical learning is to become a paradigm for analysis, decision-making, planning and action, it is essential that it be incorporated into the curriculum and instructional practices at all levels of schooling.

National Council for Science and the Environment (NCSE) (2003)

Box 1.8

Pre-service professional development opportunities in Learning for Sustainability approaches would not only prepare teachers for the complexities of sustainability, but would also broaden the base of staff committed to such an approach. This would contribute to the long term future of such an approach making it resilient to staff changes. The reality is that without professional development addressing these issues, Learning for Sustainability approaches are unlikely to become part of the mainstream of school education in Australia.

Whole School Approaches to Sustainability

'Thus, schools practice what they teach leading to values being reinforced by action; in this way, values are caught rather than only being taught.'

Shallcross and Robinson (1999, p. 405)

'Inconsistencies between a school's day to day practice and its operational curriculum are worse than oversights. There is evidence that such inconsistencies are counter productive..... (R)esearch has shown that the failure of practice, in a school's grounds, to reflect the environmental concerns expressed in its classrooms results in children calling into question the integrity of their teachers(and may lead to) feelings of both guilt and apathy among young people about the environment... This evidence raises the prospect that inconsistencies between what schools teach and what they do may be socialising young people to accept these inconsistencies as cultural and social norms.'

Shallcross and Robinson (1999, p. 405)

1.3 Learning for Sustainability

There is an urgent need for us to learn to live in sustainable ways.²⁷ Environmental Education has been used since the 1960s to bring about changes to the way people make decisions and act. In the 1970s and 1980s Environmental Education focussed on increasing awareness and knowledge and on changing attitudes towards the environment, believing that this would lead to individuals behaving in a different way. This behaviour change, however, did not materialise.²⁸

The release of the Brundtland Report in the 1980s led to an increased focus within the Environmental Education community on the notion of sustainability. It also introduced issues such as international development, economic development, cultural diversity, social and environmental equality and human health and well-being to Environmental Education. There was also a new concern with Environmental Education being limited to schools and a sense that Learning for Sustainability needed to be part of the wider learning that takes place throughout our lives (See Box 1.7). There was a new focus on engaging and empowering communities to bring about changes not only in their personal lives, but also on a broader, systemic scale.

Learning for Sustainability develops a 'frame of mind'²⁹ that requires educators and learners to be open to and engage with the complexity of environmental issues (See Box 1.8). Learning for Sustainability essentially differs from Environmental Education in that it seeks to address the systemic causes of environmental problems through holistic and integrated means. This means that issues are understood in their totality: not just as environmental issues but also as economic, social and political issues. In addition, Learning for Sustainability sees people as agents of change,³⁰ with the capacity and ability to bring about change themselves, rather than have it imposed on them.

1.3.1 Whole-School Approaches

In the last ten years, a whole-of-school approach to sustainability, which targets *all* aspects of the school, not just the curriculum, has been advocated as the most effective approach to Learning for Sustainability.³¹ 'Whole-school approaches' involve schools (and/or institutions) tackling a range of complex and diverse issues such as school governance, pedagogy, resource consumption, community outreach, curriculum development, and landscaping that will assist schools to become more sustainable.³² Whole-school approaches address the concern that the day-to-day practices of the school, evident in the non-formal or hidden curricula, ought to be consistent with the teaching espoused within the classroom. Schools that

employ whole-school approaches practise what they preach and also reinforce their espoused sustainability values with action.³³

The *Australian Sustainable Schools Initiative* (AuSSI), launched in 2002, is an initiative offered through a partnership between the Australian Government and the states and territories. AuSSI uses whole-school approaches to promote sustainability and aims to develop a school culture committed to the principles of sustainability. For example, the initiative seeks to implement environmental management systems to improve school management of resources such as energy and water; reduce waste; and utilise school grounds as both sites of learning and as habitat spaces.³⁴ The program aims to integrate sustainability into the school curriculum so that what is taught in the classroom is reinforced by messages learned in the playground and the rest of the school environment.³⁵ AuSSI also provides some professional development opportunities for schools. To date, the initiative has been adopted in all states and territories with over 1,500³⁶ schools participating Australia-wide. Already, the program is demonstrating substantial benefits to participating schools. Some schools are saving thousands of dollars on energy and water bills, while others are forging strong mutual partnerships with community groups.³⁷ In all instances, students are benefiting (see Box 1.10).³⁸

A whole-school approach to school management such as that promoted by AuSSI requires the backing and support of the entire school community.³⁹ Such an approach leads to a more sustainable process than traditional Environmental Education approaches, which were often driven by one engaged and committed teacher - who frequently burnt out in the process.⁴⁰ Indeed, anecdotal evidence from AuSSI also suggests that schools with a narrow base of staff involvement have difficulty maintaining the program, particularly after staff changes.⁴¹

Australia has a relatively long history of involvement with the whole-school approach to sustainability movement, with the NSW *Learnsapes* program (1997) being one of the first to 'incorporate the built environment, the physical landscape and the social environment as an 'educational environment' within schools and the local community' (see Box 1.11).⁴² The NSW *Learnsapes* program grew out of several pre-existing programs from the early 1990s such as the UK's *Learning through Landscapes* and Canada's *Evergreen*,⁴³ which were both predominantly focused on improving school grounds as places for learning. Under the auspices of the *Environment and Schools Initiative* (ENSI), which adapted the NSW *Learnsapes* model,⁴⁴ the concept of whole-school approaches evolved beyond the initial focus on grounds to become much more inclusive and holistic.

Despite Australia's long involvement with whole-school approaches to sustainability and with the exception of the recent AuSSI program, successful examples are relatively rare in practice.⁴⁵ There are a variety of reasons for this, not least of which is that teachers do not have the skills⁴⁶ to address the complex and varied intricacies of dealing with sustainability at all levels of school management, that is, from classrooms and school grounds to school governance and community partnerships. Furthermore, teachers in Australian schools tend to be inadequately prepared for the challenges of participatory pedagogy, interdisciplinarity, action learning, and critical thinking that are

Box 1.9

Learning for Sustainability has key components that underpin it. These include critical thinking; envisioning; systemic thinking; partnerships; participation in decision-making. These components form part of the learning process and enable the development of commitment, ownership and skills to be able to achieve change for sustainability.

Box 1.10

Benefits for Schools Participating in the Australian Sustainable Schools Initiative

- Opportunity to achieve curriculum requirements in the key learning areas through integration of sustainability principles
- Reduced consumption of resources and improved management of schools grounds
- Teachers and students working on real life problems
- Professional development opportunities for the whole staff
- The school as a model for sustainability within the local community

Adapted from: Australian Government Department of the Environment and Heritage (2005)

Box 1.11

Learning through Landscapes: A United Kingdom program founded in 1990, which focussed on promoting the value and use of school grounds in unique and innovative ways.

Learning through Landscapes (2004)

Evergreen: A Canadian program that aimed to bring communities together to transform school grounds into healthy, natural environments, which promoted respect for nature.

Evergreen (2000)

NSW Landscapes: The New South Wales Department of Education and Training, in 1998 funded fifteen schools to establish Learnscape projects. *Learnsapes* were defined as "places where a learning program has been designed to permit users to interact with the environment". In general they relate to school grounds and environs and must incorporate school curriculum subjects.

Skamp and Bergman (2001, p. 1)

ENSI: Environment and School Initiatives (ENSI) is an international government based network focused on innovation and research in environmental education (EE) and education for sustainable development. It was established under the auspices of OECD – CERI (Centre for Education, Research and Innovation) in 1986. ENSI brings together school initiatives, school authorities, teacher training, education research institutions and other stakeholders from more than twenty countries worldwide and its membership is growing.

Box 1.12

Key Features of a sustainable school:

1. **School leadership** which places sustainability at the heart of school planning and practice. It engenders democratic and participatory whole-school decision-making processes;
2. **Whole-school participation** in undertaking school action and improvement plans;
3. Reciprocal community, family and stakeholder **partnerships**;
4. **Participatory learning approaches** which engender students skills and competencies for critical thinking, intercultural perspectives, participation and citizenship;
5. **Integration of EE and EFS across** all key learning areas in the **curriculum**;
6. **Hidden curriculum** which reflects key messages and ideas supported by the taught curriculum;
7. Regular **professional development** for teachers, school management and program partners and facilitators;
8. **'Greening'** of the school and physical surroundings;
9. Classrooms within and **outside school boundaries**;
10. Reductions in a **school's ecological footprint** (through resource consumption and environmental improvements);
11. Regular **monitoring, reflection and evaluation** procedures which inform future actions. The school is not just the centre of learning but is also a **'learning organisation'** itself;
12. **Practitioner research** which encourages reflective practice of teachers and promotes improved performance.

Box 1.13

Whole-school approaches to sustainability are not common in Australia. While many teachers are interested in the educational benefits they can see for their students from such an approach, they feel they have neither the skills nor the training to be able to undertake such an approach. Lack of professional development opportunities also affects the endurance of such programs, and there are several examples of Sustainable School Initiatives folding after the dedicated teacher transferred.

Box 1.14

National Goals of Schooling

Goal 1.7 of The Adelaide Declaration on National Goals for Schooling in the Twenty First Century (Ministerial Council on Education, Employment, Training and Youth Affairs, 1999), which states, 'Schooling should develop fully the talents and capacities of all students. In particular 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)

commensurate with whole-school approaches (see Box 1.12 on next page). It is widely recognised that properly skilled educators are essential in a whole-school approach to sustainability as the approach requires different modes of teaching and learning focussing especially on democratic participation and active engagement by students in decision-making (See Box 1.13).⁴⁷ One solution to overcome this problem is to improve professional development opportunities for teachers in Learning for Sustainability and the whole-school approach associated with it.⁴⁸ Pre-service teacher education provides a unique and strategic opportunity to address these concepts, as all teachers must undertake a course of initial training.

1.4 Structures and Influences Affecting Learning for Sustainability in Australian Teacher Education

At present, Learning for Sustainability or whole-school approaches to sustainability do not form an essential part of teacher education programs in Australia. In their initial training, teachers may learn about sustainability in science, geography, studies of society and environment curricula. However, sustainability does not feature in educational leadership, management, psychology or sociology classes thereby limiting the potential for whole-school approaches.

1.4.1 Status

To understand the status of Learning for Sustainability, there is a need to acknowledge the contexts within which teacher education programs are framed. The following section examines the current structures and influences on teacher education institutions.

The Australian Government does not have a mandate to enact education policy as education is a state portfolio. It can, however, influence policy through funding and priority setting mechanisms. At the federal level, there are four key initiatives that have influenced the status of Learning for Sustainability in schools and thus teacher education provision:

a) The *National Goals for Schooling*, which were developed in 1999,⁴⁹ established a shared foundation from which state and territory governments can develop policies and directions for schooling. For example, Goal 1.7 provides a mandate for Environmental Education in schools (see Box 1.14)⁵⁰ through its focus on stewardship and skills to contribute to an ecologically sustainable future. This has given the states and territories a basis for including Learning for Sustainability in their curriculum plans and policies. A recent review of Environmental Education in Australia reveals that, apart from NSW, where Environmental Education is compulsory, there has been little response from the states and Territories in mandating Environmental Education within Australian schools.⁵¹

b) The Australian Government's *Environmental Education for a Sustainable Future: National Action Plan*⁵² recognised the need for strategies to improve the provision of professional development opportunities for teachers in the formal education sector.⁵³ The Action Plan supported many state Environmental Education policies and plans and raised the profile of sustainability across the sectors. The Action Plan also led to the establishment of the

National Environmental Education Council (NEEC) and the National Environmental Education Network (NEEN). Both have worked extensively in raising the status of Learning for Sustainability within the curriculum of schools through a variety of means including the release of *A National Environmental Education Statement for Australian Schools*.⁵⁴

c) *Education for a Sustainable Future: A National Environmental Education Statement for Australian Schools* provides a nationally agreed framework for Education for Sustainability in Australian schools.⁵⁵ Whole-school approaches are advocated as being key factors in this framework. This statement has been delivered to all schools and teacher education institutions and will serve to raise awareness of this area across the sector (see Box 1.15).

d) Also influencing the status of Education for Sustainability is the Australian Sustainable Schools Initiative (AuSSI), which advocates for a whole-school approach to sustainability. This initiative is coordinated and supported by the Australian Government Department of the Environment and Heritage, with state level co-ordination undertaken through state Education Departments.⁵⁶ This initiative has given a practical basis for schools and (thus teacher education institutions) to address Learning for Sustainability as a whole-school approach.

e) *Australian Vice-Chancellors' Committee Policy on Education for Sustainable Development* released in August 2006 calls for all universities to become major drivers in moving society towards sustainability. The influence of this policy is as yet unknown, but it offers an important opportunity for garnering support for Education for Sustainability within teacher education institutions in Australia.

The state and territories education departments are responsible for developing policy in relation to the role of pre-service teacher education. Curriculum documents and schools policies, set by state departments of education and curriculum councils, frame the work that teachers do in schools and thus the direction of pre-service preparation. Opportunities to learn about the environment are mainly included in the SOSE and science KLAs.⁵⁷ Prospective primary teachers undertake core curriculum courses, which prepare them for teaching these KLAs. There are opportunities for exposure to sustainability concepts through SOSE and Science, however, these often only feature as a small component of the subject or as an elective specialism.⁵⁸ For prospective secondary students, there are even fewer opportunities for exposure to Environmental Education or sustainability depending upon students' specialisations. Currently, there are no policies in any state or territory that mandate the inclusion of Environmental Education as a key requirement in pre-service teacher education⁵⁹ even though the teaching of Environmental Education in schools is mandatory in some states⁶⁰.

The State Registration Authorities (SRAs) approve teacher education courses in each state and territory. In collaboration with state education departments, they determine the policies, guidelines, priorities and quality frameworks for teacher education. The SRAs, such as the Queensland College of Teachers and the Victorian

Box 1.15

A National Statement for Environmental Education

'Effective environmental education for sustainability is not just a curriculum issue; it requires the involvement of the whole-school.'

Environmental education for sustainability pervades all aspects of the school operations, curriculum, teaching and learning, physical surroundings and relationships with the local community'.

Curriculum Corporation (2005, p. 7)

'Environmental Education [EE] in the Key Learning Areas across Australia

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 in 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 encourages students to consider the quality of their environment. Queensland, NSW and South Australia also encourage students to reflect on the actions of themselves on others;

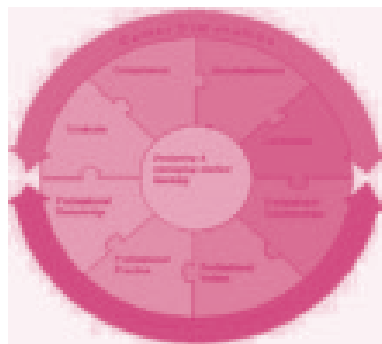
Technology: outcomes in South Australia and Western Australia are strongly focused on EE concerns, such as quality of life, sustainability, environmental impacts and ethics; and

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.

Tilbury, Coleman and Garlick (2005, p. 5)

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A National Framework for Professional Standards of Teaching



The framework for Australia's National Standards has been shaped by public consultation and recognises not only the various competencies required of teachers in terms of their professionalism but also their varying levels of competence.

Curriculum Corporation (2003)

Box 1.16

Environmental Education and its Contribution to Sustainability: A Review

At present there are very few professional development opportunities in Learning for Sustainability. Only a few teacher education institutions offer Environmental Education to prospective students, usually as an elective or as a small component of a core unit. In Australia, teacher education programs fail to prepare teachers to effectively achieve the goals of Learning for Sustainability. They provide no opportunities for prospective teachers to learn about whole-school approaches to sustainability, which encompass educational activities that reach beyond the school curriculum and the school classroom.

Tilbury, Coleman and Garlick (2005)

Box 1.17

Internationally, a number of innovative teacher Education for Sustainability initiatives from the nineties such as the Environmental Education into Initial Teacher Education (EEITE) project and WWF-UK's Thinking Futures project laid the foundation for much current thinking about teacher education for sustainability

Institute of Teaching, determine the range of professional competencies or standards that teachers must have if they are to obtain registration to teach in their respective state or territory.

Competency based approaches driven by SRAs have been utilised in the past to inform teacher education provision and provide impetus for change. The set of competencies developed by the Queensland Board of Teacher Registration⁶¹ in Environmental Education was one of the most ambitious and innovative for its time. Unfortunately, the initiative was not successful due to a lack of involvement in the process by some stakeholders, particularly the teacher education institutions.⁶²

Recently there has been some progress towards a national framework of teacher competencies,⁶³ developed through an extensive consultation process with teacher registration bodies in each state by the Ministerial Council on Education, Employment, Training and Youth Affairs (MCEETYA). This framework has to some extent influenced state and territory standards.

The National Framework considers the following competencies to be fundamental qualities of well educated and prepared teachers:

- professional knowledge
- professional practice
- professional values
- professional relationships.⁶⁴

These competencies tend to be generic, focusing for example, on literacy, numeracy and learning technologies skills. Currently, Learning for Sustainability content does not appear in the professional standards endorsed nationally or by the states and territories,⁶⁵ but neither does any other specific curriculum area. The generic nature of the current standards could however, provide a wider scope for interpretations of the standards and for the inclusion of Learning for Sustainability, which promotes generic skills such as critical thinking and problem solving.

Universities and teacher education colleges - The actual structure, content and outcomes of pre-service teacher education programs are developed and delivered by individual universities, with reference to a particular state's legislation, teacher registration requirements and course approval and accreditation guidelines. In doing so, universities ensure that their teacher education graduates have the professional standards needed to be accredited or registered to teach in their respective state. The inclusion of Learning for Sustainability in pre-service teacher preparation is not mandated in any state (see Box 1.16), and tends to occur in the SOSE curriculum specialist units at best. Some universities offer postgraduate courses specialising in Education for Sustainability, but these do not form part of the pre-service program.

1.5 Approaches to Mainstreaming Learning for Sustainability in Teacher Education

Despite international support for the importance of the role of teacher education in Education for Sustainability (see Box 1.17), this area is yet to be introduced consistently and coherently into pre-

service teacher education.⁶⁶ Some academics argue that there is a rhetoric-reality gap. This gap has been the subject of much investigation and speculation⁶⁷ and a variety of contributing factors have been proposed:

- lack of consumer demand for Learning for Sustainability expertise from teacher registration boards, school communities and student teachers;⁶⁸
- competition for time in already overcrowded curricula tends to relegate Education for Sustainability into the domain of elective courses;⁶⁹
- lack of cross-curricula dialogue and unwillingness to cooperate across discipline boundaries within teacher education;⁷⁰
- shortage of teacher educators with a strong expertise in sustainability;⁷¹
- diverse standards, structures and procedures across teacher education institutions and across states in Australia;⁷²
- a lack of professional development models that are congruent with Learning for Sustainability approaches;⁷³ and
- an inability to plan and strategically manage change within education systems.⁷⁴

Efforts to address this gap and increase the opportunities for professional development in Learning for Sustainability in pre-service teacher education have generally focussed on two main strategies:

- *Working within current structures to include Education for Sustainability.* Some institutions in Australia offer Learning for Sustainability electives in their course structure or include Learning for Sustainability components within core units (see Boxes 1.18 and 1.5).⁷⁵
- *Lobbying for systemic change.* Such change has been advocated in journals such as *Higher Education for Sustainability* and by international networks such as the University Twinning and Networking Scheme (NITWIN)/UNESCO Chair on Reorienting Teacher Education to Address Sustainability, and University Leaders for a Sustainable Future (ULSF) (see Box 1.19). These networks have targeted university and teacher education department leaders as well as individual teacher educators in their efforts to effect systemic change.

Although the ‘working within current structures’ approach has been the most popular, some of the leading thinkers in the field of Education for Sustainability argue that such an approach promotes a weak version of sustainability.⁷⁶ These changes, they argue, cannot be sustained as the system in which they are embedded is not aligned with its thinking or methodology. Others, drawing upon the whole body of organisational change theory, argue that in order for broader and far-reaching systemic changes to occur, smaller incremental steps are required to allow gradual cultural change to happen.⁷⁷ There is a large body of literature on organisational change,⁷⁸ which has begun

‘In Australia, only a limited number of teacher education institutions offer EE courses to prospective teachers. At these institutions EE is offered as an elective unit or as a small component of a core unit in Education degrees’.

Tilbury, Coleman and Garlick (2005, p. 49)

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Box 1.18

Recommendations from Environmental Education in Initial Teacher Education (EEITE) project on achieving change:

However, in order to increase the sustainability of EE curricula in teacher education EE needs to change from peripheral initiatives of highly committed individuals to a mainstream activity and become an integral feature of the culture of teaching and learning in teacher training institutions. In order to achieve this state of affairs certain factors appear to be important:

- high visibility of good practice through documentation, research and communication across institutions;
- credible evidence that EE also contributes to other highly valued aims of teacher education such as preparing teachers for community education, for fostering self-organised learning, project learning, experiential learning, etc.;
- maximum utilisation of ongoing initiatives and strengths which are in line with a broad concept of EE, establishment of networks with school teachers involved in EE initiatives; the development and discussion of standards in EE to be achieved by probationary teachers;
- attempts to increase the credibility of EE, e.g. by initiatives to improve the quality of life within teacher training institutions and in their environment as part of teacher training;
- a well-planned strategy to increase the representation of EE in written curricula;
- involvement of opinion leaders in teacher training institutions in EE initiatives which promise a high pay-off for the institution; and
- the interpretation of EE not only as an add-on element in curricula but also as an opportunity to restructure existing curricular elements and courses.

Box 1.19

University Leaders for a Sustainable Future (ULSF)

University Leaders for a Sustainable Future (ULSF) is the higher education program of the Center for Respect of Life and Environment /Humane Society. It assists colleges and universities in making sustainability an integral part of curriculum, research, operations and outreach. ULSF is also the secretariat for signatories of the Talloires Declaration (1990), which has been signed by more than 300 university presidents and chancellors around the world.

ULSF (2004)

to feature in the Education for Sustainability literature, and can provide guidance in instituting change, especially through recognising the stages of organisational change and identifying where change occurs within a system.

It is within this context that a variety of teacher education frameworks for sustainability have arisen. The following section outlines these briefly.

1.5.1 Competency Frameworks

In Australia, competencies (or professional standards) form the scaffolding around which teacher education courses are constructed. These competencies usually appear as generic skills that graduates must demonstrate over the course of their degree. The notion of competency-based frameworks for pre-service teacher education has sparked a wide and ongoing debate in education circles⁷⁹ as to whether the complex skills involved in effective teaching can be broken down into separate and distinct competencies. Some argue that such an approach is simplistic and mechanised and may well lead to the further de-professionalisation⁸⁰ of teaching. Others have argued that a more complex interpretation of a competency-based framework can facilitate planning of education provision and provide a platform upon which to ensure Education for Sustainability is addressed in a strategic and targeted way.⁸¹

Interestingly, before competency frameworks were introduced into the Australian educational mainstream, environmental educators had already constructed environmental and sustainability education competency frameworks for teacher education.⁸² These propose that in order to be proficient in environmental or sustainability learning, student teachers should develop skill sets in both knowledge of the environment and the unique pedagogical approaches of Environmental Education.⁸³ Particular competencies are:

- knowledge and understanding of environmental issues and problems;⁸⁴
- environmental action skills including the ability to undertake and teach action research (see Box 1.20);⁸⁵
- critical and reflective thinking abilities (see Box 1.21);
- ability to act and participate in a democratic society;⁸⁶
- ability to effectively utilise a wide range of pedagogical approaches such as interdisciplinarity (See Box 1.22), values education, and the appropriate handling of controversial issues;⁸⁷ and
- professional skills such as reflective practice.

While competency-based approaches to teacher education have been criticised in the past due to crude behaviouristic interpretations of skilling in Environmental Education,⁸⁸ recent approaches to competencies are more holistic and incorporate higher order thinking skills, generic skills such as problem solving, and pedagogical and professional skills such as reflective practice.⁸⁹

Box 1.20

Action Research is more than just a research process and can result in catalytic change towards sustainability. Its focus on critical reflection and self-evaluation also makes it a useful tool for professional development.

‘...the concept of standards still aims to make the basis for accreditation of practice transparent but it is a broader concept than competencies as it includes a range of factors such as values and attitudes. Further, standards refocus issues of teachers, processes, purposes and efforts rather than outcomes alone.’

Curriculum Corporation (2003, p. 2)

Box 1.21

Critical (Reflective) Thinking challenges the way people interpret the world and how knowledge and opinions are shaped by personal experiences and social influences. It empowers the individual to identify these influences in their thoughts and actions and to clarify for themselves whether they are making the appropriate choices. By understanding the presence of bias and assumptions in structures, ideologies and processes in the world, people can be empowered to think and act in genuinely rational and autonomous ways.

Tilbury and Cooke (2005)

Box 1.22

Interdisciplinary Approaches: consciously apply methodology and language from more than one discipline to examine a central theme, topic, issue, problem or work.

1.5.2 Content Frameworks

Student teachers come from different contexts, backgrounds and interests. This requires the offering of a variety of approaches and content to students through their courses. It would be inappropriate to provide a prescriptive course structure for every student of education, particularly in the case of secondary education students who major in different discipline areas. However, a basic content in Learning for Sustainability has been advocated for pre-service teacher education programs by some environmental education scholars.⁹⁰ This content includes:

Environmental philosophy and ethics which provides an important foundation for the development of reflective practitioners learning to reflect upon their informed commitment to particular environmental philosophies and evaluate how these affect their educational practice.⁹¹

History of education would assist students in critically examining modern and historical contexts of education and their focus on promoting economic development, which continues to reproduce unsustainable practices. Alternative systems, curricula and pedagogies that facilitate sustainability should also be contrasted with more conventional ones.⁹²

Philosophy of education would provide opportunities to examine the role of the modern scientific approach to knowledge in promoting unsustainable development. Students would understand the ways in which new holistic approaches to science have the potential to integrate both hard and social science approaches.⁹³

Sociology of education would enable teachers to explore how Education for Sustainability gains relevance from mainstream and critical sociology. Of particular interest are:

- critical theories such as reflexive modernisation (See Box 1.24), which highlights the role of risk and uncertainty in post-industrial life and culture;⁹⁴ and
- ecological citizenship models, based on a philosophy of recognising ecological limits, which requires us to rethink current notions of efficiency and reshape our perceptions of needs and aspirations in order to realise new kinds of wealth which focus on quality over quantity.⁹⁵

Cultural studies and educational psychology would enable students to explore how marketing and popular culture evident behind branded clothing, fast food, computer software, and the entertainment industry reshapes young people's desires and identities.⁹⁶ Students would develop the skills to teach critical cultural and media literacy. Courses in educational psychology would also enable teachers to engage children's multiple identities, desires, intelligences and literacies.⁹⁷

Political and citizenship education assists teachers in gaining an understanding of the institutions and processes that regulate relations between people and between people and environments. This includes the scope of local and national governments and also the de facto

Box 1.23

Critical pedagogy is primarily concerned with the kinds of educational theories and practices that encourage both students and teachers to develop an understanding of the interconnecting relationship among ideology, power, and culture... [that] challenges us to recognise, engage, and critique any existing undemocratic social practices and institutional structures that produce and sustain inequalities and oppressive social identities and relations'

Leistyna and Woodrum (1996, p. 2 – 3)

Box 1.24

Reflexive modernisation is a process of modernisation where progress is achieved through re-organisation and reform rather than through new strategies, ideas, technologies and developments. The role of science and technology is relegated to re-evaluating our current resource uses rather than expanding our resource base. The constant flow of information between science and industry leads to progress through reform and adaptation.

'Teacher education for the 21st Century should pay attention to learning how to learn using both theoretical and practical knowledge; the integration of curriculum knowledge informed by educational disciplines; partnerships between schools, communities and universities to foster community development based on action research; and new forms of teacher accountability and responsibility that echo new approaches to decision-making and risk management.'

Huckle (2001, p. 8)

Education for Sustainability and Ecological Citizenship in Europe; A challenge for teacher education in the 21st century.

power held by multinational companies to regulate economic, political and cultural life in an era of globalisation.⁹⁸

These content suggestions are not necessarily relevant exclusively to Education for Sustainability, but are also pertinent and appropriate for teacher education in general. Such grounding in sociology, philosophy, history and politics would assist teachers to critically examine the social, cultural and political contexts within which education occurs and understand the discourses that shape current education systems. This is particularly relevant to Education for Sustainability because of its aim to challenge unsustainable thinking and practices.⁹⁹

1.5.3 Pedagogical Frameworks

Learning for Sustainability approaches, while having much in common with most good general education approaches, are informed by a unique and particular set of educational knowledge and assumptions. These pose a pedagogical challenge to teacher education because they challenge current educational systems with their reductionist and utilitarian approaches to knowledge that are seen to be contributors to the crisis of sustainability.¹⁰⁰ Therefore, Learning for Sustainability represents a paradigm shift seeking to transform education and as such requires pedagogical approaches that are very different from traditional teaching styles.¹⁰¹ UNESCO, the international body charged with implementing the education component of Agenda 21, has long called for a reorientation of teacher education to reflect this paradigm shift. Teacher education programs underpinned by this new paradigm would not only introduce systemic views of economy, environment and education (see Box 1.25), but would also employ critical pedagogy approaches (see Box 1.26).¹⁰²

Box 1.25

Systems Thinking is a type of thinking methodology based upon a critical understanding of complex systems, which stresses the consideration of the whole rather than the sum of the parts. This kind of thinking is particularly important for ecosystems and environments where interrelationships and dynamic systems cannot be reduced.

Box 1.26

Reorienting Education

Education has often been seen as the solution to the sustainability crisis but also paradoxically as the problem. Dominant approaches to learning, which fulfill instrumental aims and serve economic and political purposes do not often complement those of sustainability. This is why many believe that there is a need to reorientate education towards sustainability.

Box 1.27

Inquiry Learning: provides opportunities for students to experience and acquire processes through which they can gather information about the world. This requires a high level of interaction among the learner, the teacher, the area of study, available resources, and the learning environment. Through inquiry learning students become actively involved in the learning process.

SaskEd (1991)

Critical pedagogy approaches draw on quality teaching and learning frameworks. They are interdisciplinary, based on action learning and critical reflective practice and should be modelled by teacher educators in their teaching if students are to be able to learn how to take such an approach in their own teaching. The following guiding principles for teacher educators have been widely used by environmental educators to frame professional development programs:

- *Enquiry based* - encouraging participation at all levels in order to adopt a research stance to curriculum planning and teaching skills (See Box 1.27);¹⁰³
- *Participatory and practice based* - which encourages students to construct their own knowledge and provides opportunity to reflect upon experiences;¹⁰⁴
- *Ideologically critiquing* - supporting critical analysis of environmental and educational values and assumptions underpinning education policies and practices;¹⁰⁵
- *Community based* - providing opportunities for students to undertake action research on real world issues relevant to local communities;¹⁰⁶

- *Collaborative* - collaboration provides support and collegiality and facilitates collective action;¹⁰⁷ and
- *Reflective in practice* - encouraging reflection by educators in order to improve their practice (see Box 1.28).¹⁰⁸

These principles provided the foundation for Education for Sustainability initiatives such as *Learning for a Sustainable Environment (LSE)* and *Action Research for Change Towards Sustainability (ACTS)* projects, which are reviewed later in this report.

1.6 Summary

Pre-service teacher education programs provide a unique opportunity for developing teachers' competence and confidence in implementing whole-school approaches to sustainability in Australian schools. This opportunity has unfortunately not yet been taken up in Australia. Indeed, this study was unable to find a teacher education institution in Australia that has mainstreamed Learning for Sustainability approaches in its pre-service teacher education programs (see Box 1.29).

The context of teacher education and the opportunities and limitations it places on the possibilities for mainstreaming Learning for Sustainability in teacher education have been discussed in this section. In addition, approaches to mainstreaming Learning for Sustainability in teacher education were reviewed. The section ends with content and pedagogy frameworks that have been recommended for use in teacher education to address Learning for Sustainability.

Box 1.28

Reflective Practice: is a critical process in refining one's artistry or craft in a specific discipline. It involves thoughtfully considering one's own experiences in applying knowledge to practice.

Schon (1996)

'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 and only some postgraduate courses make explicit reference to approaches such as learning for sustainability, education for sustainability, sustainability education or the socially critical pedagogy associated with the new paradigm'.

Tilbury, Coleman and Garlick (2005, p. 54)

Box 1.29

In Australia, there have been relatively few initiatives targeted at teacher Education for Sustainability, and these have been aimed mainly towards in-service rather than pre-service audiences. Most notable of these were the *National Professional Development Program* AAEE and the Griffith University/AusAID *Teaching for a Sustainable World*. These efforts have led to pockets of good practice emerging.



2.0 Professional Development Initiatives and Models

Box 2.1

Questions used to scaffold this enquiry:

- Where are the initiatives seeking to affect change?
- What changes were brought about by the initiative?
- What was the target audience of the initiative? Who was it seeking to change and who was involved in the process of change?
- Was the initiative successful in bringing about the desired changes?

Box 2.2

There has been no teacher education initiative that has strategically set out to mainstream sustainability into the core of teacher education programs. There have been some teacher education initiatives in the area of environment or sustainability but these have mostly appealed to the 'converted' – involving those who have already an interest in sustainability. This has been the case with '*Reorienting Teacher Education towards Sustainability*' initiative;¹ '*Teaching and Learning for a Sustainable Future*' project¹ and '*Teacher Education and School Development Project*'.¹ They have had little impact on mainstreaming sustainability in pre-service teacher education.

Box 2.3

This research does not represent an exhaustive study of all initiatives that exist throughout the world but instead captures a range of efforts. For example, it does not review all Environmental Education or Education for Sustainability (see Glossary) programs or indeed evaluate the ones that are featured. Neither does it intend to include all initiatives that attempt to mainstream concepts across teacher education. Instead the focus is on showcasing the different models that underpin a range of initiatives

This section of the report examines a range of programs that have sought to embed a new perspective or dimension within pre-service teacher education. It provides details of the programs by identifying processes used, key characteristics, and the models of professional development that underpin each initiative. The examination of these initiatives has been focussed on how the initiative aimed to bring about change in teacher education. Box 2.1 outlines the questions we used to interrogate the data. The analysis and key findings associated with this review are provided in Chapter 3. When reading this section, it is important to note that the goal of this research was not to review good practice but rather to identify models that could lead to changes within pre-service teacher education.

The initiatives presented in this report are organised to reflect the three broad models for change within teacher education that we identified: (i) the Collaborative Resource Development and Adaptation model; (ii) the Action Research model; and (iii) the Whole-of-System model.

While the search for appropriate initiatives was not restricted to Environmental Education or sustainability-focussed programs (See Box 2.3), the majority of initiatives featured here are sustainability-related. A range of programs, particularly in the areas of ICT, multicultural and ATSI perspectives were examined. However, none of these provided examples of new models that had not already been used in Environmental Education and Education for Sustainability. Given that the research focus is on mainstreaming whole-school approaches to sustainability in pre-service teacher education, the initiatives reviewed here are those that have a sustainability focus.

2.1 The Collaborative Resource Development and Adaptation Model

While the development and dissemination of resources could be considered as the default model of professional development within teacher education generally, Environmental Education has had a history of innovating upon this model. Many professional development programs develop resources, often in the form of teaching kits that address a range of issues, such as the *Gifted Education Professional Development Package*,¹⁰⁹ *Australians at War*,¹¹⁰ *Pathways to Parliament*,¹¹¹ and *Drug Education*,¹¹² for example. Generally, the resource is developed along with professional development courses that are provided to assist teachers in implementing the materials in their particular setting. This model of professional development has also underpinned many government efforts such as the recent *Discovering Democracy* program.¹¹³ In the field of Environmental Education, this basic model has often been adapted to provide a variety of professional development opportunities which both demonstrate good practice and act as a stimulus to further dissemination, adaptation, development and in-service.

This section examines three initiatives that have adapted this general model and are relevant to this study. These are the *School Development*

through *Whole School Approaches to Sustainability Education*: the *Sustainability Education in European Primary Schools (SEEPS)* project; the *Teaching and Learning at the Environment, Science, Society Interface (TaLESSI)* initiative; and the *Teaching and Learning for a Sustainable Future (TLSF)* initiative.

These initiatives were chosen because they explicitly attempt to effect change by not only developing new cutting edge resources and demonstrating possibilities but also by providing the stimulus for further adaptation and innovation. They seek to provide new content and approaches to teaching and learning through the take-up of new resources and pedagogical approaches. Their key goals are effecting curriculum change in schools and teacher education institutions, demonstrating what is possible within institutions and providing capacity-building opportunities for teachers and teacher educators. The different initiatives featured here have been able to innovate on the general model of resource development and adaptation in a variety of different ways. All have broadened the influence of their initiatives by engaging practising educators and teacher educators in the process of developing materials, with some having encouraged target institutions to adapt the materials to suit local contexts and undertake further professional development. These approaches also encourage those who need to implement the change to engage in the process of developing the resources, thereby ensuring a sense of ownership of the resources.

2.1.1 School Development through Whole School Approaches to Sustainability Education: The Sustainability Education in European Primary Schools (SEEPS) / Educating for a Sustainable Future Project (1996-2004)

The SEEPS project began as a continuing professional development initiative in 1995. It was a trans-European project funded by the European Union, with the final two cycles funded by the Comenius Education Fund. This fund aims to promote peace through fostering and supporting cross-European collaborative partnerships on education projects.

As an in-service project, the SEEPS initiative sought change through the development and delivery of materials, primarily for in-service teachers. These materials encouraged the embedding of whole-school approaches to sustainability in schools and were largely designed so that teachers and in-service educators could adapt and modify the resources to suit their own local contexts. The sleeve of the CD-Rom contains a detailed description of how the resource can be adapted.¹¹⁴ The original cycles of development involved educators from 14 European countries including primary school teachers, teacher educators, representatives of ministries of education, and NGOs.¹¹⁵

An internal website¹¹⁶ based on the in-service resources available on CD-Rom was developed in 1998 to provide a resource to support environmental education provision in the then six pre-service teacher education institutions taking part in the project in Scotland. The pre-service focussed *Education for a Sustainable Future* website was then made public and available on open access. The online pre-service version incorporates units on education for sustainability, whole-school approaches to sustainability education in schools, institutional change and action research. It focuses on five key aspects of whole-

To find out more about the
**Sustainability Education in
European Primary Schools (SEEPS)**
project, please visit

The SEEPS Initiative

'The SEEPS project distinguishes between rationale (why), vision (what), and design (how) in its promotion of ESD and organisational change. The project's vision is whole-school approaches. This is a process-based vision in which the emphasis is on *how* we educate. Sustainable outcomes are deliberated, decided, and practiced locally. SEEPS is also concerned with design, with how change is managed and evaluated'.

Shallcross (n.d., p.2)

'The SEEPS Project has attempted to avoid some of the pitfalls associated with centralized, top-down (professional development). A centralised approach sees the initiation of change as externally driven and does not consider how institutional factors in schools influence change, let alone equip teachers with the skills to manage change in their own schools'.

Box 2.4

SEEPS Initiative Process

In the SEEPS initiative, a group of teacher educators identified the need for a continuing professional development resource in whole school approaches to sustainability. They received funding and began to collaboratively develop the material to suit an in-service audience. The resource is suitable for adaptation to suit local contexts.

Drafts were trialled by participating institutions and refined and revised.

The resource was adapted and converted to HTML for online access to suit pre-service teacher training. The collaborative authors currently offer professional development to schools and teacher education institutions based upon the resource.

Box 2.5

SEEPS Snapshot

SEEPS sought to affect change through the development of a useful and well researched resource that deals with issues of change towards sustainability in school contexts. The in-service materials were designed to be easily adapted to suit local contexts and the pre-service resources focus strongly on action research and effecting change in schools.

SEEPS attempted to broaden the influence of the resource though collaboratively developing a resource that would be relevant to teacher educators and pre-service teachers.

The collaborating writers tended to engage more deeply in the materials and have more commitment to the process.

Some schools have responded well to the schools focussed resource but there is little information available on the success of the initial teacher education version examined here.

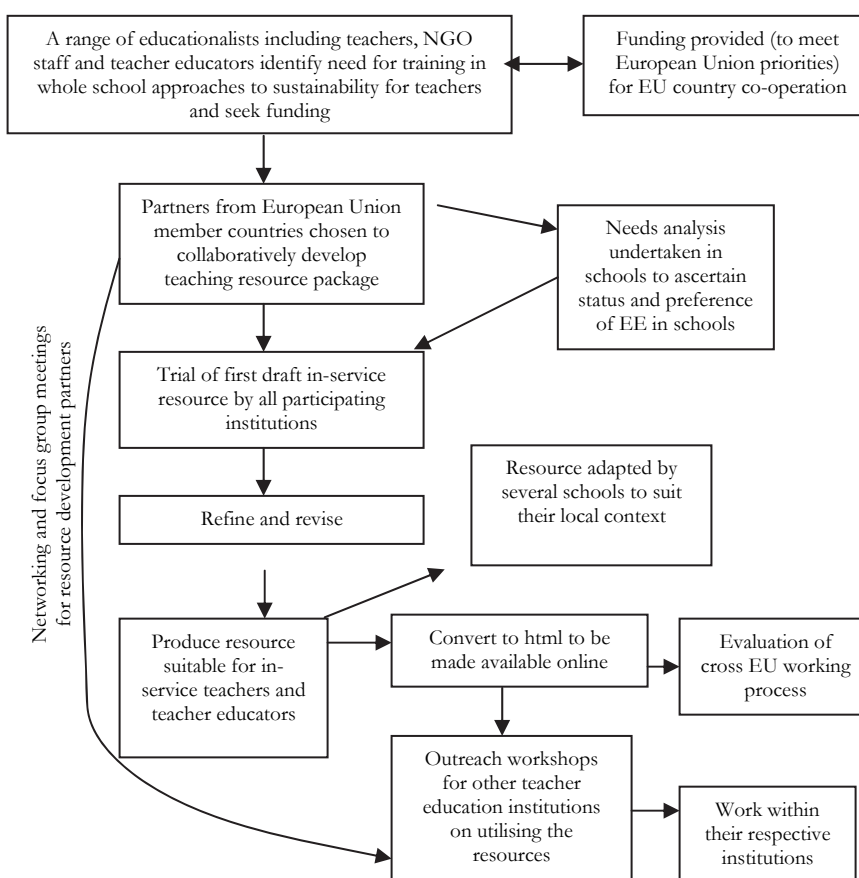
One of the most innovative features of SEEPS is the explicit focus on changing school cultures and institutions in the SEEPS content.

SEEPS approach to change may depend upon the individual pre-service teacher and teacher educator and their curriculum. The initiative's content certainly focuses on the process of change but its process has not led to a change in system structures.

To find out more about the **Teaching and Learning at the Environment, Science, Society Interface (TaLESSI)** project, please visit <http://www.gre.ac.uk/~bj61/talessi/>

school approaches: formal curriculum and pedagogy; institutional culture and ethos; institutional practice; self-evaluation and action-research; and community links.¹¹⁷

Fig. 1 Sustainability Education in European Primary Schools (SEEPS)



As the diagram outlining the process illustrates, the SEEPS initiative provides an interesting innovation on the Collaborative Resource Development and Adaptation model. While it assumes that change occurs through providing good quality resources that will be taken up and used by teachers and teacher educators, it does not focus solely on curriculum change. Through its content focus on institutional ethos, educational policy, commitment, action, and change, the SEEPS initiative demonstrates a complex understanding of the change process.

As the diagram also illustrates, the resource was developed collaboratively, rather than by a single expert. In this way, the SEEPS initiative was able to engage a range of teachers and teacher educators in the process of materials development. This resulted in a higher level of ownership of the materials and process by the teacher educators/researchers involved and an enhanced dissemination of the materials within these particular schools and pre-service teacher education institutions. In addition, outreach workshops were held to encourage teacher education institutions that had not been involved in the development of the resource to utilise it in their courses. Box 2.5 provides a snapshot of the SEEPS approach to change.

2.1.2 Teaching and Learning at the Environment, Science, Society Interface (TaLESSI) (1997-2001)

The *Teaching and Learning at the Environment, Science, Society Interface* (TaLESSI) initiative attempted to bring about change in student competencies by developing materials for use by academics. The particular competencies the TaLESSI initiative sought to develop were critical thinking and values awareness.

Based at the University of Greenwich, the TaLESSI initiative aimed to enhance environmental studies students' ¹¹⁸ understandings of interdisciplinarity, critical thinking skills and values awareness ¹¹⁹ (See Box 2.6). While the program only ran for two years at the University of Greenwich, the impact of its change has been broader than a single institution as it was also piloted, through an outreach program, in several other universities within the United Kingdom. ¹²⁰

The initiative grew out of academics' experiences in attempting to integrate the disciplinary perspectives of the natural sciences (e.g. biology and chemistry) with the social sciences (e.g. economics and sociology) and humanities (notably ethics and philosophy). In particular, the initiative sought to address the epistemological conflict (See Box 2.7) that is evident between these disciplines over what counts as valid knowledge. ^{121, 122}

Once again, the assumptions about change that underpin the Collaborative Resource Development and Adaptation model are also evident in the TaLESSI initiative. However, in a desire to broaden the level of change, the traditionally linear process of resource development was altered, as Figure 2 illustrates. For example, the need to bring about change in student competencies was not identified by a single expert but by a range of academics working within the broad environmental sciences discipline area. In addition, resources were not developed by an 'expert'. Rather, through the facilitation of interdisciplinary focus groups, staff development, and an outreach program of departmental support, a bank of teaching and learning resources which promoted active learning for interdisciplinarity, critical thinking and values awareness, was collaboratively developed. ¹²³

Evidence suggests that the most significant impact of the project was felt in its home institution. Through their involvement with TaLESSI, many academics incorporated interdisciplinary and critical thinking perspectives in their classes. The project also contributed to the development of a 'Teaching and Learning Forum' ¹²⁴ that would assist academics in changing their pedagogical practices. See Box 2.8, on the next page, for a description of the TaLESSI process.

Box 2.6

TaLESSI Snapshot

TaLESSI attempted to effect change in student competencies by developing curriculum materials for use by academics. The materials focussed particularly on developing skills in critical thinking across the disciplines. The initiative evolved in response to widespread dissatisfaction with students' abilities in this area.

TaLESSI employed an interdisciplinary approach to embedding skills in critical thinking across all areas of the curriculum.

Focus group interviews across the faculty enabled staff and students to inform the direction of the process. Professional development workshops were also organised to assist academics in writing modules to share.

A variety of curriculum modules demonstrating skills in critical thinking/values awareness dealing with a range of environmental topics were collaboratively written by lecturers in the faculty. These were piloted by colleagues and by academics in other universities. The resources were uploaded to a website, where they can be accessed for free. The project team also embarked upon scholarship of teaching research on the project to advocate for their perspective.

The initiative enjoyed success in changing some academics' teaching styles, however, not all academics were engaged in the process. Academics from hard science backgrounds, with epistemological beliefs, found the resources and process challenging.

TaLESSI aim

'...students should develop a *critical* approach to knowledge - and should learn to make informed judgments about how much 'authority' and 'credibility' attaches to any particular 'knowledge claim'.'

Jones and Merritt (1999, p. 2)

TaLESSI project coordinators

'Our approach to learning and teaching sought to problematise the 'knowledge claims' made from within those various disciplinary perspectives, in such a way as to reveal their epistemological bases and the entry of values into environmental debate. This approach, which was anchored principally in philosophy and sociology of knowledge, appeared particularly helpful in making sense of the *contested* character of many current environmental issues: that is, where knowledge is uncertain and provisional in nature; and where conflicting views are heard, both within academia and beyond.'

Jones and Merritt (1999, p. 2)

TaLESSI project coordinators

Box 2.7

'**Epistemology** is a branch of philosophy concerned with theories of knowledge, or theories of how we can know about the world. The key point that we wish to make here is that there is no single, universally accepted theory concerning the production of knowledge, including scientific knowledge. Rather, scholars have developed a wide range of more or less distinct theories.'

Jones and Merritt (1999b, p. 349)

TaLESSI project coordinators

Box 2.8

TaLESSI Process

Teacher educators identified the need for an interdisciplinary approach to critical thinking.

A coordinating body ran forums and conducted focus group interviews to ascertain the opportunities for critical thinking in each discipline.

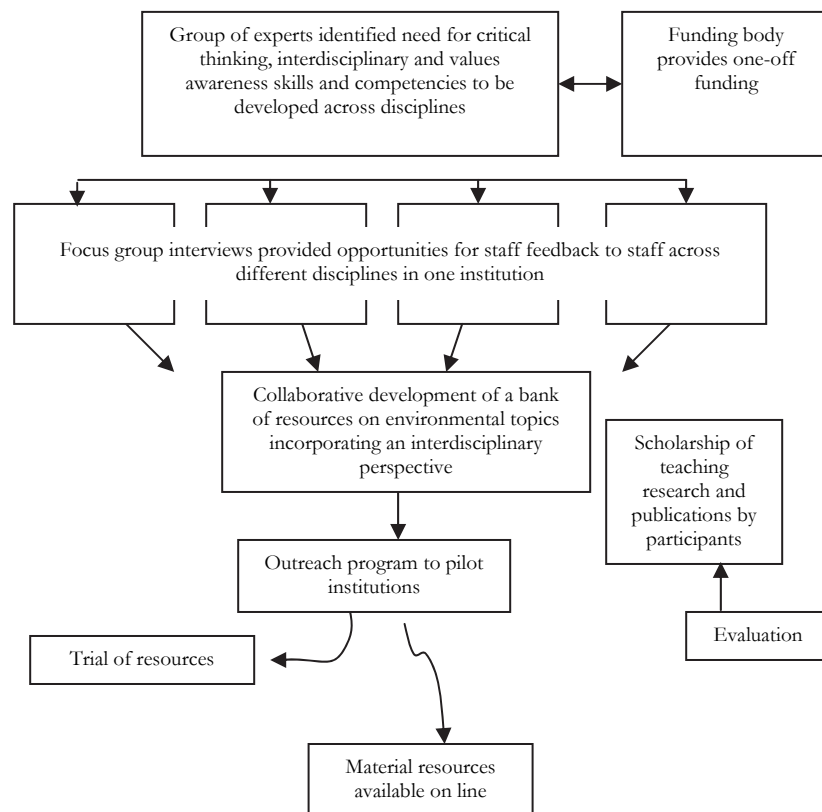
A bank of lesson plans addressing these opportunities were developed (these lesson plans were suitable for a variety of disciplines and including topics such as global warming, sustainable development and corporate policy making).

The resources were trialled by a number of outreach institutions. The resources were made available online,

Professional development conferences and workshops were held to publicise the resources.

The materials were evaluated and findings to contributed to a number of scholarship of teaching publications.

Fig. 2 Teaching and Learning at the Environment Society and Science Interface (TaLESSI)



To find out more about the **Teaching and Learning for a Sustainable Future** project, please visit <http://www.unesco.org/education/tlsf/>

Box 2.9

In 25 different modules, teachers can learn about:

- the rationale behind a vision for a sustainable future
- different ways of integrating this vision across all areas of the curriculum
- examples of teaching interdisciplinary themes
- learner-centred teaching and learning strategies that can be used in the classroom and
- outcomes based assessment.



'Teaching and Learning for a Sustainable Future' front page

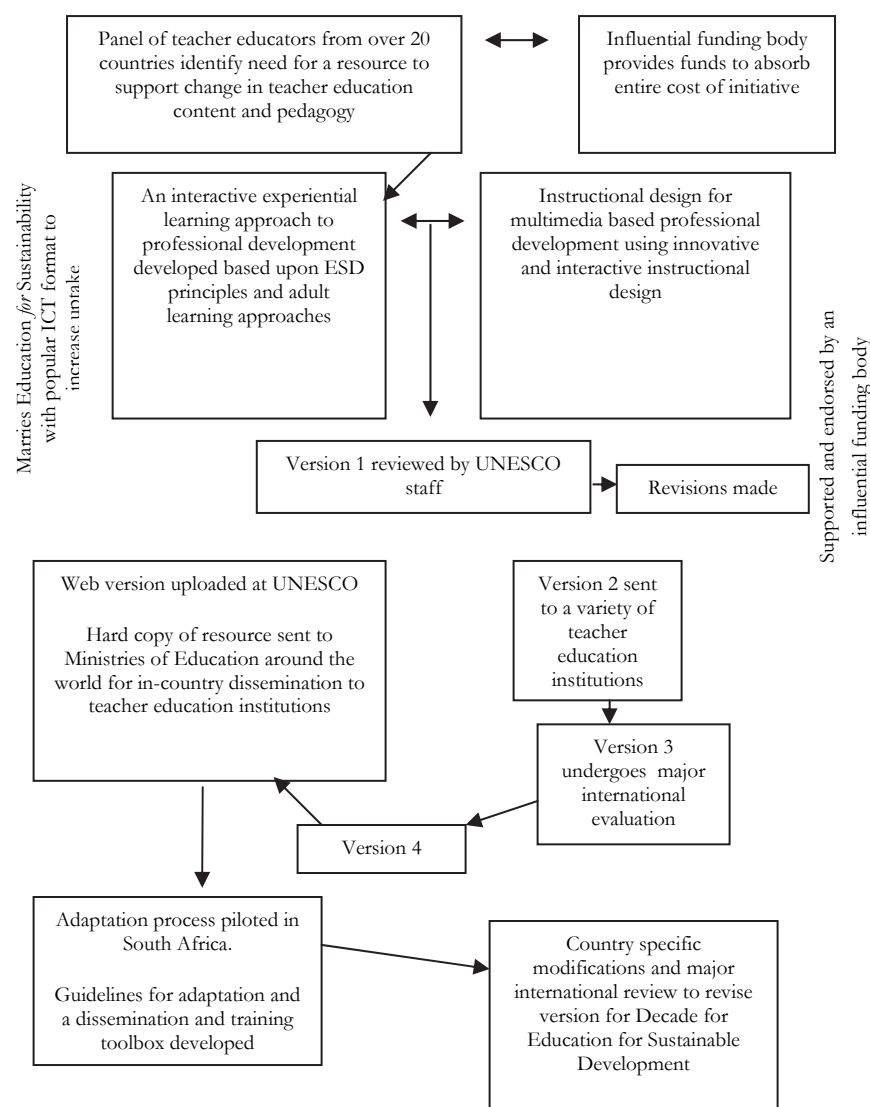
2.1.3 Teaching and Learning for a Sustainable Future (2001-)

Teaching and Learning for a Sustainable Future (TLSF) is a multimedia teacher education initiative commissioned by UNESCO and developed by a team of educators and multi-media professionals from Griffith University and other teacher education institutions around the world. It was the 2002 winner of the Australian Museum's Alan Strom Eureka Prize for Environmental Education Materials. It contains more than 100 hours of professional development activities and content on a variety of Education for Sustainability themes (See Box 2.9).¹²⁵ The program aims to assist teachers in planning learning experiences that empower their students to develop and evaluate alternative visions of a sustainable future in ways that help bring their visions of a better world into being.¹²⁶ The resource may be used in a variety of learning settings such as whole classes, small groups and is also suitable for self-guided study by in-service teachers.

The TLSF initiative seeks to bring about change in in-service and pre-service teacher education in two ways: through the development and delivery of a suite of resources that teacher educators can use in their courses and through the adaptation of the resources to provide locally specific versions. One of the unique features of the TLSF initiative is that it addresses change not only at the level of curriculum content but also in the pedagogical processes that are used to deliver this new content, and the philosophy that is commensurate with such an approach. The program is academically rigorous in that it incorporates up-to-date information on sustainability issues and links to a variety of perspectives that encourage critical thinking. It utilises experiential learning processes, which encourage analysis and interpretation of information; provides skill development in a range

of innovative teaching and learning strategies; and encourages adaptation and application of new ideas to current educational contexts. Additionally, TLSF also incorporates opportunities for teacher educators and teachers to reflect on their own teaching and learning in order to practically apply new understandings and concepts to individual teaching and learning contexts.¹²⁷ Reflective practice is encouraged through a virtual learning journal, where participants may reflect on what they have learnt and how they will apply this to their particular teaching contexts.¹²⁸ See Box 2.11 for a description of the process.

Fig. 3 Teaching and Learning for a Sustainable Future (TLSF)



One of the change strategies evident in the TLSF initiative is its use of web-based learning. The choice of the internet as a vehicle for professional development means that it can be accessed in isolated locations (provided a computer with internet access is available) and comprehensive, up-to-date information providing a variety of viewpoints is readily available at little cost.¹²⁹ Web-based learning can also be seen as an effective strategy to encourage stakeholder buy-in as it helps to address an increasingly core competency of computer literacy.

Another effective strategy for enabling widescale change that has been used by the TLSF initiative is its alignment with UNESCO, an

Box 2.10

Another innovation in this initiative is that the source code for the programming of the software has been made accessible to ministries of education around the world to allow for easy adaptation of the program to local contexts and languages. Since its launch, it has been adapted for several regions, including South Africa and Kyrgyzstan.



Kyrgyzstan adaptation

Box 2.11

TLSF Process

A panel of teacher educators and influential intergovernmental organisations identified the need to provide resources on, and demonstration of, incorporating Education for Sustainability content, pedagogy and philosophy into teacher education.

Material developed collaboratively from earlier participatory initiatives form basis for adaptation. Teacher educators were contracted to write interactive resources suitable for interactive HTML programming.

The resource was sent to a variety of teacher education institutions around the world for a number of trials. Revisions were made.

The resource was endorsed and distributed free of charge to ministries of education around the world.

Country specific adaptations have also been made with the support of UNESCO. Some countries, like South Africa, have adapted TLSF through adding in local examples and modules consistent with their philosophy and local needs.

Box 2.12

TLSF Snapshot

TLSF is targeted towards teachers and teacher educators and approaches change through curriculum and pedagogical innovation through the development and dissemination of a free, high quality, internet resource, which may be adapted to suit a local context.

TLSF was developed by experienced teacher educators and trialled in a number of schools and teacher education institutions around the world.

The resource is innovative in that it utilises cutting edge technology and has a number of built-in best practice pedagogical techniques such as reflective practice, experiential education and action research.

The resource has been endorsed and distributed widely through the auspices of the highly influential intergovernmental body UNESCO.

Results from the initial trial and evaluation indicated that it was a useful resource. It does not, however, aim to bring about the broadscale change required to reorientate teacher education towards sustainability.

internationally recognised, inter-governmental body (see Box 2.12). This alignment has meant that the resource has not only been publicly endorsed and promoted by UNESCO but that UNESCO has also disseminated the resource through its extensive networks, including national ministries of education. The alignment with UNESCO has also been used to enable language and context-specific adaptations of the materials to be undertaken (see Box 2.10 on previous page).

While TLSF is a high quality resource, its aim is not so much to provide a resource but rather to demonstrate the possibility of what can be achieved in teacher education institutions. It seeks to be a catalyst for country specific adaptations and change. This aim is based on the premise that no centrally prepared program could be relevant to all countries¹³⁰. While one of the greatest strengths of TLSF's approach to change is the relative cost effectiveness of the approach, securing funding for the follow up professional development associated with the county-specific adaptations has proved difficult.¹³¹

The Collaborative Resource Development and Adaptation model, which these three initiatives were based upon, has been widely used in professional development in teacher education. In its simplest form, the model assumes that change can occur through the provision of curriculum and pedagogical resources and adequate training in the use of these. In the Environmental Education field, innovative adaptations of the model have led to the development of participatory and relevant professional development guides and resources. Such initiatives often incorporate a collaborative materials development phase, which engages teacher educators in the process and increases their uptake and commitment to the initiative. Some initiatives based on this model also use the resource as a stimulus for further, more specific, adaptations to suit a local context. The model offers a number of advantages: it has the ability to reach a large target audience and it is relatively cost effective because in most instances, once the resource is produced and disseminated there is little ongoing cost, although in some cases this perception works to limit funding of further adaptations. The model also has a number of drawbacks, however. It has a relatively narrow target in that it depends very much upon the take up and use of the resource in the current system. It targets change at the level of curriculum and pedagogy rather than at the broader systemic level. The initiatives reviewed mostly preach to the converted, it is the teacher educator who already has an interest in EE or sustainability who takes up the opportunity to be involved in the development or adaptation of the resource. Current interpretations of the model provide little incentive for others to take an interest in the resources.

Box 2.13

A Demonstration Project

Teaching and Learning for a Sustainable Future has been developed by UNESCO as a demonstration project to illustrate:

- ways of meeting the professional development needs of educating for a sustainable future;
- how interdisciplinary approaches can be applied in education;
- how to combine training about sustainable development issues with training in how to teach about them;
- how to deal with the values laden nature of sustainable development issues;
- how to encourage ongoing reflection (via a learning journal) as a key aspect of ongoing professional development;
- the potential of international collaboration in providing resources for teacher professional development; and
- the potential uses and benefits of multimedia technologies in pre- and in-service teacher education.

UNESCO (2005)

2.2 The Action Research Model

Initiatives that use the Action Research model (see Box 2.14) aim to do more than introduce new curriculum. They also aim to build capacity in educators so that they see themselves as competent developers and deliverers of curriculum by utilising the action research process as a form of professional development.

This section examines two initiatives we identified that use an Action Research model. They are the *Learning for a Sustainable Environment: Innovations in Teacher Education* (LSE) program; and the *Action Research for Change Towards Sustainability* (ACTS) program. The two initiatives both develop new curriculum but are different from the initiatives based upon the Collaborative Resource Development and Adaptation model because they seek to deeply engage with educators as key agents of change through a process of action research. The

Box 2.14

Action Research

Action research can be used as a process of professional development. It is often represented as a four-phase cyclical process of critical enquiry: plan formation, action, outcome observation and reflection. It provides the opportunity for practitioners to reflect upon their practice with the aim of improving and innovating upon it.

Adapted from Tilbury, Coleman and Garlick (2005, p. 85)

effectiveness of this model is enhanced in these initiatives through the targeting of individuals who can act as key agents of change within their institutions to effect change at both the policy and the practice levels.

2.2.1 Learning for a Sustainable Environment: Innovations in Teacher Education (LSE) (1994 - 1997)

One of the earliest examples of a pre-service professional development initiative that seeks to bring about a systemic change is the LSE initiative which sought to bring about a systemic change by taking a multi-system partnership approach to change. This means that there was an acknowledgement of the strong relationship between pre-service professional development, curriculum development, networking and practitioner-based research; and the political, cultural and institutional contexts in which teacher education occurs.¹³² The approach was 'ecological' because it recognised that these contexts are 'so interconnected and interdependent that none can survive without the other'.¹³³ LSE sought to address this by developing a program that leveraged these relationships by engaging with personnel from ministries of education as well as teacher education institutions not directly involved in the LSE project. In this way, LSE attempted to effect change beyond particular teacher educators and particular teacher education institutions.

The LSE initiative was undertaken by UNESCO-ACEID and Griffith University in the mid-1990s. The LSE initiative created and supported an international network of teacher educators and ministry officials from 29 countries in the south and east Asia region¹³⁴ in a collaborative action research approach to professional development (see Box 2.14 on the previous page). This approach saw participants engaged not only in resource development but also in professional and curriculum development. Participants engaged in a process of creating materials, experimenting with innovative methodologies, sharing with colleagues, adapting materials for different cultural settings, evaluating, pilot-testing, and refining the resources.¹³⁵ The challenge for this project was to ensure that this process remained relevant in such a culturally diverse region, where a standard set of resources would not be useful. In evaluations undertaken of the initiative, participants agreed that the 'professional development and practitioner research process was more personally, professionally and culturally relevant to them and their institutions than previous resource or materials focused projects they had encountered'.¹³⁶ This high level of engagement has resulted in change. The modules are currently used in both pre-service and in-service teacher education programs throughout the Asia-Pacific region and have served as the framework for national training workshops for teacher educators in several countries.¹³⁷

The LSE initiative was unique in its efforts to take an ecological approach to change as Figure 4 illustrates. This saw it move well beyond the resource development approach in its efforts to engage participants in a process of action research. This allowed for a deep level of engagement and a higher level of ownership and support of the resources and the process. In addition, the initiative also engaged with teacher educators who were not directly involved in the resource development process as critical friends and reviewers of draft

To find out more about the *Learning for a Sustainable Environment* project, please visit <http://www.cns.gu.edu.au/cirec/LSE/main.htm>

Box 2.15

Several teacher educators from the region wrote a set of workshop modules, each about 3-6 hours in duration, which could be used in either pre-service or in-service teacher education. A network of critical friends then provided advice and revisions for each module. The draft modules were further trialed for possible adaptation to other contexts and evaluated by a widening circle of network members. These trials not only provided both guidance on ways to adapt the module to differing contexts but also, more importantly, provided opportunities for reflection and evaluation in the action-research process and professional development.

Fien and Maclean (2000)

LSE Snapshot

LSE was targeted not only towards teacher educators, but also to ministry officials in an attempt to effect leverage from the top.

It is difficult to gauge the long term effect of the initiative as no longitudinal evaluations have taken place.

LSE Process

A variety of sympathetic teacher educators and their respective institutions from the Asia-Pacific region were recruited as participant researchers in an action-research/professional development project culminating in the production of curriculum resources.

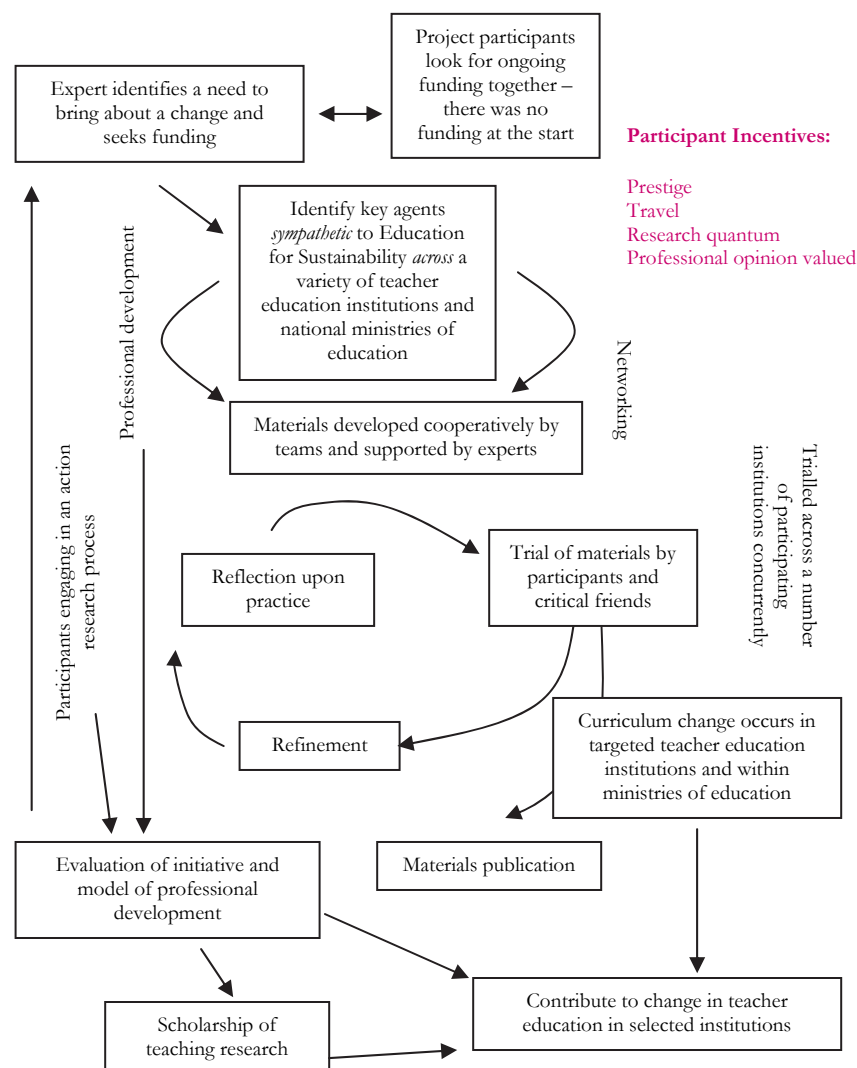
Materials were developed and trialled by a network of participants and critical friends who reflected upon the practice evident of the process. Materials were refined and retrialled.

Materials and scholarship of teaching research based upon the evaluation of the model of professional development applied were published.

To find out more about the **Action Research for Change Towards Sustainability (ACTS)** project, please visit <http://www.aries.mq.edu.au/news.htm>

materials. The use of critical friends was another successful strategy used by the LSE initiative to bring about change. In addition, engaging with ministry of education officials meant that LSE was also working to effect change beyond a few pre-service classrooms (See Box 2.16). This project was cutting-edge in terms of its strategic design.

Fig. 4 Learning for a Sustainable Environment



2.2.2 Action Research for Change Towards Sustainability (ACTS) (2002-2004)

The ACTS initiative is a later example of the use of the Action Research model and was developed in response to an industry need for particular graduate capabilities in sustainability. It aimed to encourage change not only in curriculum and staff professional development but also to institutionalise a process of change through negotiating partnerships with key stakeholders within institutions (see Box 2.18 on next page).

The ACTS initiative was a two year pilot project, funded jointly by the Australian Government Department of the Environment and Heritage and Macquarie University. It addressed the need for university graduates to develop competencies or capabilities such as critical, creative and futures thinking skills,¹³⁸ confidence to deal with uncertainty; and an awareness of sustainability issues so that they would be able to address sustainability within their future professional

work situations.¹³⁹ The ACTS initiative achieved this through providing an opportunity for university academics to reflect on and rethink their own teaching practice.

Ten academics from several Australian universities, across a variety of discipline areas such as accounting, finance, health and chiropractic, volunteered to take part in the ACTS project. See Box 2.19 for a snapshot of the ACTS initiative and its approach to change. In order to encourage participation from a range of disciplines, ACTS interpreted sustainability to be more than just about environmental issues and promoted consideration of ‘quality of life’ issues. The use of the term ‘quality of life’ served as a camouflage attracting educators who would not normally associate themselves with the concept of sustainability, thereby going beyond the converted. The quality of life badging increased the perceived relevance of the ACTS project to potential participants and was deemed a critical success factor by the developers of the initiative. Another feature of the initiative that encouraged participant involvement was its goal of ‘learning through research’ reflected in the use of action research, and engagement not only with curriculum reform but also with the scholarship of teaching.

Participants attended professional development workshops and were supported in their efforts to incorporate quality of life issues in their teaching by mentors. These workshops used a variety of methodologies such as action research and phenomenography (see Box 2.20) to explore sustainability across the disciplines in higher education. The participants’ action research journey was supplemented by the compilation of a portfolio, which also facilitated the process of reflective practice. The outcome of the ACTS initiative was a group of academics across a range of institutions that had engaged deeply with sustainability issues and had developed new curricula that would ensure their students graduated with the range of desired competencies.

The ACTS initiative was based on an Action Research model of change as Figure 5 illustrates. While the ACTS initiative responded to industry needs, recruited participant researchers nonetheless had a great degree of flexibility and control over the topic and process of research. This created a deep sense of ownership and strengthened the likelihood of lasting change.

The ACTS initiative used a variety of support mechanisms within different contexts to enhance the level of change the initiative was able to bring about. For example, phenomenographic research was used to explore different conceptions of sustainability; critical friends and mentors were used to provide advice and act as a sounding board particularly in relation to Education for Sustainability; and institutional workplaces, managers and initiative coordinators provided high level support.

Another interesting feature of the ACTS initiative was its attempt to ensure that its model of change was taken up and institutionalised. To this end, ACTS built a partnership with a university continuing professional development unit, which provides support to new and existing lecturers in scholarly teaching and learning processes. While this was the least successful aspect of this initiative, with better

Box 2.18

The ACTS project core objectives were to:

1. explore sustainability as a generic skill across disciplines at the university level;
2. explore **research** based activities to enhance **professional and organisational development** for sustainability;
3. support teachers of **postgraduate** units in Education *for* Sustainability to support their plans for innovation; and
4. assist **curriculum change** through action research, with the ultimate aim of preparing postgraduates students for addressing sustainability within their professional work. exploring research based activities to innovate for sustainability – through curriculum.

Tilbury et al (2004)

Box 2.19

ACTS Snapshot

The ACTS initiative, like LSE before it, took a multi-dimensional approach to change. Although the main target audience was a range of self-selected academics, partnerships were also negotiated with heads of departments to ensure managerial support for the process. This had the effect of beginning to combine a top-down with a bottom-up approach to change.

Interestingly, ACTS deliberately, through the use of ‘camouflage’, set out to draw academics who previously would not have seen the relevance of sustainability to their chosen discipline or area of work. The ‘quality of life’ issue was very successful in this sense.

One of the assumptions underpinning ACTS’s approach to change was that change can be effected from building capacity of a range of agents of change within the institution through a professional development process based upon action-research. ACTS, however, expanded the action research process to also include the research facilitators in ongoing cycles of research and reflection.

The deep engagement afforded by the action research process increased motivation and continued commitment to the project.

ACTSs had several impacts including alignment of individual degree courses towards sustainability, and developing a supportive institutional culture.

ACTS also aimed to institutionalise its approach to professional development by partnering with the University’s continuing professional development unit.

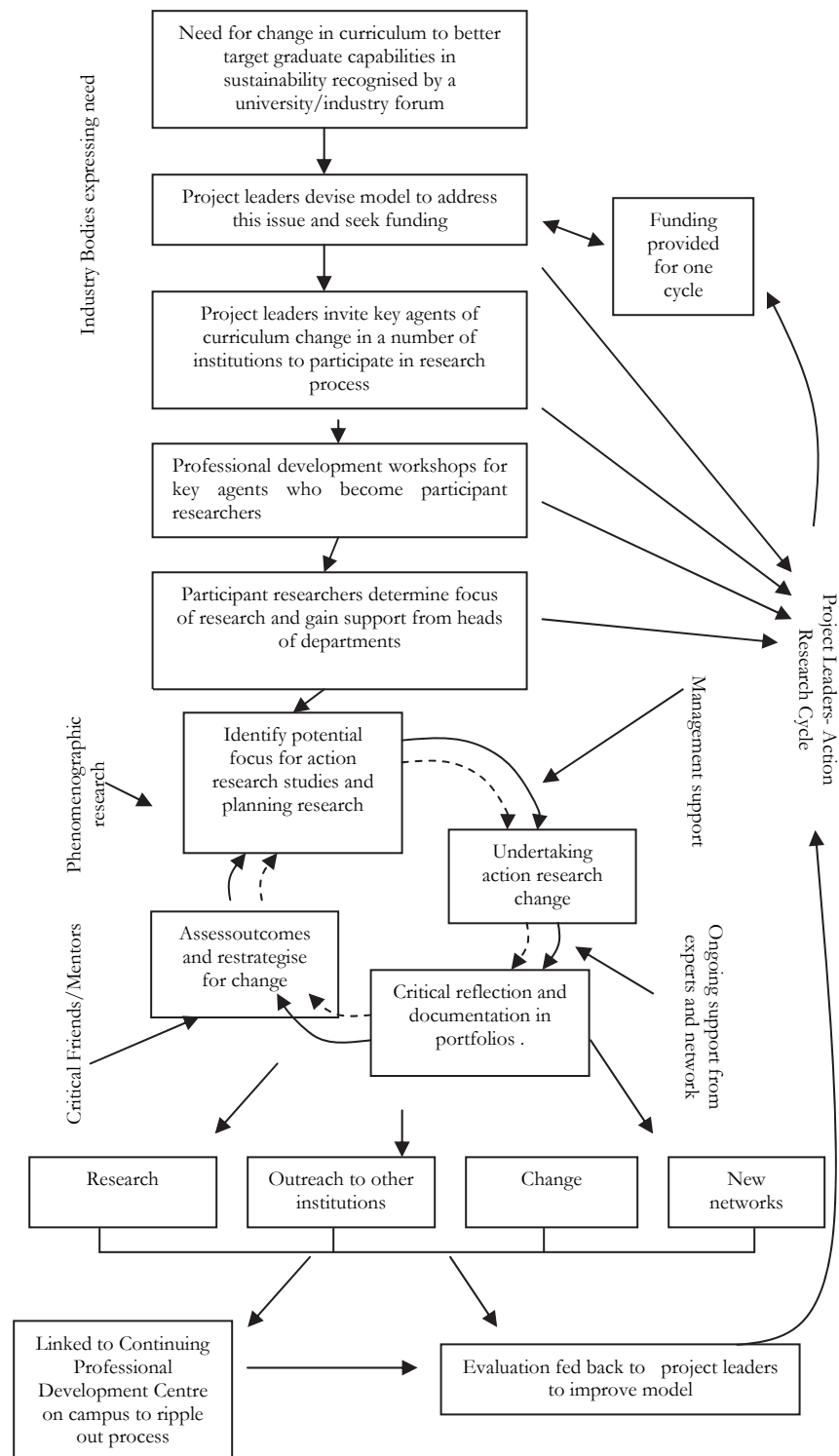
Box 2.20

Phenomenographic Research looks at the differing ways people experience, understand and ascribe meaning to a specific situation or phenomenon. Phenomenography richly describes the object of study through an emphasis on describing the variation in the meaning that is found in the participants’ experience of the phenomenon. Phenomenography examines the experience of each participant and recognises that each person’s experience is an internal relation between the subject and the object.

Marton (1994)

research design this could be an effective means for embedding change within and across an institution.

Fig. 5 Action Research for Change Towards Sustainability (ACTS)



The ACTS initiative was unique in that the developers of the initiative were also simultaneously engaged in an action research process so that they could better understand, modify and improve the process being experienced by the participant researchers. This was another feature of this initiative's success at effecting systemic change.

The Action Research model, utilised by both the Learning for a Sustainable Environment and the Action research for Change Towards Sustainability projects, has been extremely effective in deeply engaging groups of teacher educators,

academics and managers in a professional development process of reflective action. In both instances, change was effected in (a) curriculum and course structures through the inclusion of Learning for Sustainability principles and (b) in the immediate institutional climate, to make it more receptive to sustainability. The model assumes that deep engagement by key stakeholders and supported action is critical. The level of engagement increases the competence and propensity for research participants to act for change therefore increasing the longevity of the intervention. For example, in the case of the ACTS initiative, participant researchers continue to meet and support each other, two years on from the completion of the project. It also rippled out into other institutions not participating in the original process. The model also recognises that key stakeholders operate within a system which also needs to be addressed if the change is to be embedded. The action research process, however, is time intensive and difficult to 'sell' because of a lack of 'tangible' outputs to potential funders. Current interpretations of the model have focussed on higher education institutions and curriculum or organisational change and not engaged with mainstreaming Learning for Sustainability across the system.

2.3 The Whole-of-System Model

Initiatives that use the Whole-of-System model of professional development have a radically different approach to change than those initiatives reviewed above. The initiatives underpinned by the Whole-of-System model seek to address not only the introduction of new curriculum content and/or pedagogical processes, but also seek to ensure that change occurs in a multi-faceted and system-wide manner. While it was easy for this study to identify a very wide range of initiatives that were based on the Collaborative Resource Development and Adaptation model, far fewer initiatives using the Whole-of-System model were identified.

This section examines two initiatives we identified that use a Whole-of-System model. They are the *Embedding Education for Global Citizenship and Sustainable Development in Initial Teacher Education and Training* (EGCSD) initiative; and the *Sustainable Teacher Environmental Education* (STEEP) initiative.

2.3.1 Embedding Education for Global Citizenship and Sustainable Development in Initial Teacher Education and Training (EGCSD) (2001-2004)

The EGCSD initiative sought to bring about change in a range of areas related to the pre-service teacher education institution. It aimed to change curriculum within and outside the institution by facilitating a process of curriculum change within the institution and ensuring that opportunities existed for students to implement this curriculum in their practicum schools (see Box 2.21). Relationships were developed with a key stakeholder – practicum schools – to ensure congruence between what was taught in the pre-service program and what students experienced during practicum. Change was thus brought about through specifically targeting a number of contextual layers within the system.

The EGCSD initiative was a three-year project of the World Education Centre (see Box 2.22) and the University of Wales' School of Education. Its explicit aim was to develop a replicable model for embedding education for global citizenship and sustainable

To find out more about the **Embedding Education for Global Citizenship and Sustainable Development in Initial Teacher Education and Training (EGCSD)** project, please visit <http://www.bangor.ac.uk/addys>

Box 2.21

The EGCSD Project had several objectives:

- Raise awareness of global citizenship and sustainable development within the School of Education;
- Identify opportunities to embed these in each course;
- Identify support needs of tutors and students and respond;
- Supply case studies of good practice and support with resources; and
- Document exemplars for the project and disseminate to other institutions and NGOS.

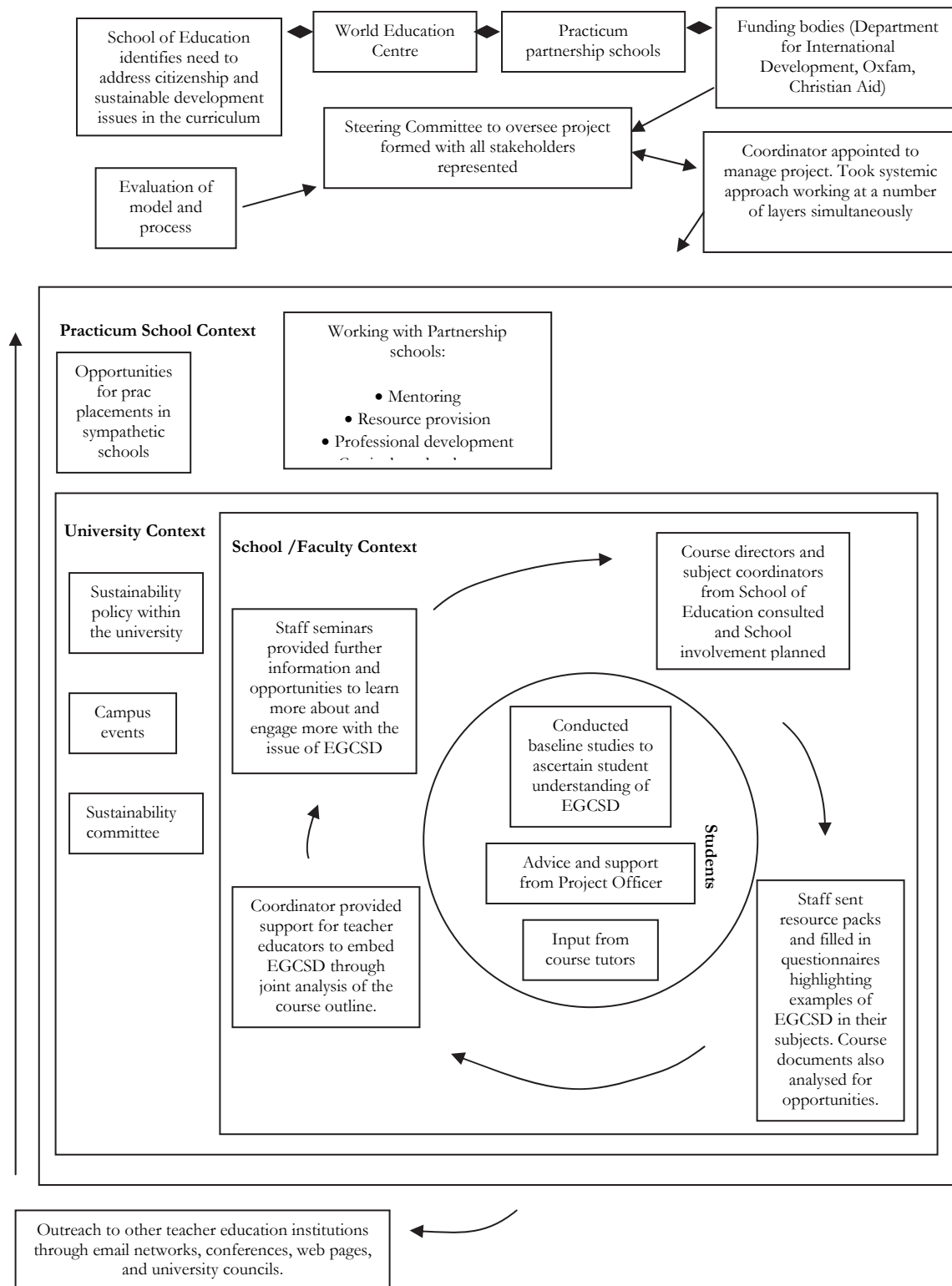
Bennell (2004)

Box 2.22

The World Education Centre is one of several development education centres in Wales, but is the only one located within a university.

development into pre-service teacher education across graduate and undergraduate entry programs, thus targeting primary as well as secondary student teachers.¹⁴⁰ The process involved working primarily with staff in the School of Education but also directly engaged student teachers, practicum school based mentors and staff from the World Education Centre, a development education resource centre located within the university.¹⁴¹

Fig. 6 Education for Global Citizenship and Sustainable Development (EGCSD)



The EGCSO initiative was collaboratively designed by a group of stakeholders who had an interest in global citizenship and sustainable development. The broad-based nature of this input meant that all concerns were factored into the project design and there was genuine buy-in from all stakeholders. This multi-faceted approach to change was a critical success factor for this initiative.

This initiative began by undertaking a baseline survey of students to ascertain their perceptions of global citizenship and sustainable development and their preparation to teach this in schools. The findings were used to identify and address gaps in curriculum and to seek opportunities in practicum schools.

The EGCSO initiative was also able to appoint a project officer, thanks to funding support from several NGOs. The project officer received direction from a group comprised of seven university staff members who were particularly committed to EGCSO. The project officer worked closely with all School of Education staff to:

- audit courses for opportunities to introduce EGCSO concepts;
- provide resources and professional development opportunities on the topic; and
- support staff as they engaged with EGCSO issues.

Professional exchange programs with foreign universities also added to staff capacity to grasp the range of development issues that could be applicable to their courses.

The initiative also established networks with ‘partner schools’ in Wales, with a mentor in each school for pre-service students undertaking practicum in these schools. This ensured a consistent concentration on global citizenship and sustainable development issues from the university to the schools.¹⁴²

The EGCSO initiative adds another layer of complexity to the contextual use of the Action Research model demonstrated by the LSE and ACTS initiatives, as Figure 6 illustrates. This is because the Whole-of-System model assumes that change is deeply rooted in context and that efforts to engage with new ideas can only be successful if the whole institutional context is targeted. For example, the EGCSO initiative has activities and strategies for change embedded in each contextual layer from interactions with students, teacher education staff, broader university policy, and practicum placements and partnership schools. Such a model succeeds because it simultaneously launches top-down strategies - such as garnering institutional support at the policy level - while at the same time building broad-based bottom-up support through professional development opportunities for all stakeholders. See Box 2.23 for a brief overview of the EGCSO initiative’s approach to change.

2.3.2 The Sustainable Teacher Environmental Education Project (STEEP) (2002-2004 and ongoing)

The STEEP project is an outstanding example from Jamaica of an effort to bring about broadscale, systemic change. The STEEP initiative occurred as a result of overseas aid and development funding provided to the National Environmental Education Council Jamaica (NEEC Jamaica) to undertake a range of Environmental

Box 2.23

EGCSO Snapshot

EGCSO has a richly contextual approach to change, which it assumes can only occur if all elements of the system are aligned and engaged. Hence its focus on delivering a variety of activities aimed at each contextual layer of pre-service teacher education including students, Faculty, University and practicum school.

EGCSO was also supported by the university hierarchy, where there was already a sustainability committee engaged in developing enabling policy. This could perhaps partially explain the ease with which EGCSO engaged teacher education staff in the process.

This approach proved successful, and resulted in a large majority of teacher education staff incorporating EGCSO into their courses and a number of highly publicised and attended sustainability events on campus. At the time of the completion of the initiative, the practicum schools component required further negotiation.

Although the initiative has been completed, the University is still committed to EGCSO and is continuing with a variety of other EGCSO initiatives.

(See http://www.esdgc-wales.org.uk/english/Teacher_Education/default.htm)

Embedding EGCSO in Teacher Training

‘If EGCSO is to become truly embedded in ITET courses then the ethos of the School of Education must reflect this in everything that it does. Educating students, and in turn asking them to educate children about EGCSO, should not just occur in academic structures but in opportunities for students to participate in good practice in their every day lives’.

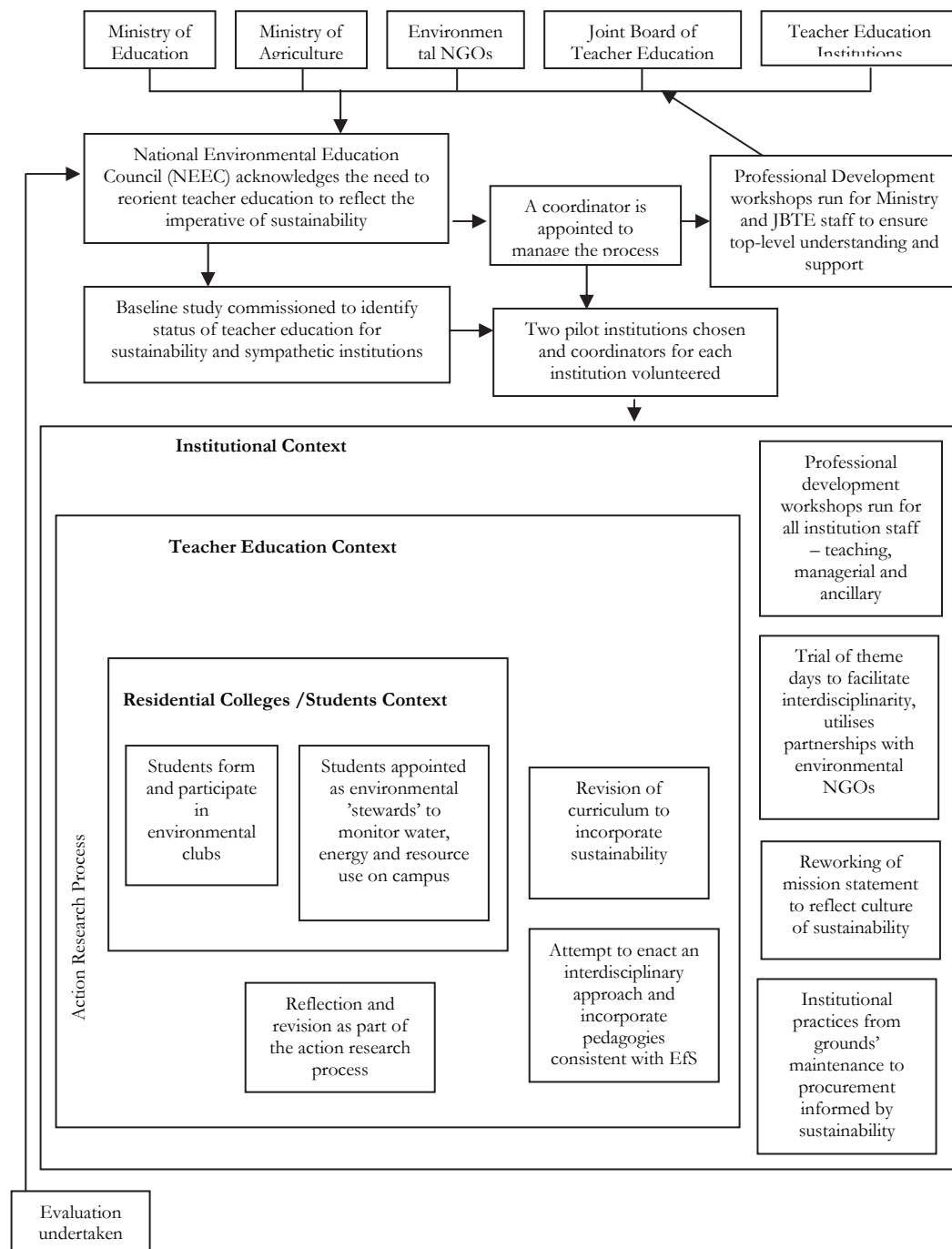
Bennell (2004, p. 19)

To find out more about the **The Sustainable Teacher Environmental Education (STEEP)** project, please visit <http://www.enact.org.jm/Publications/Publications5000.htm.gbyd/eng/itet.htm>

Action (ENACT) programs. The STEEP initiative was one such program.

The STEEP initiative was similar to the EGSCD initiative in that it sought to effect change by engaging with a range of contextual levels and key stakeholders. However, EGSCD was more focused on bringing about curriculum change. The STEEP initiative aimed to bring about a far broader change, across the whole of the pre-service teacher education system. This aim was reflected in both the range of activities in which the initiative engaged and the number of levels at which the initiative sought to institute change. For example, the initiative engaged with ministries who had a concern with either teacher education or the environment such as the ministries of education and agriculture. In addition, the initiative also engaged with the local Joint Board of Teacher Education and the National Environmental Education Council. These stakeholders played a pivotal role by providing very high level, ongoing support and encouragement for the initiative.

Fig. 7 Sustainable Teacher Environmental Education Project (STEEP)



The STEEP initiative also engaged with all sectors within the teacher education institution, including students, academic staff, administrative staff and ancillary staff to ensure that the whole institution had a shared vision that would support a radical shift in institutional culture.

The STEEP program was initiated by the Jamaican Environmental Action (ENACT) program and NEEC Jamaica who both understood and supported the need for pre-service teacher education to reorient itself towards sustainability (See Box 2.24). The Jamaican Ministry of Education, along with the Jamaican Joint Board of Teacher Education began by undertaking a baseline study on the status and strength of Education for Sustainability in Jamaican teacher education colleges. This study was used to identify good practice, gaps, and possibilities for change. It was also used to identify those teacher education institutions that would be the most receptive to efforts to embed a whole-of-system approach to sustainability.

Two teacher education institutions were identified as pilots for a program seeking to bring about change by mainstreaming Education for Sustainability in pre-service teacher education colleges in Jamaica. These institutions brought about change through engaging in a range of activities as illustrated in Figure 7. In particular, change occurred through engaging in the following activities:

- offering professional development for ministry and teacher education officials from the National Environmental Education Council, the Joint Board of Teacher Education, the Department of Education, Youth and Culture, and the Department of Agriculture. This professional development ensured a good level of understanding and support for the initiative at the highest levels;
- lobbying for policy changes and the inclusion of Education for Sustainability in national curricula such as Science and Early Childhood;
- garnering high level support from government departments and agencies, NGOs, and college executives. This high level support helped to create an environment conducive to change and also helped to ensure buy-in by colleges;
- appointing an environmental coordinator in each institution and providing supportive networks and resources to enable them to bring about change within their institutions. The environmental coordinator's goal was to implement change within curriculum through supporting academic staff in their efforts to develop course and lesson plans;
- forming environmental committees led by the environmental coordinator and consisting of representatives from all groups within the institution. These committees led the visioning, policy development, and action plan development processes to bring about change at all levels: curriculum, environmental management systems, student practice, grounds, etc.;
- providing professional development opportunities for all staff in the institution - academic, administrative and ancillary - about ways to mainstream Education for Sustainability and change practices;

Box 2.24

STEER Process

The National Environmental Education Council made up of a variety of stakeholder groups acknowledges the need to reorient teacher education.

A coordinator is appointed and a baseline study commissioned to ascertain the status of teacher education for sustainability.

Two teacher education colleges already attempting to infuse EE into their courses are recruited as pilot colleges.

The coordinator worked with teacher education, admin and ground staff in each pilot college, reviewing curriculum documents and institutional procedures. Coordinators were engaged at each institution to manage their school's response.

Professional development workshops on LfS and whole school approaches (including action-research) for all staff were run. This occurred at a number of levels including staff at each pilot institution (teacher education, executive, administrative and ancillary staff) and also at the level of Ministry and Joint Board of Teacher Registration.

A range of activities were undertaken at each contextual layer during the process:

- Residential colleges involved students in environmental resource monitoring and in environmental clubs.
- To facilitate interdisciplinarity, environmental theme days were instigated and were supported by environmental NGO partners.
- Curriculum was revised to incorporate environmental themes.
- Institutional practices and mission statement redrafted to reflect focus on sustainability.

'Teacher-centered, didactic strategies, which are the antithesis of what is needed to promote environmental awareness in teachers themselves, as well as in their students, are still the dominant mode of instruction'.

Collins-Figueroa and Glasgow, in NEEC (Jamaica) (1998)

STEER coordinators

Box 2.25

STEEP Snapshot

Like EGCSO, the STEEP initiative had a richly contextual approach to change. It sought to mainstream Learning for Sustainability approaches within the whole of the teacher education institution, not just at the teacher educator level but also at the institutional policy level. The assumption here is that prospective teachers are also influenced by the hidden curriculum. The explicit messages from courses are consistent with the underlying institutional climate.

One of the key enabling factors that allowed it to target multiple levels was the broad-based buy-in it leveraged with the Ministry of Education and Youth Affairs and the Joint Board of Teacher registration. Involving these influential bodies right from the start ensured their participation and developed their ownership of and commitment to the process.

The initiative was successful in bringing about change and importantly this was achieved by not only incorporating Learning for Sustainability into the teacher education curriculum, but also in reorienting the institutional culture of the teacher education colleges towards sustainability, so that the institution practised what it preached.

- establishing and/or supporting already established environmental clubs for students;
- electing environmental stewards from the student body to undertake audits and implement change strategies within the residential colleges, in particular in the area of resource use;
- undertaking environmental days at the colleges to focus the attention of the whole institution on sustainability and the environment;
- developing materials for an elective course on Education for Sustainability for secondary trainees to be used in pilot and non-pilot colleges; and
- developing guidelines for the remaining colleges on how to mainstream Education for Sustainability in their colleges.

The STEEP initiative took a multi-faceted and multi-layered approach to change (see Box 2.25). Indeed, the success of the initiative in assisting teachers' colleges to mainstream Education for Sustainability into all aspects of their operations was supported by this approach. While the STEEP initiative is by no means perfect in every way, it was the only initiative we identified that attempted such a wide-ranging level of systemic change.

The Whole-of-System Model utilised by the Education for Global Citizenship and Sustainable Development (EGCSO) initiative and the Sustainable Teacher Environmental Education Project (STEEP) demonstrates a richly contextual understanding of the nature of change. The model assumes that change towards sustainability will only occur if all levels and contexts within the system are aligned in their efforts to work towards sustainability. The model is extremely complex, like any system, as it needs to take into account the variety of factors and components inherent within an organisation. Its success depends upon its ability to leverage top-down and bottom-up approaches to change simultaneously. This complexity also means that the model is not prescriptive in the activities that are undertaken at each layer - this may be seen as a weakness by some. The model's strength lies in the stability created by the partnerships negotiated across all layers of the system and it is this stability that enables it to effect broad-based systemic change.

2.4 Summary

This section has examined initiatives identified as seeking to embed a new perspective within pre-service teacher education. Seven representative initiatives have been described and analysed in order to identify the professional development models underpinning each initiative. Three main models of professional development that seek to effect change within teacher education institutions have been revealed from an examination of these initiatives.

The Collaborative Resource Development and Adaptation model generally attempts to influence change through the development and adaptation of high quality curriculum and pedagogy resources, usually targeted at teacher educators. It assumes that teacher educators already have an interest in using Learning for Sustainability resources. The model appears to have limited ability to bring about widespread change because it does not seek to change structures but operates instead within the current system. It has been made more effective in the initiatives reviewed through an understanding of resource development as a part of professional development for teacher

educators. Such an understanding improves the relevance of resources and ensures they are seen as demonstration projects rather than as a panacea. All the initiatives we reviewed here innovated substantially upon the generic model and had varying degrees of success as a result of their innovations.

The Action Research model attempts to engage participants deeply in a professional development process, which can build skills and action competence for a variety of change efforts. Most commonly, this model targeted teacher educators and tended to result in curriculum and some institutional innovation. However, the Action Research model is not restricted to this audience and may be used with other key players. It has been shown to attract stakeholders who do not already have an interest in Learning for Sustainability. The model is quite time intensive and often difficult to 'sell' to potential funders, but anecdotal evidence suggests that long term outcomes may be more sustainable than the Collaborative Resource Development and Adaptation Model.

The Whole-of-System model has a richly contextual approach to change and attempts to align and engage all elements of the system to work towards a vision of sustainability. Initiatives based upon this model negotiated partnerships with, and worked to engage, not only teacher educators but also educational policy makers, NGOs, boards of teacher registration, teacher education institution executives, administrative and ancillary staff, and students. This model is extremely complex, difficult to coordinate and time consuming, however, evidence shows that it has had a great degree of success in embedding Learning for Sustainability within pre-service teacher education.

Three models of professional development were thus identified through a review of current initiatives. These models differ in a range of ways, most notably in the systemic level at which they attempt to effect change. These three models are discussed in more detail in the following section.

3.0 Research Findings and Implications

The research findings reported in this section identify three principal models of professional development that have been used to instigate change in pre-service teacher education. These have been identified as the:

1. Collaborative Resource Development and Adaptation Model

2. Action Research model

3. Whole-of-System model.

These three models are underpinned by different assumptions about and approaches to change. This section discusses the key features of each of the three models identified and assesses their contribution to innovation and change in teacher education. This discussion aims to understand:

- the general principles of change that underpin each model;
- how the models effect change;
- who these models engage with in the process of change and how this is done;
- how the generic models have been modified in practice;
- the assumptions and limitations of the models;
- how successful these models would be at mainstreaming Education for Sustainability in teacher education.

3.1 Models of Professional Development Identified

3.1.1 Model 1: Collaborative Resource Development and Adaptation Model (SEEPS, TaLESSI, TLSF)

The research undertaken for this report indicated that the Collaborative Resource Development and Adaptation model was the most frequently used in all the initiatives we considered for review. Indeed, the development of resources seems to be the default model for those seeking to influence the general professional development of pre-service teacher trainees and teacher educators. This could be due to the tangible outcomes, in the form of a resource, offered by this model and the fact that it may be able to target a wide audience.

This model generally seeks to bring about change at the level of curriculum by developing resources that may assist in reorienting the content and processes of curriculum towards sustainability. However, in the environmental education field, as the initiatives reviewed here illustrate, this basic model has been improved on through collaborative development processes that target not only curriculum but also pedagogical and philosophical change.

The success of this model in effecting widespread curriculum change is largely dependent on the potential users firstly being aware of the materials and secondly having an interest in engaging with the material. In the case of *Teaching and Learning for a Sustainable Future* (TLSF), for example, UNESCO provided support and

communication structures so that outreach was increased. However, unless educators already have an interest in Education for Sustainability it is unlikely that they would be adopting the material.

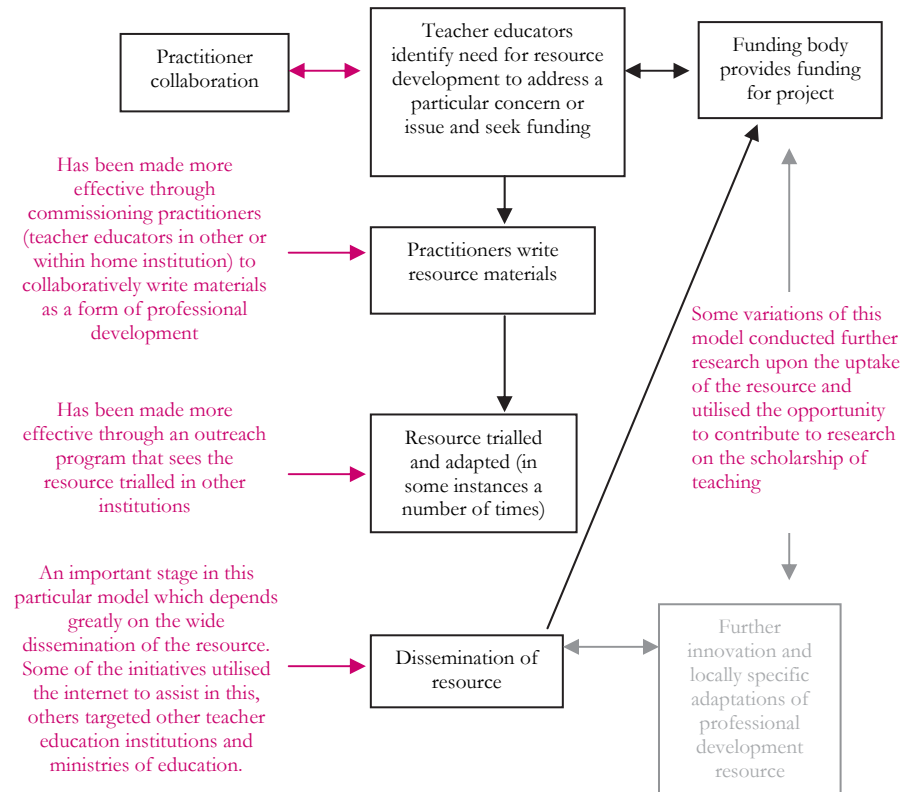
If possibilities exist for engaging stakeholders in the collaborative development of the resource, be they internal to an institution, or across multiple institutions, the impact of the program is likely to increase. For example, the *School Development through Whole School Approaches to Sustainability Education: The Sustainability Education in European Primary Schools (SEEPS) Project* engaged a group of teacher educators across a variety of teacher education institutions in Europe in a collaborative process of curriculum design. While the process was driven by a group of educators who sought funding for their project, the result was not only a useful material resource, but also an engaged professional development process for the resource creators. Both the SEEPS and the TLSF initiatives took the collaboration process one step further by encouraging and facilitating the adaptation of the resource to suit local contexts.

A limitation of the Collaborative Resource Development and Adaptation model is that it requires that resources are kept up-to-date. This limitation has also been mitigated by initiatives that utilise the Internet as a medium for dissemination. TLSF's judicious use of the Internet, for example, allows for easy and regular updating, thus ensuring the resources remain useful, relevant and up-to-date.

The model is also limited in that it seeks to bring about change at the level of individual programs by adding new content or improving pedagogy, not to broader teacher education systems and structures. An assumption underpinning this model is that curriculum and pedagogical change will lead to wider systemic change. However, the model tends not to allow for whole-of-system change, seeking instead to work within and through current systems and structures, and isolated individuals.

Very few long term evaluations of resources have been undertaken thus making it difficult to accurately argue for the success of this model. Indeed, research points to the more likely outcome that such resources may often become outdated and forgotten as newer resources compete for space.¹⁴³ A limitation of this model is thus that there is often no process of evaluation of the initiative's effectiveness 'built-in'. While those initiatives that have a long term planning process often do build evaluation in as part of an iterative cycle of reflection, some of the initiatives we identified were resources that were developed and then never revised. If evaluations of these occurred, they were largely undertaken to satisfy funding agencies, and were not used as reflective tools for improving the resource or the process of dissemination.

Collaborative Resource Development and Adaptation Model

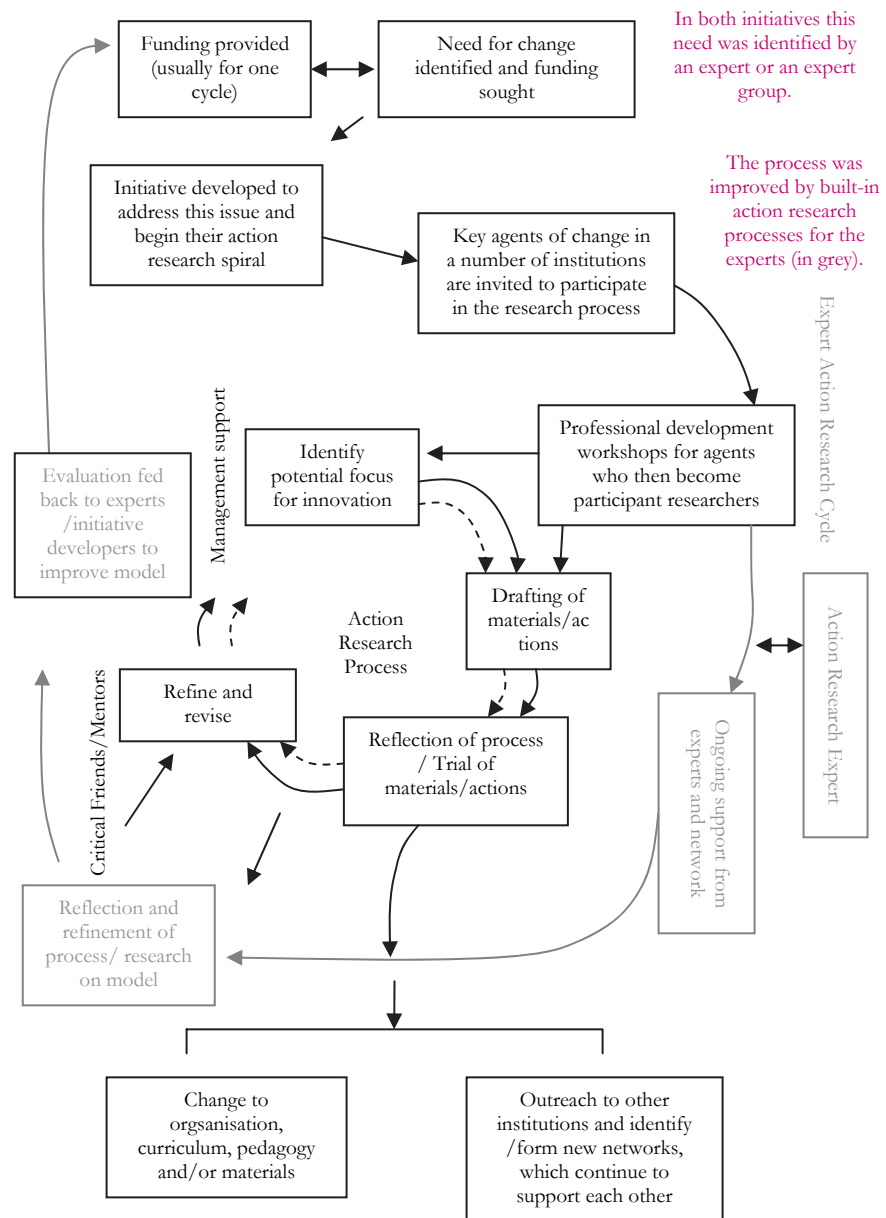


3.1.2 Model 2: The Action Research Model (ACTS, LSE)

The Action Research model seeks to bring about change by engaging directly and deeply with those practitioners who have control over the content and teaching processes of particular courses. It seeks change through linking curriculum (and organisational) innovation, professional development and innovative pedagogy. One of the first professional development initiatives to utilise action research as a model for change towards sustainability was the *Learning for a Sustainable Environment* (LSE) initiative. This initiative involved teacher educators across the Asia-Pacific in a combined process of curriculum development, action research and networking. The initiative targeted teacher educators who would be able to act as agents of change within their respective teacher education institutions. One of the aims of the initiative was to build capacity for these teacher educators to be leaders in their institution by advancing the sustainability agenda, while being supported through an international network.

A positive feature of this model is that it engages with participants as researchers. Participants can thus tailor the focus to suit their needs thereby retaining a high level of control over the processes. While the model relies on someone to initiate it, it is not expert-led. Rather, the experts sit to the side of the model, as illustrated in the figure below. Indeed, one of the initiatives we reviewed, the *Action Research for Change Towards Sustainability* (ACTS) initiative, also engaged these experts in an action research process, allowing for the experts to be continually engaging with and reflecting on how effectively the model was working for participants. This allows for evaluation to be embedded as a core component of the model. The evaluation and reflection that occurs through the action research process feeds back into the process, thus ensuring immediate and ongoing improvement. Such ongoing and iterative cycles of evaluation and reflection were unique to the Action Research model.

Action Research Model



Both the LSE and ACTS initiatives, which used the Action Research model, have been successful at bringing about change in organisations, curriculum and pedagogy, even after the closure of the projects. One of the reasons for this may be the strong support network that develops between research participants when they engage through such a model. By undertaking action research as part of a network of researchers, participants were able to be part of a community of enquiry. This facilitates ongoing collaboration and peer support. For example, participant researchers from the ACTS initiative still meet regularly, nearly two years on, to discuss issues arising out of their practice. Some have also obtained grants for further work in this area.

The LSE initiative sought to bring about change at the level of the teacher educator, whilst ACTS sought to target change across the university. The ACTS initiative attempted to do this by involving a

university continuing professional development department in a rippling out of the process, so that all academic staff could have the opportunity to participate. Unfortunately, in this instance this attempt at systemic change was unsuccessful. However, with improved planning that includes professional development departments at the initial phases of the project, this could prove to be a worthwhile strategy for mainstreaming change within teacher education. Current interpretations of the model do not ‘preach to the converted’ and enable others to engage with concepts of sustainability.

Limitations of this model are that it is very time intensive and requires an ongoing commitment from participants. This may be more problematic the higher up the hierarchy the intervention is seeking change. One way to ‘soften’ this is to offer incentives to participants, (for example, the possibility of improving research quantum by engaging in a research project or publishing one’s findings, as was done with the ACTS program).

3.1.3 Model 3: Whole-of-System Model (EGCSD, STEEP)

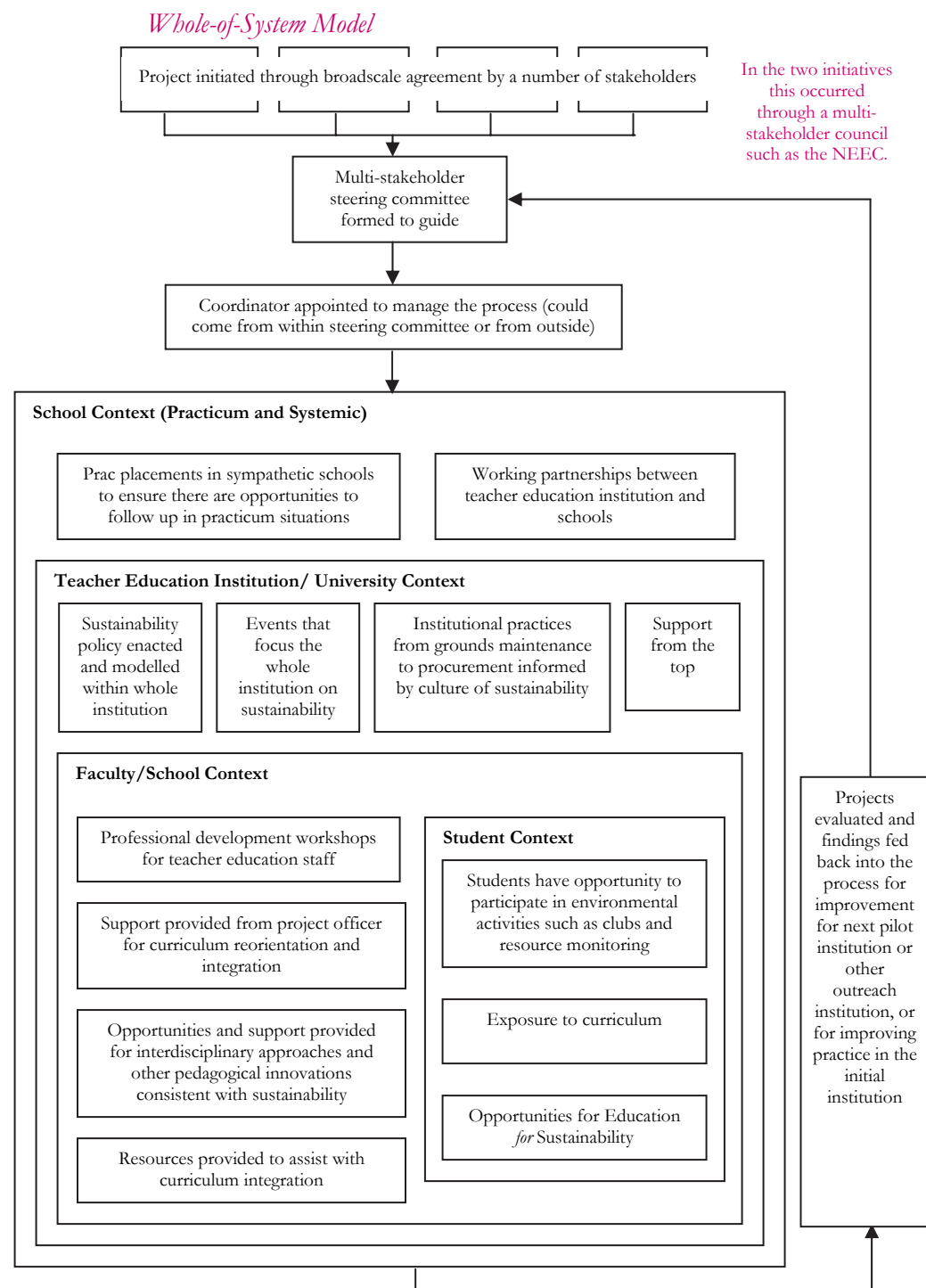
There are very few examples of this model - which views change as occurring within a particular context and takes a broad and multi-faceted approach to engaging change. The approach is complex and requires a clear understanding of the particular context teacher education operates within. This includes working at the interface of every contextual layer of teacher education from student and practicum, school principals to program directors and external agencies, so that the organisational culture and processes of each can be influenced. The model is unique in that it seeks to bring about change from the bottom-up and the top-down simultaneously.

The two initiatives we reviewed that used this model demonstrated the importance of involving a broad base of stakeholders in initiating and guiding the project. A range of internal (students, administration, ancillary and academic staff) and external (practicum schools, relevant government departments, national Environmental Education councils, and NGOs) stakeholders was engaged from the initiative’s conception. In this way, the initiatives were driven by this large group and gave a sense of ownership to all stakeholders from the beginning. Such a participatory approach is well aligned with the principles of Education for Sustainability.

For example, Jamaica’s *Sustainable Teacher Environmental Education Project* (STEEP) engaged with the National Environmental Education Council (NEEC Jamaica), the Jamaican Joint Board of Teacher Education (JBTE) and the Department of Education, Youth and Culture. This engagement occurred in two ways: through the delivery of professional development workshops for government officials about Education for Sustainability, and through lobbying the JBTE for the inclusion of Education for Sustainability in Early Childhood and Science curricula (which were the two curricula being rewritten at a national level during the time of the initiative). The *STEEP* evaluation identified a need to play an even greater role in the development of policy and efforts are now being directed to this area.

The *STEEP* initiative also sought to bring about change by garnering the support of leaders in a number of government departments and agencies, in NGOs and amongst teacher training college executives.

Through these partnerships, the *STEEP* initiative was able to both leverage top-level endorsement and enable a supportive political climate for the project.



The *Education for Global Citizenship and Sustainable Development* (EGCSD) initiative in Wales also sought to bring about systemic change. This was done through developing strong partnerships with practicum schools. Mentors were identified in practicum schools that could work with student teachers on practicum to implement a sustainability and development approach in their teaching. This allowed for a consistency to occur between the experiences students had on practicum and the values, curriculum, and teaching and learning processes that were espoused by the teacher education

institution. This extended the level of systemic change outside the gates of the pre-service teacher education institution and into the real world setting in which their students would soon find themselves.

The unique way in which the Whole-of-System model responds to context is illustrated through the two initiatives we reviewed. Each initiative attempted a whole-of-system change by engaging stakeholders specific to their context. While the flexibility of this model is a positive feature because it does not prescribe solutions but instead enables contextually specific strategies to be developed, it can also be problematic if it results in an ad-hoc engagement that sees some areas receiving less attention than others. A more systematic approach would ensure that all areas where change is being attempted are equally dealt with in a coherent and consistent fashion.

Another limitation of this model is that it relies on a broad range of equally committed people for it to work. However, this broad engagement and commitment is also the reason for its success.

The model’s reliance on high level support can also be seen as a limitation. Such support is often difficult to obtain, not least because of a range of equally important but competing interdisciplinary demands, such as those of indigenous perspectives or ICTs. While this is a limitation, such support is also essential to the models success at mainstreaming Learning for Sustainability, not only in teacher education institutions, but also across a range of institutions and agencies.

The Whole-of-System model is also limited in that it is difficult to coordinate the range of changes occurring and thus to monitor success. One solution to this may be to have such a project managed by a high level group such as a national Environmental Education council, with dedicated coordinators appointed at all levels at which change is occurring, along with a mechanism that facilitates ongoing communication amongst these coordinators, and between these coordinators and the project management group.

3.2 Summary

Three professional development models have been examined in this section. The first of these, the collaborative resource development and adaptation model, seeks to effect change through the provision of curriculum and pedagogical resources and adequate training in the use of these. The second identified model is the Action Research model. This model seeks to effect change by engaging key agents of change in reflective action and strategic change. The third model is the Whole-of-System model. This model seeks to effect change by aligning all elements of a system with a vision of sustainability.

Each of the initiatives reviewed attempted to bring about change – either at the level of curriculum, the practitioner, or the whole system. They experienced varying levels of success. Very few of the initiatives reviewed clearly articulated the model of professional development that underpinned their activities. Had they been more explicitly aware of the areas where they were attempting to effect change, they might also then have been more reflective of the means they were using to do this. Such reflection would have allowed for critical success factors to be identified and overtly addressed.

Model	Attempts to bring change at the level of:
Collaborative professional development guide and delivery	Practitioner and Curriculum
Action Research	Practitioner and Institutional
Whole-of-System	Whole-of-system

4.0 Critical Success Factors

In examining the range of initiatives and identifying underlying professional development models, this study recognised a range of critical success factors. The factors proved to be pivotal to improving the success of the initiatives reviewed.

4.1 Funding and Management

An important factor that influenced the success of these programs was funding and management arrangements. Most of the initiatives reviewed through this research study were instigated by pre-service teacher educators but were funded from a variety of different sources such as education trusts, intergovernmental bodies, government departments and non-government organisations. This study found that the funding cycles and levels of autonomy exercised at the management level were important variables.

4.1.1 Funding Cycles

Unlike the many and varied examples of school initiatives that may be found today,¹⁴⁴ virtually no current long term Environmental Education initiatives targeting pre-service teacher education were found to be operating beyond their funding cycles. This does not imply that the initiatives were unsuccessful or ineffective. Indeed, the resource materials and outcomes of the professional development of teacher educators were still influencing curricula in some institutions. However, an inability to undertake iterative cycles and detailed evaluations of initiatives, which can further inform practice and research, has been a major obstacle to improving the success of many of the initiatives reviewed here. For example, if initiatives were funded over longer terms then successive evaluations could lead to an ongoing improvement of the initiative. In addition, longer term funding cycles would allow for the appointment of support personnel such as ‘sustainability coordinators’ that have been demonstrated as being of enormous value in rippling out the effects of initiatives.

Funding cycles are needed that allow for evaluation to be meaningfully used to refine and improve initiatives. Short term funding cycles do not encourage the use of evaluation in this way and as a result evaluations most often deliver findings that satisfy funding agencies but are of little use in improving and mainstreaming initiatives.

4.1.2 Initiative Autonomy

Generally, the initiatives featured here were instigated and managed by teacher educators or academics seeking to find better ways to incorporate Environmental Education or environmental studies not only into their courses but also across the sector. Maintaining control throughout the initiative ensured that the programs remained responsive to contextual needs and structures. A review of the initiatives revealed just how important it was for initiative management to be independent and autonomous of funding bodies.

The *School Development through Whole School Approaches to Sustainability Education: The Sustainability Education in European Primary Schools (SEEPS)* project was initiated by a group of educators from a number of universities across Europe. Their main aim was to provide training

opportunities for teachers (both in-service and pre-service) in whole school approaches to sustainability through the creation of a resource bank of activities that could be adapted to suit local contexts.¹⁴⁵ The group, led by Manchester Metropolitan University, was funded by the European Union Comenius 2.1 Project for European Cooperation. The project's evaluation thus detailed how the project met Comenius criteria for funding - to stimulate cooperation and collaboration across Europe - but did not address how well the project had met any environmental education criteria.¹⁴⁶

The UNESCO web-based resource *Teaching and Learning for a Sustainable Future* was commissioned by UNESCO and developed by a team of Environmental Education and multimedia specialists at Griffith University who based their adaptation on an earlier resource developed by educators and practitioners from across Asia. The resource was designed to be used by teacher educators and teachers around the world and features an open architecture that allows for easy adaptation and translation.

Another Australian initiative, Macquarie University's *Action Research for Change Towards Sustainability* project (ACTS) was funded in part by the university and also by the Australian Government. The initiative was managed by an interdisciplinary project team at the university but research participants also had a great deal of input into the process. The close connection between the management team and participant researchers guaranteed that the initiative was relevant to its audience and flexible in meeting the needs of participants.

Analysis of the initiatives illustrates the importance of incorporating participant and target audience input into the design and management of the initiative in order for it to be responsive and relevant. It also appears that seeking funding sources with aims and objectives similar to that of the initiative may allow for a greater degree of success.

4.2 Partnerships

Partnerships are increasingly recognised as an important variable in achieving sustainability,¹⁴⁷ particularly within the higher education sector where there is a key role for universities in outreach.¹⁴⁸ Our analysis of the initiatives found that the more equal and participatory the partnership, the better the shared process and outcomes.¹⁴⁹

Our review shows the importance accorded to partnerships by all the initiatives. Partnerships were sought from a variety of sectors including NGOs, intergovernmental bodies, other teacher education institutions both nationally and internationally, resource centres, other faculties within the university, industry bodies, and boards of teacher education.

There were many motivations for forming partnerships identified by the initiatives, such as:

- sharing expertise;
- capitalising on funding opportunities;
- ensuring relevance to market demands from industry and employers;

Teaching and Learning for a Sustainable Future Critique

'...computer centred education, just as teacher centred education, is detrimental to Education for Sustainability because of its abstractness and alienation from local people, knowledge systems, environments and histories.'

Jucker (2003, p. 98)

'Flexibility and open door policy: the project's in-built flexibility to meet the needs of the participants and also to explore change as opportunities presented themselves was a key factor in contributing to the significant outcomes of the (ACTS) project.'

Garlick (2004, p. 33) ACTS Evaluation Report.

'National partnering and networking has proven successful in sharing examples and lessons of good practice and encouraging adoption by others.'

*UNESCO (2002, p. 39)
Education for Sustainability from Rio to Johannesburg:
Lessons learnt from a decade of commitment*

- maximising the multiplier effect by networking across institutions; and
- mutual peer support and encouragement.

Although each partnership arrangement varied, many benefits arose out of these relationships.

4.2.1 Multi-Level Partnerships

Perhaps the most successful partnership example is Jamaica's *Sustainable Teacher Environmental Education Project* (STEEP), which was a Jamaican National Environmental Education Council (NEEC Jamaica) initiative.¹⁵⁰ STEEP had a multi-systemic approach to building partnerships, which were negotiated with many stakeholders at many levels in the system. These included partnerships with the principals of several teacher education colleges;¹⁵¹ the Jamaican Board of Teacher Registration (JBTE); a number of environmental NGOs who provided much of the technical expertise in professional development workshops; students from campus environmental clubs; residential administration; and the Ministries of Education and Culture, and Agriculture. The partnership framework in the STEEP project was a genuinely participatory partnership, with each stakeholder having the opportunity to influence and learn from the other. The partnership worked at all these levels to influence authentic change within the system through creating a supportive educational climate.

Multi-systemic partnerships increase stability and create synergy because the aims and objectives of the initiative are mirrored at all levels, from policy to practice.

4.2.2 Partnership Secondment

Another form of partnership was demonstrated by the University of Wales which drew upon expertise from a partner organisation in conducting its *Education for Global Citizenship and Sustainable Development* (EGCSD) project. In this case, a skilled education officer from the World Education Centre was seconded as a full-time project coordinator. While having a project coordinator was a key to the success of the project, the evaluation indicated that some difficulties arose because the coordinator came from *outside* the Faculty and lacked organisational knowledge. The evaluation recommended that seconded School of Education staff, with organisational knowledge, might be more suitable coordinators. This was the option successfully used by the STEEP initiative.

Partnership secondment provides opportunities for sharing expertise as well as the load associated with program implementation.

4.2.3 Partners with Influence

Two of the initiatives reviewed here, TLSF and LSE, effectively developed partnerships with prestigious and influential organisations. These partnerships provided many opportunities for international endorsement, recognition and broadscale dissemination.

Teaching and Learning for a Sustainable Future (TLSF) is a web-based Education for Sustainability resource produced by Griffith University. The resource can be used by practising or novice teachers to gain knowledge and skills in Education for Sustainability. Griffith

Partnerships for Change

'The expertise available in Development Education Centres and Development NGOs, as well as in other university departments, should be utilised to enrich ITET (pre-service teacher education) courses.'

Bennell (2004)

Full-time project officer - EGCSD

'A fulltime project officer was employed and she had time to concentrate her efforts on EGCSD, spending time talking to members of staff, researching documentation and regularly passing on information on research and resources. This resulted in much *effective* practice taking place.'

Bennell (2004, p. 5.1.2)

University secured support and funding from the large and influential intergovernmental organisation UNESCO. This prestigious partnership with UNESCO not only carried influence within the university, where the project garnered approval from the Vice-Chancellor's office, but also internationally where it has been enthusiastically received by many departments of education.

TLSF has been translated into several languages and adapted for different countries including South Africa and Kyrgyzstan, where it is used in teacher preparation programs. Its acceptance and uptake has been enhanced by its connection with UNESCO. TLSF has been endorsed and promoted through UNESCO's international channels; country-specific adaptations have been funded; and the resource remains freely available via the UNESCO website where it is regularly updated to ensure it remains relevant.

Partnerships with large influential organisations such as intergovernmental bodies and international NGOs can confer prestige and importance to teacher education initiatives in Education for Sustainability. They can also influence the potential outreach and adoption of such initiatives.

4.2.4 Networking Partnerships

Partnerships that provide professional networks are also extremely important in building a strong support base for teacher educators who are often working outside their comfort zones with new approaches, technologies and ideas. These networks can provide moral support, advice and information, a sense of being part of a community and examples of practice from other members. Networking partnerships can exist within an institution, but are more importantly used to connect members from different institutions, where they may be working in isolation.

The *Learning for a Sustainable Environment* (LSE) initiative, for example, built networks for mutual peer support. In the LSE initiative, partnerships were formed across institutions with other teacher educator participant researchers. LSE's network partnership approach worked effectively to support participants, often working in isolation in their respective institutions¹⁵² and out of their comfort zone. The network was facilitated by regular meetings, seminars, and through email. The network involved all participants, and utilised a participatory approach that provided an atmosphere of cooperation. Uncertainty about using alternative pedagogies and unfamiliarity with interdisciplinary teaching and student-centered learning approaches were common for research participants. The LSE network aided communication on these common issues and provided opportunities to gain advice from more experienced colleagues.

Cross-disciplinary partnerships were also important in encouraging communication across disciplinary barriers and facilitating interdisciplinary initiatives. The TaLESSI initiative successfully built and utilised partnerships from a range of disciplines. Cross-disciplinary communication was the key to addressing the major obstacle to the project: how to maintain rigorous disciplinary inquiry when discipline foci were 'reduced' to a theme such as sustainability.

Partnerships are critical to the success of initiatives. Partnerships include a variety of arrangements such as networking and secondment. Whole-of-sector partnerships

UNESCO Commends TLSF

'....Teaching and Learning for a Sustainable Future is one of UNESCO's responses to that challenge, (to help teachers world-wide understand sustainable development concepts issues and teaching approaches) and I am very happy to see it being adopted so enthusiastically.

I commend this programme to you and encourage all Ministries and organisations present this evening to develop partnerships to prepare adapted and translated versions of *Teaching and Learning for a Sustainable Future* suitable to your countries and their specific contexts.'

Mr Koïchiro Matsuura
Director-General
UNESCO

Learning for a Sustainable Environment

'The purpose of the project is to raise the profile and quality of EE in teacher education courses throughout the region by providing professional development for teacher educators through a process of practitioner research. The project's activities focus on an action research network in which teacher educators in the region have shared in the development of carefully researched and evaluated, and culturally sensitive, teacher education modules.'

Fien (1998, p. 252)

LSE Project

'Participants commented on the collaborative processes adopted in this project and the role of the project office in facilitating collaboration between network members from different countries. In particular, they noted the sharing of ideas via newsletters and reports, the training workshops and the flexible guidelines which addressed professional development needs at different stages in the project.

The series of regular (roughly annual) seminars also were seen as important influences for several reasons. They provided opportunities for obtaining the advice and support of experienced colleagues from other countries.

This helped to provide an atmosphere of egalitarian cooperation amongst network members and might be seen to represent a more democratic approach to international development assistance in education than approaches based upon top-down expert–novice relationships.'

Fien (1998, p. 253)

are essential if Learning for Sustainability is to be mainstreamed into pre-service teacher education.

4.3 Program Focus and Pedagogical Principles

A critical success factor for the initiatives reviewed in this study was that the program focus and pedagogical processes reflected the principles of Learning for Sustainability. These principles include an interdisciplinary focus; a holistic and integrated concept of sustainability; teaching and learning pedagogies which are process-oriented and develop critical thinking skills; and actively engaging learners.¹⁵³

4.3.1 Interdisciplinary Focus

The most successful initiatives reviewed were those that attempted to be interdisciplinary in their focus, rather than single-issue or single-discipline focussed. Interdisciplinarity is one of the key principles of Learning for Sustainability. One of the earliest efforts to facilitate engagement across disciplines was the *Teaching and Learning at the Environment, Science, Society Interface* (TaLESSI) initiative in 1997. The TaLESSI initiative sought to create new opportunities for students to experience an interdisciplinary approach through their courses. This was done by collaboratively developing a range of interdisciplinary coursework material on current environmental and social issues. This coursework material was then made available through professional development workshops and the university website for all interested academic staff to access.

Three different approaches to facilitating interdisciplinarity were identified:

1. A central coordinator liaised with all academics to assist them in infusing Education for Sustainability into their classes by making connections with what other academics in their institution were already doing. This was the approach taken by the *Education for Global Citizenship and Sustainable Development* (EGCSD)¹⁵⁴ initiative and the *Sustainable Teacher Environmental Education Project* (STEEP).¹⁵⁵
2. The introduction of theme days was another successful way that interdisciplinarity was facilitated within the initiatives featured. The Jamaican STEEP project found interdisciplinarity particularly difficult to encourage. Theme days, such as Wetlands Day, provided teacher education staff with discrete and easily implemented interdisciplinary topics. Environmental NGO staff also assisted with technical information and activities.¹⁵⁶
3. Interdisciplinarity was initiated by several staff members and facilitated by them through group meetings and planning sessions. An example of this is the TaLESSI initiative. Through these sessions, a group of academics were able to investigate opportunities for interdisciplinary and cross-disciplinary approaches in their teaching.

It seems that where an institution has not before taken an interdisciplinary or Education for Sustainability approach, the first two approaches of working with a coordinator and introducing theme days might be the most appropriate. However, if academics already

work in interdisciplinary teams then the third approach, driven by the academics themselves, might be more suitable as this offers the highest level of initiative ownership and is genuinely participatory. Participatory approaches to learning are another key principle of Learning for Sustainability.

All the initiatives reviewed as part of this research attempted to be interdisciplinary in their approach. However, this also proved to be one of the most difficult challenges. This is no doubt because very strong disciplinary boundaries exist and are reinforced through the structure of many pre-service teacher education institutions. Not only do embedded boundaries exist around disciplinary content, disciplines also have quite different approaches to knowledge and processes of inquiry. These ‘silos’ of knowledge make it very difficult for meaningful engagement to easily occur across and between disciplines.¹⁵⁷

Interdisciplinary approaches to teaching and research in Education for Sustainability appear to contribute to the success of programs in teacher education. Interdisciplinarity may be encouraged through thematic days, using the web as a virtual space to facilitate communication across and between disciplines, or through a sustainability resource person.

4.3.2 Concept of Sustainability

Another critical success factor evident in the initiatives reviewed was a holistic and complex interpretation of sustainability, which took economic, political, social and environmental factors into account.

The initiatives reviewed all showed evidence of having engaged with the most current, cutting-edge understandings of, and knowledge about, sustainability at the time of development. TLSF demonstrates a complex understanding of sustainability by covering a range of interdisciplinary environmental issues such as consumer education, futures education, culture and religion, indigenous knowledge, and population and development, to name a few. Other initiatives reviewed were also underpinned by a holistic and complex understanding of sustainability. The *Learning for a Sustainable Environment* (LSE) initiative, for example, addressed a broad range of environmental issues from an interdisciplinary perspective, including whole-school approaches.

One of the more recent initiatives explicitly taught pre-service teachers about whole-school approaches to sustainability. The *Sustainability Education in European Primary Schools* (SEEPS) initiative aimed to promote and support whole-school approaches to sustainability in schools through a program of pre-service and in-service professional development. To this end, SEEPS developed a manual to support teachers’ efforts to implement a whole-school approach. The manual includes modules on leading and managing change, encouraging student participation, and monitoring and evaluation. Examples of previous success stories are also included.

An holistic and integrated understanding of sustainability is another critical success factor identified through this research. More recent approaches to learning for sustainability also incorporate whole-school approaches that focus on the processes of change.

4.3.3 Teaching and Learning Pedagogies

Another factor critical to the success of the initiatives reviewed was the congruence between the teaching and learning processes promoted and the principles of Learning for Sustainability. Teaching and learning was therefore not didactic but interactive and inquiry-based, and engaged participants actively in the process of teaching and learning.

The *Learning for a Sustainable Environment* (LSE) initiative, for example, demonstrates a range of complementary approaches: inquiry-learning, experiential learning, a problem solving approach, the use of story telling, and the use of reflection. LSE sought to not only introduce a range of new teaching and learning strategies to teacher educators but also provided opportunities for teacher educators to reflect on how they might use such approaches in their own teaching.

The *Sustainable Teacher Environmental Education Project* (STEEP) also focussed on developing the capacity of teacher educators and student teachers in active and participatory learning approaches. All the other initiatives reviewed also demonstrated such approaches in their teaching and learning processes. This was a heartening finding as it might indicate that such teaching and learning processes, at least within the Education for Sustainability field, are no longer considered unusual or extra work.

Teaching and learning pedagogies such as inquiry learning, experiential learning, problem solving and reflection are critical to the success of the initiatives as they are congruent with the principles and processes of Learning for Sustainability.

4.3.4 Linkage to Broader Goals

Successful initiatives also linked their aims and objectives to broader institutional goals. Both the *Teaching and Learning and the Environment, Science, Society Interface* (TaLESSI) and *Action research for Change Towards Sustainability* (ACTS) initiatives tied their work to broader graduate or generic skills for students (See Box 4.1). TaLESSI linked their initiative to the generic skills of critical thinking and values awareness. ACTS also worked on generic skills such as critical, creative and futures thinking and confidence to deal with uncertainty.¹⁵⁸ Generic skills such as engagement with risk; the acknowledgement of different epistemologies; engaging with uncertain futures; a focus on local issues and solutions; and holistic and systemic ways of understanding issues are increasingly advocated not only by Education for Sustainability but by other disciplines as well - as are skills such as problem solving, working cooperatively, and taking action. Focussing on generic skills provides an opportunity for teacher educators to see the relevance of sustainability concerns to their discipline. The recent release of the AVCC Policy on Education for Sustainable Development may provide another opportunity for those seeking to mainstream Education for Sustainability in pre-service teacher education in Australia.

Linkages to broader goals and strategies such as critical thinking, problem solving and futures orientations provided the impetus for Learning for Sustainability initiatives to be undertaken more readily and are therefore a critical success factor.

Box 4.1

ACTS Key Skills

The skills and areas of learning that universities should be actively involved in providing participants as identified by the Summit, which also conform with Education for Sustainability, include:

- critical, creative and futures thinking skills to develop alternative and innovative solutions to sustainability issues;
- needs assessment and action-oriented skills needed to motivate, manage and measure change towards sustainability;
- interpersonal and intercultural skills needed to redefine relationships amongst the various stakeholders – abilities to open communication between workforce and executives, government, community, legislators;
- confidence and skills to deal with uncertainty;
- learning through engaging with real and specific problems or tasks; and
- learning about and for sustainability.

Tilbury, Dodson and Reid (2004): 7

4.3.5 Whole-of-Institution Approach

We found only one initiative that attempted to implement a sustainability focus and approach across a whole institution – that is, when individual institutions take a whole-school approach at the tertiary institution level. This was the *Sustainable Teacher Environmental Education Project* (STEEP), which was exemplary in its efforts to engage entire institutions in Education for Sustainability. The initiative attempted to include a wide range of participants including student teachers, teacher educators, faculty and institutional administration and support staff, the Jamaican Board of Teacher Education (JBTE), the National Environmental Education Council (NEEC Jamaica), and government departments such as the Ministries of Agriculture, and Education, Youth and Culture. This engagement occurred through a range of committees, professional development workshops and demonstration or thematic days. The STEEP initiative also successfully used ‘champions’ through appointing staff as environmental coordinators and students as environmental stewards.

While whole-of-institution approaches are extremely rare in practice, such approaches at the tertiary institution level help to model the whole-school approach and give students an experience that is consistent with what is taught in the classroom.

4.4 Level of Participant Engagement

Another critical success factor we identified was the level at which participants were provided with opportunities to reflect on their learning – in particular, to reflect on how they would apply what they had learnt to their own situations.

4.4.1 Depth vs. Breadth

Most initiatives reviewed seemed to make a choice between the depth at which participants would be able to engage and the breadth or outreach of the initiative. For example, some initiatives, such as *Teaching and Learning for a Sustainable Future* (TLSF) and *Sustainability Education in European Primary Schools* (SEEPS), seek to affect a large (regional or international) audience. Other initiatives are focussed on a smaller audience, such as *Education for Global Citizenship and Sustainable Development* (EGCSD), and *Action research for Change Towards Sustainability* (ACTS). Only one initiative, *Learning for a Sustainable Environment* (LSE) attempted to combine both by having two stages, the first a process of resource development with a small group, the second a process of broader professional development using the resources developed in the first stage.

While reaching a broader audience might seem like the best way forward, our findings show that deep engagement by a small group of participants has the potential to bring about long term, sustainable and systemic change. With a deep level of engagement over a longer period of time,¹⁵⁹ participants are more likely to remain committed and to continue to seek ways in which to mainstream Learning for Sustainability ideas and approaches in their own teaching, and in the teaching of their colleagues.

Simply engaging participants at a deep level does not ensure success, however. Ongoing support is also needed in order to sustain the change. It may well be that offering long term support to a group that has already engaged deeply with Learning for Sustainability issues is an effective use of resources because the group is already ‘tuned into’ Learning for Sustainability approaches. Providing such support may require a changed approach to funding arrangements,¹⁶⁰ as has been discussed earlier. Engaging participants at a deep level, over a prolonged period of time, is another critical success factor this research has identified.

Dedicated support personnel were another factor that impacted on the level of participant engagement. A dedicated person knows staff and their needs, is able to act as a mentor, is able to direct staff to information and materials they require, and is able to support staff when they are trying something new. We found that funding bodies often support the development of materials, possibly because this requires a short term commitment, and seldom provide the longer term support that would be required for dedicated support personnel.

Most initiatives focussed either on the depth at which participants would be able to engage, or the breadth and outreach of the initiative. This study found that the deeper the engagement by participants, the more likely the initiative was to bring about long term, sustainable and systemic change.

4.4.2 Incentives for Participation

Using incentives to attract teachers and teacher educators to the initiative is another factor critical to success. Interestingly, it seems that such incentives were often not financial and that people were willing to engage for a range of other reasons.

One of the most significant incentives we identified was the opportunity to be part of an initiative that was deemed to be valuable and worthwhile by either the upper echelons of participants’ institutions or by reputable government, non-government and international agencies (such as UNESCO, government departments of education, national councils or committees, and prestigious NGOs such as the WWF). The benefits of such influential partnerships to an initiative’s success have been noted earlier.¹⁶¹

High level recognition and support was critical to levels of engagement by both teacher educators and student teachers in the initiatives reviewed here. It provided teacher educators with a new sense of credibility, prestige and professional respect within their own institutions, especially when they had been chosen to be part of a nationally - or internationally - funded project.¹⁶² The recognition and prestige provided by such involvement appears to be another factor in an initiative’s success.

In addition, many initiatives provided opportunities for networking with colleagues within and outside of their institutions (sometimes internationally);¹⁶³ and for networking in new and more direct ways with university executives, high level ministry officials, councillors on national bodies and industry partners.¹⁶⁴ Providing opportunities for developing new professional networks gave participants access to a whole range of new knowledge and experiences; opportunities for engaging in high level decision-making; opportunities for travel (both

domestic and international); access to research funding; and new opportunities for research and publication.¹⁶⁵ Such networks also allowed participants to feel supported within their institutions by their colleagues, their departments or faculties and their university executives; and to feel supported outside their institutions by government ministers, government departments, colleagues in other institutions, and professional associations and NGOs. Providing opportunities for facilitating such new networks of support were critical factors in an initiative's success.

Another significant incentive was the opportunity that involvement in such initiatives provided participants with for 'time out' from the rigours of teaching to deeply consider and reflect on their teaching and on their students' learning.¹⁶⁶ Recognition by their institutions that participants were engaging in meaningful professional development also acted as an incentive. This recognition ranged from institutional support through providing leave, to the award of certificates and trophies.¹⁶⁷

The provision of incentives to encourage participation in initiatives proved to be a critical success factor. However, incentives were rarely monetary with participants engaging for a range of reasons such as high level recognition and support within and outside their institutions, opportunities for networking, and time out from the rigours of teaching.

4.5 Level of Intervention and Approach to Change

Teacher education institutions do not exist in a vacuum but are shaped by the many contextual influences around them. Government policies and practices, guidelines for professional standards for teachers, current curriculum documents, professional associations and research outlined in the overview sections of this review all shape the way teacher education institutions are managed. Our research found that the initiatives that were most successful were those that showed a complex understanding of this context and sought broadscale, systemic change – through taking a multi-faceted and systematic approach to such change. Such an approach focuses on:

- the development of enabling policies;
- developing capacity amongst teacher educators, student teachers, administrative and ancillary staff; and
- coordinated professional development programs that facilitated the cascading of new ideas and practices throughout a system.¹⁶⁸

Among the initiatives we reviewed, there was one outstanding example of an effort to bring about broadscale, systemic change. This was Jamaica's *Sustainable Teacher Environmental Education Project* (STEEP), which sought to bring about change at a range of different levels. Through these partnerships at each level, the STEEP executive leveraged top-level endorsement and enabled a supportive political climate for the project. Support at this level has been identified as critical to the success of the initiative.¹⁶⁹ This reconfirms our earlier finding concerning the importance of multi-sectoral, multi-level partnerships.¹⁷⁰

Jamaica's Sustainable Teacher Environmental Education Project (STEEP)

We believe that good environmental education is good education: it develops the critical knowledge, skills and values that our students need to live sustainably in this world. It inspires them to care not only for the physical and natural environment but also to care about their peers and elders, their community, and the nation as a whole. The Ministry continues to pledge its support to the NEEC.

Ministry of Education Chief Education Officer at National Consultation at EE for SD, Nor, 2003

Support from Above

“Nonetheless, support, if not guidance from the top, is clearly an important factor in sustaining curriculum change.”

Thomas (2004)

STEEP's Efforts to Mainstream

“These efforts have successfully begun to mainstream environmental education for sustainable development (EESD) in the formal education system in Jamaica. This system reaches 1,200 schools with over 20,000 teachers and 600,000 students in grades 1-12.”

C. Easton and Associates (2004, p. 54)
STEEP collaborators

“Training people and giving them knowledge is not enough. The college-led approach systematically built capacity and capability at the individual (educator), organisational (college) and system (policy) levels. This is all part of making the entire system more capable and committed. Infusion of EESD objectives in whole college planning concomitant professional development empowered college staff and students to create practices that have institutional permanency.”

C. Easton and Associates (2004, p. 63)

Box 4.2

A lack of evaluation has had some significant impacts on the validity of this report in terms of the availability of quality evaluation documents able to be reviewed and the lack of substantive evidence of the impacts of such initiatives.

The STEEP initiative also sought to bring about change amongst all staff (academic, administrative and ancillary) and students at teacher education colleges. An environmental coordinator was appointed at both the pilot colleges to provide support and resources; and college committees consisting of staff and students were established to lead the visioning, policy and action plan development processes. This was supported through the delivery of professional development programs about mainstreaming Education for Sustainability through changing practices – in curriculum, in administration and in the management of grounds and buildings. Academic staff also received professional development in writing grant applications with some having successfully obtained grants to assist them in their work beyond the STEEP initiative.¹⁷¹

Students were another focus of the STEEP initiative and were engaged with through the establishment of environmental clubs; through new environmental content in their courses; and through the appointment of environmental stewards in residential colleges to promote sound environmental practices amongst students through auditing and monitoring energy, waste and water usage. The evaluation of the STEEP initiative found that student capacity was greatly enhanced through improved content knowledge, problem solving, critical thinking and leadership skills.

As the STEEP initiative was only working with two pilot teacher education colleges, a model elective course on Environmental Education for secondary teacher trainees was also developed for inclusion in the programs of all teacher education colleges in Jamaica.

Our research found that there is generally a poor level of engagement with systemic and organisational change issues amongst creators of professional development initiatives. Many seemed to assume that such change would occur through osmosis. However, if Learning for Sustainability is to be mainstreamed in pre-service teacher education then perhaps issues of organisational change need to be addressed in program design. The evidence from this study suggests that initiatives that engaged at the top and lower levels at the same time were most successful at mainstreaming change. There needs to be ownership from the bottom-up as well as support and commitment from the top-down: all facets of the system must be marching to the beat of the same drum.

4.6 Evaluation

In general, evaluation of the initiatives was poorly done (see Box 4.2). Few evaluations were done effectively and no long term evaluations were undertaken to indicate the sustainability and longevity of an initiative's impacts. The only two initiatives to undertake well-structured, effective evaluation were the two action research projects *Learning for a Sustainable Environment* (LSE) and *Action research for Change Towards Sustainability* (ACTS). This is, in all likelihood, because action research approaches have built-in evaluation, which provides an opportunity for reflection and consideration to be given to the evaluation findings, and allows for further rethinking and refining as part of the process. However, these evaluations also lacked longitudinal studies and were only indicative of the first cycle of action.¹⁷² As discussed previously, this may be an effect of funding cycles, which currently rarely acknowledge the need to refine and re-implement such initiatives. Evaluation that only occurs at the end of

the first cycle may suit the reporting requirements of funding bodies but does little to improve the quality or longevity of such programs, which is in essence the purpose of evaluation.

However, despite this limitation, evaluations generally indicated that all the initiatives did achieve varying degrees of success (see Box 4.3). This ranged from improvement in individual teaching and learning practice to developing capacity across the institution to implement environmental management practices. The evaluations also highlighted some of the challenges that limited the impacts initiatives might otherwise have had. The most significant of these stemmed from culturally rooted resistance to change, particularly in changing didactic teaching pedagogies to more learner-centred approaches¹⁷³ and in encouraging working across the disciplines.¹⁷⁴ Interdisciplinary approaches were particularly difficult to implement because of the existence of rigid disciplinary boundaries that defined disciplinary content and frameworks of inquiry. A lack of perceived relevance of sustainability across the curriculum hampered attempts at interdisciplinarity.¹⁷⁵ Successful strategies to counter these challenges were introducing theme days, starting with small projects, creating mentor and support networks, and combining a top-down with a bottom-up approach to change. These strategies are consistent with the literature on managing change.¹⁷⁶

Few evaluations were undertaken outside of those initiatives that were based on the Action Research model where evaluation was built in. Where evaluations were undertaken, they tended to suit the requirements of funding agencies, rather than reflect on the effectiveness of the initiative or strategies for improvement.

4.7 Summary

In conclusion, the study found that there was a range of factors that were critical to the success of initiatives. These related to: the nature and length of funding; the range and quality of partnerships and networks; the curriculum focus; the teaching and learning processes used; the levels and incentives for engaging participants in professional development; the use of evaluation as a tool for learning and ongoing improvement; and the context in which the initiative occurs. Attending to these factors will improve the scope and longevity of change that occurs through each of the professional development models identified through this study.

Box 4.3

Evidence of success

EGCSD: students felt better prepared to teach this area.

TaLESSI: Resources provided were found useful by teacher educators and provided wider links to other disciplines than envisaged.

LSE: Variety of changes was affected from addition of EE as a compulsory subject to establishment of EE resource centres.

TLSF: Resource has been adapted and translated into other languages.

ACTS: Changes to existing teaching and learning processes and inclusion of sustainability issues in course content.

SEEPS: Evidence of a participatory process and production of online resource.

STEPP: Improved teaching and learning processes and developed capacity for college based environmental management.

5.0 Recommendations

The purpose of this research was to identify models of professional development that would be most effective in mainstreaming whole-school approaches to sustainability in teacher education in Australia. The study was unable to identify an existing model that would, on its own, be successful at bringing about widespread and long-lasting change.

After careful consideration, this report recommends an approach that combines the core features of the Action Research model with the focus of the Whole-of-System model. It recommends that a ‘mainstreaming sustainability’ initiative be developed based on this approach that takes into consideration the critical success factors identified through this study. This section also provides guidance for the implementation of the proposed approach.

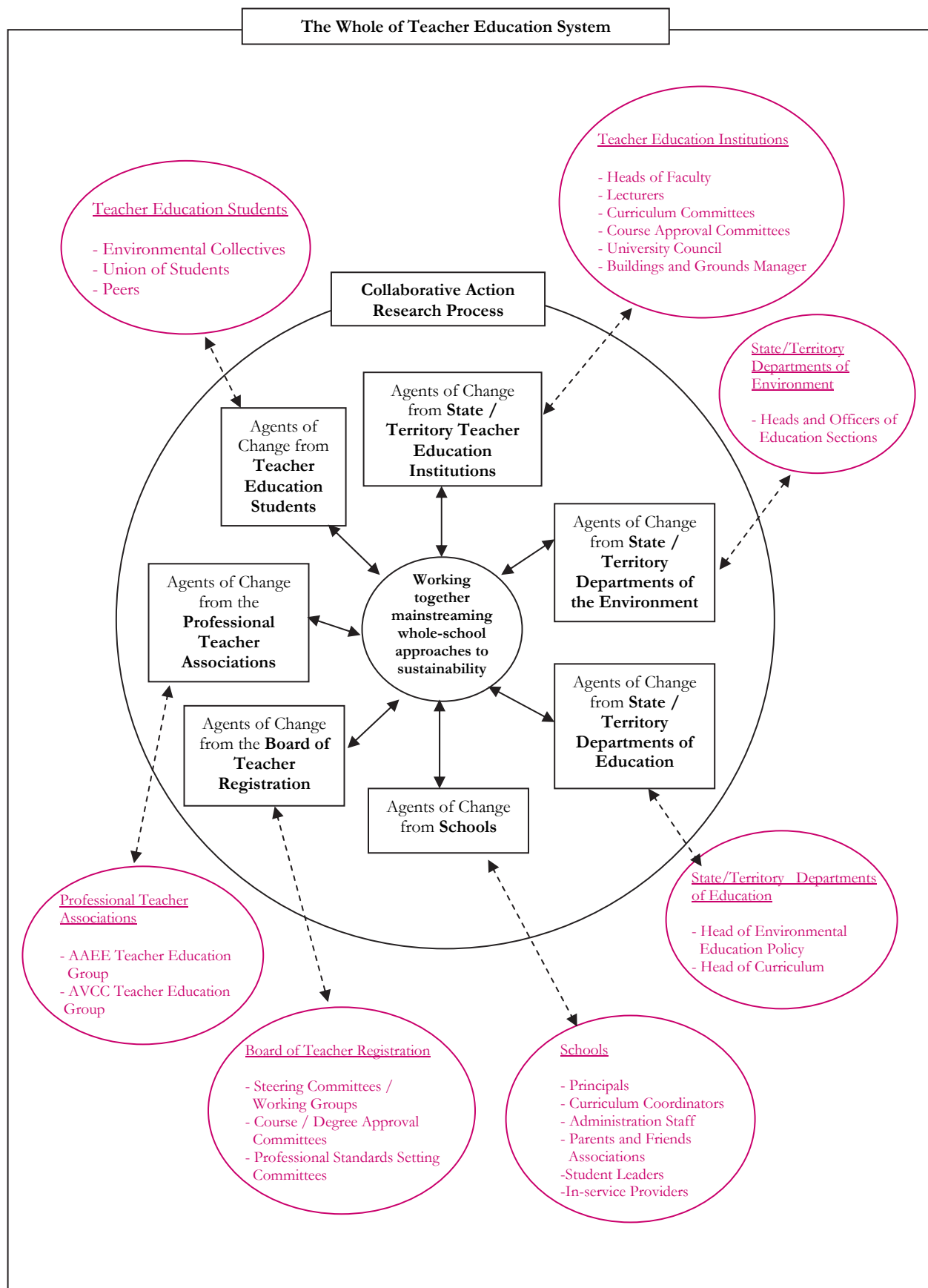
5.1 A Systemic Approach

A systemic approach to ‘mainstreaming sustainability’ within pre-service teacher education is advocated. This approach will:

- seek change at a number of levels in the teacher education system (e.g. teacher education accreditation, policy, planning and practice). This multi-level approach will help embed the change;
- seek to involve the agents of change from each of the key stakeholder groups in a process that enables them to see the relevance of sustainability to their work in teacher education. This approach is important to attain commitment to, and ownership of, the innovation across the system; and
- seek multi-dimensional change. This is important to embed the change within various components of the system so that there is compatibility and thus less resistance to the innovation (e.g. policy development, professional development, curriculum development and resource development are tackled simultaneously).

Figure 8 on the next page illustrates the basic components of a ‘mainstreaming sustainability’ initiative based on the above approach.

Fig. 8 A systemic model for pre-service teacher education



5.1.1 Multi-Level Change

If the mainstreaming of whole-school approaches to sustainability is to occur in pre-service teacher education in Australia, engagement of the following stakeholder groups is necessary (as illustrated in Figure 8):

- Departments of education;
- Teacher registration bodies;
- Teacher education institutions;
- Teacher educators;
- Departments of environment;
- Teacher education students;
- The school community; and
- Teacher education professional associations.

These stakeholders operate within different levels of the teacher education system. We recommend that key agents of change at each level of the system be identified and that these come together to form a core group that drives the changes in teacher education. Involving agents of change from across the teacher education system (e.g. teacher education accreditation, policy, planning and practice) will help establish and 'grow' the change.

5.1.2 A Process for Involving Agents of Change

The study also advocates the engagement of these agents of change in a process that enables them to establish the relevance of sustainability to their own work in teacher education. This approach is important to attain commitment to, and ownership of, the innovation across the system.

The initiatives reviewed in this study suggested that action research offers a powerful means for developing a practitioners' sense of autonomy, ownership, and ability to bring about change within one's own particular setting. Such deep engagement will mean that there is a commitment to, and a process for, change throughout a system. Such engagement also overcomes an identified limitation of other models of professional development, that is, a reliance on the single motivated and committed teacher. A wide range of stakeholders engaging deeply with the process of change is thus essential if Learning for Sustainability is to be mainstreamed across a system.

The study recommends that an action research methodology be adopted that includes opportunities that facilitate cross-system engagement such as face-to-face meetings and workshops; e-groups and lists; virtual and other networks of support. The identified agents of change will need to be trained in action research methods and supported with action research tools.

Another feature of the approach proposed is the use of a process of iterative evaluation. This study found evaluation to be a key flaw and

an under-used resource in the initiatives reviewed. Evaluations were largely undertaken to meet funding agency requirements and were seldom used to improve initiatives. The study also found that reflective practice was an under-used process. The proposed approach is thus underpinned by an action research process that has evaluation and reflection built into it.

5.1.3 Multi-Dimensional Change

It is recommended that a multi-dimensional approach to change be adopted. This is important to embed the change within various components of the system so that there is less structural resistance to the innovation (e.g. the initiative incorporates policy development, professional development, curriculum development and resource development in whole-school approaches to sustainability). It is thus important that the key agents of change be engaged in activities that are focused on more than just resource development or policy development. Changes sought by the key agents of change should take a multi-dimensional approach.

5.2 Implementing the Approach

There is no one way in which to implement the proposed approach as the process of implementation will be dependent on the context in which change is to be brought about. However, we provide below a range of suggestions that will facilitate the implementation of the recommended model. They are addressed to two key stakeholders: government and funding agencies; and pre-service teacher education institutions.

For government and funding agencies

1. We recommend that an audit be undertaken of what is currently occurring in relation to Learning for Sustainability in teacher education institutions in Australia. This will provide invaluable baseline data for future developments and will also assist in identifying those institutions where some Learning for Sustainability activity is already taking place and/or where there is a supportive institutional climate. Such an audit would not only provide baseline data against which to measure future success, it would also identify those institutions which may be suitable 'pilots' for any program that seeks to mainstream whole school approaches to sustainability in pre-service teacher education programs.
2. We recommend that a pilot attempt at implementing the model be undertaken. Such a pilot could involve:
 - a) A teacher education institution engaging with all stakeholders including state and federal agencies.
 - b) A more effective approach would involve all teacher education institutions in a single state. However, such a project would be dependent upon resources available and commitment from stakeholders

- c) If option (a) is chosen, it is recommended that the process involve one institution from each State and Territory working with stakeholders in their region. This will maximise learning opportunities and provide support to those effecting the change within their stakeholder group. Networking with others undergoing a similar change process has shown to increase changes of success.¹⁷⁷
3. We recommend that funding cycles be developed that allow for evaluation to be meaningfully used to refine and improve initiatives. Short term funding cycles do not encourage the use of evaluation in this way and as a result evaluations most often deliver findings that satisfy funding agencies but are of little use in improving and mainstreaming initiatives. For example, if initiatives were funded over longer terms then successive evaluations could both lead to an ongoing improvement of the initiative and the longevity and mainstreaming of the initiative. In addition, longer term funding cycles would allow for the appointment of support personnel such as ‘sustainability coordinators’ that have been demonstrated as being of enormous value.

The success of the proposed approach is also dependent on attention being paid to the range of critical success factors outlined in Chapter 4 relating to:

- *The nature and length of funding* - A whole-of-system approach will need a minimum of two years to deliver results. Funding could be sourced from a credible organisation that could add kudos and ‘authority’ to the initiative.
- *The breadth and depth of partnerships and networks* - This critical success factor highlights the importance of involving all stakeholders in some capacity in an initiative. It also points to the importance of establishing networks to ripple out the outcomes and learnings.
- *The curriculum content and teaching and learning processes promoted through the initiative* - This is a critical factor in that the quality of the ideas promoted have an influence on what is achieved. For example, it would be important to have an approach based on agreed Learning for Sustainability principles such as envisioning, critical thinking, partnerships, etc.
- *The levels and incentives for engaging participants in professional development* - This has proven to be important in most of the initiatives reviewed. Financial, resource, and recognition incentives will also assist in committing participants to the duration of a project. Motivations for becoming involved in attempts to change a system vary. Finding the appropriate incentive for each level of the teacher education system is important. This may be in the form of financial incentives to

subsidise the time spent on the whole-of-system initiative and/or providing partnership incentives with an organisation that can add knowledge, support and credibility or status to the work of the key agents of change.

- *The number of levels within the teacher education system engaged in change* - The more levels of stakeholders involved in the initiative the more likely that the change will be supported and will become mainstreamed within teacher education.
- *The use of evaluation as a tool for learning and ongoing improvement* - Adopting an adaptive management approach would strengthen the effectiveness of the initiative. The proposed approach of a Whole-of-System model has never been fully implemented before and thus requires points of assessment/reflection to consider what progress is being made and whether the model needs to be adapted.

For pre-service teacher education institutions

In taking part in the whole-of-system approach recommended above, teacher education institutions could focus on:

1. Developing mission statements and enabling policies and strategies that support the mainstreaming of whole school approaches at an institutional level. We recommend that these be developed within education faculties and throughout universities. These would include policies that facilitate interdisciplinary teaching, for example. In this way the hidden curriculum will match the overt Learning for Sustainability approach.
2. Adopting a whole-of-institution approach that is multi-layered and inclusive. For example, decision-making committees could be established that include university managers, academics, administrative and ancillary staff, and students. Interdisciplinary partnerships and arrangements within the institution should also be encouraged, facilitated and supported.
3. Identifying joint projects with relevant education departments, teacher registration authorities and curriculum bodies. For example, such bodies could be encouraged to develop professional standards that are aligned with Learning for Sustainability.
4. Developing strategies to support staff seeking to mainstream whole-school approaches to sustainability through their teaching and research. For example, a 'sustainability coordinator' could be appointed to coordinate efforts across the institution and to provide a range of support for staff. Staff with a particular interest in Learning for Sustainability can be identified and supported to work as 'champions' alongside a 'sustainability coordinator'. Such involvement should be recognised and rewarded. In addition,

professional development in whole-school approaches to sustainability could be offered for all staff, be they academic, administrative, ancillary or from practicum schools. Staff opportunities for networking at meetings, conferences and exchange visits between institutions could also be supported.

5. Developing strong partnerships at the institutional and individual staff level with relevant agencies and NGOs, schools, and other institutions seeking to mainstream whole-school approaches to sustainability. This would ensure up-to-date and relevant content, a synchronicity between university and school teachings, and an opportunity to share what has been learnt with others.
6. Creating opportunities for staff to develop and use strong networks both within and outside their teacher education institution. These networks could be with colleagues, NGOs and professional associations, for example. Opportunities for learning provided through programs of professional development and engagement with community groups should also be sought out.
7. Creating opportunities for interdisciplinary approaches to be adopted in teaching and research. Thematic approaches to teaching and assessment could be taken, for example, in collaboration with colleagues from other disciplines. This may be through thematic days, using the web as a virtual space to engage communication, or through a sustainability resource person.
8. Encouraging teaching and learning processes that assist in meeting the goals of Learning for Sustainability, such as inquiry learning, problem-based learning and experiential learning. Whole-school approaches to sustainability should be explicitly taught to fully prepare students for the task of reorienting education towards sustainability.

5.3 Summary

The whole-of-system professional development approach recommended in this report is complex and challenging. It advocates a systemic approach to change, in order to:

- (i) *align all key stakeholders in their efforts.* Working collaboratively builds an understanding of how each stakeholder has a role to play in re-orienting education towards sustainability. By building collaborative relationships with different parts of the teacher education system, change can be embedded.
- (ii) *engage and develop the capacity of key agents of change at each level in the teacher education system.* This encourages key agents of change to explore the relevance and implications of sustainability to their role and develop strategies for change.
- (iii) *provide support processes and networks to address structural change.* This is necessary to embed Learning for Sustainability within the sector.

Structural change is complex and mechanisms to support efforts at change are needed; and

(iv) *incorporate a range of critical success factors*. These factors assist in improving the chances of embedding change.

The proposed model for mainstreaming change thus seeks to simultaneously engage all stakeholders within the teacher education system in addressing Learning for Sustainability. As has been indicated through this report, there are a number of contextual layers that influence what is learnt, and how it is learnt, within a teacher education system, and this approach attempts to address the complexity reflected in these layers.

Efforts at mainstreaming sustainability in pre-service teacher education must therefore involve all the key players from the different components of the teacher education system. It is only through such multi-systemic engagement that whole-school approaches to sustainability will be able to be mainstreamed within teacher education in Australia.

Endnotes

- ¹ UNESCO-UNEP (1990)
- ² Hopkins, C. (2001) UNESCO (1997) UNESCO (2004) UNESCO-UNEP (1990) UNESCO (2005a)
- ³ see Section 1.3 for a detailed discussion of learning for sustainability)
- ⁴ UNCED (1992); UNESCO-UNEP (1990); UNWIN/UNESCO (2000); Tilbury, Coleman and Garlick (2005); Fien (1993); Fien and Tilbury (1996); Tilbury (1992) and (1993); Spork (1992)
- ⁵ UNESCO (2005a)
- ⁶ UNESCO (2005b)
- ⁷ ENSI (n.d.)
- ⁸ Shallcross (2004); Fullan (1991)
- ⁹ Tilbury, Coleman and Garlick (2005, p. 50-60)
- ¹⁰ Ballantyne and Bain (2002)
- ¹¹ Ballantyne and Bain (2002); Australian Government Department of Education, Science and Training (2003)
- ¹² Ballantyne and Bain (2002)
- ¹³ Ballantyne and Bain (2002)
- ¹⁴ Ballantyne and Bain (2002)
- ¹⁵ PCE (2004)
- ¹⁶ Sterling 2001; Tilbury and Janousek 2005
- ¹⁷ Donnelly (2004)
- ¹⁸ Inman (1996)
- ¹⁹ Adey (1998); McMenemy (2004)
- ²⁰ For example, the QUT Faculty of Education Cluster School model in QUT (2005)
- ²¹ Inman (1996); Scott (1996)
- ²² Buckingham (2005)
- ²³ Imman (1996)
- ²⁴ Donnelly (2004); Inman (1996); Briant (2005)
- ²⁵ Younge (2006); Donnelly (2005)
- ²⁶ This comment was made by Hon. Brendan Nelson to describe a variety of university courses that he believed to lack academic rigour and not contribute meaningfully to Australian society. See for example the transcript of his interview Nelson (2003) and Gibert (2003)
- ²⁷ Commonwealth of Australia (2001); Lowe (2005)
- ²⁸ Shallcross and Robinson (1999); Hungerford and Volk (1990); Caduto (1983); Finger (1993)
- ²⁹ Huckle (2005); Bonnett (2002)
- ³⁰ Tilbury and Cooke (2005, p. 23-27)
- ³¹ Henderson and Tilbury (2004); Shallcross and Robinson (1999); Skamp and Bergmann (2001)
- ³² Henderson and Tilbury (2004)
- ³³ Shallcross and Robinson (1999)
- ³⁴ Australian Government Department of the Environment and Heritage (2005)
- ³⁵ Australian Government Department of the Environment and Heritage (2005)
- ³⁶ Mr Cam McKenzie (2005) Personal communication via email. Cam is the Education Queensland Principal of Sustainability and coordinator of Education Queensland's QESSI.
- ³⁷ Henderson and Tilbury (2004)
- ³⁸ Australian Government Department of the Environment and Heritage (2005)
- ³⁹ Henderson and Tilbury (2004)
- ⁴⁰ Nyander (2004) in Henderson and Tilbury (2004)
- ⁴¹ Mr Cam McKenzie (2005) Personal communication via email. Cam is the Education Queensland Principal of Sustainability and coordinator of Education Queensland's QESSI.
- ⁴² Henderson and Tilbury (2004, p. 11)
- ⁴³ Henderson and Tilbury (2004)
- ⁴⁴ Henderson and Tilbury (2004)
- ⁴⁵ Tilbury and Cooke (2005)
- ⁴⁶ Grace and Sharp (2000); Skamp and Bergmann (2001)
- ⁴⁷ Henderson and Tilbury (2004, p37)
- ⁴⁸ Henderson and Tilbury (2004)
- ⁴⁹ MCEETYA (1999)
- ⁵⁰ MCEETYA (1999)
- ⁵¹ Tilbury, Coleman and Garlick (2005)
- ⁵² Australian Government (2000)
- ⁵³ Australian Government (2000, p. 5)
- ⁵⁴ Curriculum Corporation (2005)
- ⁵⁵ Curriculum Corporation (2005)
- ⁵⁶ Australian Government Department of the Environment and Heritage (2005)
- ⁵⁷ Curriculum Corporation (2003b)
- ⁵⁸ Tilbury, Coleman and Garlick (2005, p. 49)
- ⁵⁹ Tilbury, Coleman and Garlick (2005, p. 49)
- ⁶⁰ Tilbury, Coleman and Garlick (2005, p. 3)
- ⁶¹ Queensland Board of Teacher Registration (1993)
- ⁶² Tilbury, Coleman, and Garlick (2005) say that evidence for this is anecdotal.
- ⁶³ Curriculum Corporation (2003a)
- ⁶⁴ Curriculum Corporation (2003a)
- ⁶⁵ Curriculum Corporation (2003a); Teacher Registration Board of the Northern Territory (n.d); Victorian Institute of Teaching (2003); Education Queensland (2005)
- ⁶⁶ Brinkman and Scott (1995); Tilbury, Coleman and Garlick (2005)
- ⁶⁷ Ballantyne (1995), Scott (1996a); Scott (1996b); UNESCO (2005a); Posch and Rauch (1998); Board of Teacher Registration (Qld) (1993); Spork (1992)
- ⁶⁸ Ballantyne (1995)
- ⁶⁹ Ballantyne (1995)
- ⁷⁰ Williams (1992a); Thomas (2004)
- ⁷¹ Oulton and Scott (1995); Papadimitrou (1995)

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- ⁷² Scott (1996a)
- ⁷³ Tilbury (1995)
- ⁷⁴ UNESCO (2005a)
- ⁷⁵ See for example QUT, UTS and Southern Cross University, which all have electives in education for sustainability or environmental education
- ⁷⁶ Huckle (1996)
- ⁷⁷ Atkisson (1999) Thomas (2004)
- ⁷⁸ See for example: Dunphy et. al. (2003); Dunphy et. al. (2000); Clark (2003); Doppelt (2003)
- ⁷⁹ Board of Teacher Registration (Qld) (1993)
- ⁸⁰ See earlier section for further discussion of this. Inman and Champain (1996)
- ⁸¹ Fien and Tilbury (1996), Inman and Champain (1996), Wilke et al. (1987); Cutter-Mackenzie (2003)
- ⁸² Wilke et al (1987); Fien and Tilbury (1996), Tilbury (1993)
- ⁸³ Fien and Tilbury (1996); Board of Teacher Registration (Qld) (1993);
- ⁸⁴ Fien and Tilbury (1996); Board of Teacher Registration (Qld) (1993);
- ⁸⁵ UNESCO-UNEP (1990); Board of Teacher Registration (Qld) (1993);
- ⁸⁶ Huckle (2005); Wals and Jickling (2002)
- ⁸⁷ UNESCO-UNEP (1990)
- ⁸⁸ Inman (1996)
- ⁸⁹ Fien and Tilbury (1996)
- ⁹⁰ Huckle (2005); K  pyl   and Wahlstr  m (2000)
- ⁹¹ Huckle (2005)
- ⁹² Gilbert (1984); Wright (1989), Huckle (2005)
- ⁹³ Lyon (1999); Dickens (1996); Huckle (1993).
- ⁹⁴ McGuigan (1999); Huckle (2005)
- ⁹⁵ Dryzek (1996); Huckle (2005)
- ⁹⁶ Klein (2000)
- ⁹⁷ Huckle (2005)
- ⁹⁸ Huckle (2005)
- ⁹⁹ Huckle (2005); Sterling (1996); Orr (1992)
- ¹⁰⁰ Robottom (1987); Robottom and Hart (1993); Huckle (1996); Sterling (1996); Orr (1992)
- ¹⁰¹ Robottom (1987)
- ¹⁰² Tilbury, Podger and Reid (2004)
- ¹⁰³ Robottom (1987)
- ¹⁰⁴ Robottom (1987)
- ¹⁰⁵ Robottom (1987)
- ¹⁰⁶ Robottom (1987)
- ¹⁰⁷ Robottom (1987)
- ¹⁰⁸ Hart (1990)
- ¹⁰⁹ Gifted Education Research, Resource and Information Centre (2005)
- ¹¹⁰ Australian Government Department of Veterans' Affairs (2001)
- ¹¹¹ Parliamentary Education Office (n.d.)
- ¹¹² Australian Government Department of Education, Science and Training (n.d)
- ¹¹³ Curriculum Corporation (1998)
- ¹¹⁴ Shallcross (2006) Personal communication. Anthony Shallcross is one of the SEEPS' project leaders.
- ¹¹⁵ The Moray House School of Education, The University of Edinburgh (2006)
- ¹¹⁶ The Moray House School of Education, The University of Edinburgh (2006)
- ¹¹⁷ The Moray House School of Education, The University of Edinburgh (2006)
- ¹¹⁸ This initiative was unique in that it was aimed at environmental studies courses rather than education courses.
- ¹¹⁹ Jones and Merritt (1999)
- ¹²⁰ Jones, et al (2000)
- ¹²¹ For example many environmental issues such as global warming, ozone depletion and genetic modification all display an uncertainty of reliance on information due to conflicts and contestations of perspectives put forward from a variety of stakeholder groups. A neutral, value-free approach to issues such as these is non-existent.
- ¹²² Jones (2002)
- ¹²³ Jones, et al (2000)
- ¹²⁴ Jones et. al. (2000)
- ¹²⁵ UNESCO (2002)
- ¹²⁶ UNESCO (2002)
- ¹²⁷ UNESCO (2005a & 2005b) http://www.unesco.org/education/tlsf/TLSF/intro/uncofrm_0.htm As above
- ¹²⁸ UNESCO (2002)
- ¹²⁹ UNESCO (2002)
- ¹³⁰ UNESCO (2002 & 2005)
- ¹³¹ Fien (2006) personal communication. Professor John Fien was the Project Director for UNESCO's Teaching and Learning for a Sustainable Future project. He is a highly respected leader in the Environmental Education field in Australia.
- ¹³² Robottom (1987)
- ¹³³ Fien and Maclean (2000, p. 94)
- ¹³⁴ McKeown (2002)
- ¹³⁵ McKeown (2002)
- ¹³⁶ Fien and Maclean (2000, p. 107)
- ¹³⁷ NIER/UNESCO-APEID (1996)
- ¹³⁸ Tilbury, Podger and Reid (2004)
- ¹³⁹ Tilbury, Podger and Reid (2004)
- ¹⁴⁰ Bennell (2004)
- ¹⁴¹ Bennell (2004)
- ¹⁴² Bennell (2004)
- ¹⁴³ Shallcross (2004)
- ¹⁴⁴ Henderson and Tilbury (2004)
- ¹⁴⁵ Manchester Metropolitan University (2001)

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- ¹⁴⁶ Manchester Metropolitan University (2001)
- ¹⁴⁷ UNCED (1992); UNESCO (2002); Tilbury, Podger and Reid (2004)
- ¹⁴⁸ UNESCO (2002)
- ¹⁴⁹ Tilbury, Podger and Reid (2004)
- ¹⁵⁰ Easton (2004)
- ¹⁵¹ Most teachers in Jamaica's educational system receive their initial teacher education at one of six undergraduate teachers' colleges; or one of seven teacher education departments within other tertiary institutions.
- ¹⁵² Ryan (2001)
- ¹⁵³ Sterling (1996)
- ¹⁵⁴ Bennell (2004)
- ¹⁵⁵ Marceline Collins-Figueroa (2005) Personal communication via telephone. Marceline is the coordinator of Jamaica's STEEP program
- ¹⁵⁶ Marceline Collins-Figueroa (2005) Personal communication via telephone. Marceline is the coordinator of Jamaica's STEEP program
- ¹⁵⁷ Numerous initiative leaders indicated that interdisciplinarity was one of the most difficult barriers they faced.
- ¹⁵⁸ Tilbury, Podger and Reid (2004)
- ¹⁵⁹ That is, longer than a one-off professional development workshop.
- ¹⁶⁰ See discussion in Section 3.1 on funding
- ¹⁶¹ See Section 3.2
- ¹⁶² LSE – Being chosen to be part of an internationally funded project gave LSE participants increased standing and prestige within their own institution and also within their national departments of education.
- ¹⁶³ For example University of Wales' Education for Global Citizenship and Sustainable Development Project (see Section 2.3.1)
- ¹⁶⁴ STEEP Jamaica – being the environmental coordinator or an environmental steward provided new opportunities for high level networking and a position of responsibility and prestige within the institution. (see Section 2.3.2)
- ¹⁶⁵ For example the Learning for a Sustainable Environment Project (see Section 2.2.1)
- ¹⁶⁶ For example the Australian Campuses Towards Sustainability and Sustainable Teacher Environmental Education Project (see Section 2.2.2)
- ¹⁶⁷ For example see Jamaica's STEEP project (see Section 2.3.2)
- ¹⁶⁸ Thomas (2004)
- ¹⁶⁹ Marceline Collins-Figueroa (2005) Personal communication via telephone. Marceline is the coordinator of Jamaica's STEEP program
- ¹⁷⁰ See Section 4.2 on partnerships
- ¹⁷¹ Marceline Collins-Figueroa (2005) Personal communication via telephone. Marceline is the coordinator of Jamaica's STEEP program
- ¹⁷² Action research is an iterative research process, where participants reflect upon their own practice, revise and refine their practice, and reflect again. Although the research participants in both the ACTS and LSE projects had undertaken several cycles of research, the research facilitators have yet to input findings from their meta-evaluation into further cycles of the initiative.
- ¹⁷³ This was particularly noticeable in academics from the hard sciences, who found alternative epistemologies or ways of knowing more difficult to accept.
- ¹⁷⁴ This was evident in the TaLESSI, LSE, STEEP, EGCSd and Walking projects.
- ¹⁷⁵ Again evident in the TaLESSI, STEEP, EGCSd, Walking and ACTS projects.
- ¹⁷⁶ Thomas (2004)
- ¹⁷⁷ See critical success factors

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APPENDIX 1: Summary of Initiatives Reviewed

Initiative Title	School Development through Whole School Approaches to Sustainability Education: the Sustainability Education in European Primary Schools (SEEPS) Project	Teaching and Learning at the Environment, Science, Society Interface (TaLESSI)	Teaching and Learning for a Sustainable Future	Learning for Innovations in Teacher Education	Action research for Change Towards Sustainability	Embedding Education for Sustainable Development in Initial Teacher Education and Training (EGCSD)	Sustainable Teacher Environment Education Project (STEEP) Jamaica
Years of operation	Main aspect of the project ran from 1996-2004 but the partnership is still undertaking projects related to the topic and the website is still operating and being used by several of the partner institutions in their pre-service programs.	1997 – 2001 Website providing access to many teaching and learning resources is still functional.	The CD Rom and website was launched in 2001 and the program continues to be used around the world. It has also been translated into several languages.	Workshop scoping and planning began 1994, publication of manual 1997. Manual continues to be utilised as a resource within teacher education institutions around the region in a variety of forms and the process has also been replicated in other initiatives.	2002 - 2004 Participant researchers have also continued to meet and support each other as they continue with the process of including sustainability in their disciplines.	The project began in April 2001 and was funded for three years until March 2004.	2002-2004 and ongoing.
Funding and management	SEEPS was funded as part of the Socrates–Comenius project from the European Union.	The project was funded and supported by the Fund for the Development of Teaching and Learning, which in turn is funded by the Higher Education Funding Council for England and the Department for Employment and Learning. Management of the project was undertaken by Greenwich University (School of Environmental Science).	Commissioned and funded by UNESCO and undertaken by Griffith University. UNESCO continues to update and administer project.	Majority of funding provided by NIER (Japan) boosted by funding from Japan Foundation Asia Centre and AusAID ASEAN Economic Linkages Scheme. Managed jointly by Griffith University and UNESCO ACEID.	A two year pilot research project, jointly funded by the Australian Department of the Environment and Heritage and Macquarie University.	EGCSD was a joint project between the School of Education, University of Wales, Bangor and the World Education Centre (WEC), a development education resource centre for North Wales located within the university. The project was funded by the UK Department for International Development, Oxfam and Christian Aid.	The initial funding round was from 2002-2004 and was obtained from ENACT, a joint initiative of the governments of Jamaica and Canada. The project was initiated and administered by NEEC and a project coordinator was appointed to manage the process.
Partnerships	While the project was managed by Manchester Metropolitan University, 10 other trans-European universities, education organisations and NGOs were research partners.	Partnerships with other FDTL projects were an important aspect of the project providing support, advice and an avenue for dissemination. Partnerships with other schools within Greenwich University and with external institutions also assisted project outcomes.	The project was a partnership between UNESCO and Griffith University. UNESCO absorbed all research and development costs so that the resource could be made available to all ministries of education around the world free of charge. The original source code was also made available so that the resource could be easily translated and made locally relevant.	Support from UNESCO and an international network of critical friends. Has implications for teacher educators and ministries of education around the world.	Research was undertaken by Macquarie University with participants coming from Macquarie, UNSW and Griffith. Partnerships were also negotiated with industry bodies. Interest also came from outside the project and internationally.	The project reinvigorated an existing relationship between WEC and the School of Education through an atmosphere of collaboration. Partnerships were also formed with practicum schools, where mentors were fostered and with several education departments in universities in Lesotho, Jamaica and Mauritius where lecturer exchange programs provided important concrete experience.	Partnerships occurred at nearly all levels of the education system and included teacher education college executives, environmental NGOs, the Board of Teacher Registration, the Ministry of Education and Culture and the Ministry of Agriculture, teachers in schools and student teachers.

Target audience	<p>There were four main target audiences:</p> <ul style="list-style-type: none"> ■ teacher educators, particularly within the partner institutions ■ school based-trainers, including principals, teachers and support staff ■ undergraduate and postgraduate education students ■ primary school students. 	<p>TaLESSI's target audience were lecturers from across the disciplines in Environmental Science in order to improve student's abilities to critically analyse environmental issues.</p>	<p>The resource was targeted internationally and non-specifically at all teachers who wished to gain further skills in the area of education for sustainability. Pre-service teachers could also utilise the resource in the course of their training. Access is available on the world wide web or through a CD Rom.</p>	<p>Relatively small number of deeply engaged teacher educators, mainly working within EE, as agents of change within their respective institutions to affect change from the bottom-up. Also over 100 critical friends informed the process.</p>	<p>14 lecturers of postgraduate units from a range of different disciplines in 3 different universities volunteered to participate. Students were indirectly targeted through influence on lecturers' practices as were a range of interested and critical friends.</p>	<p>Although the project was aimed initially at teacher educators in the School of Education, project staff also worked with students from both primary and secondary strands as well as school-based mentors. Another important target was university administration and other universities in the UK.</p>	<p>The target audience is teacher education colleges and student teachers. The first phase of the project targeted students and teachers at two teacher education colleges and there are plans to extend this to other colleges. To this end, stakeholders and partners of the project have also been targeted by professional development activities. Staff from the board of teacher registration and from the Ministry of Education and Culture have also attended professional development activities.</p>
Context in which initiative is operating	<p>This project operates within an EU context and, as part of the EU funding, seeks to create links and partnerships in education across the region. Another important context is the devolution of much initial teacher education to the schools, current in the UK. Therefore the focus of much of the project is on in-service rather than pre-service teacher education.</p>	<p>Typical of most higher education institutions, which are discipline oriented. Although most teaching and learning theory points to the importance of interdisciplinary approaches, this situation is rarely addressed in practice.</p>	<p>Teaching and Learning for a Sustainable Future promotes a new vision of education, which aims to prepare students for a rapidly changing world. At the same time rise of information and communication technologies has facilitated the use of the internet as a teaching resource. TLSF's dual focus on technology education and EE provides a model for the use of ICTs in education in a way that is scaffolded by educational approaches inherent in EE. This initiative has been designed with an international context in mind.</p>	<p>Action Research Project undertaken by selected teacher educators in over 16 countries within the Asia-Pacific. Broad variety of contexts. Based upon reflective practitioner approach to professional development where teacher educator engages in an action research process to develop, trial and evaluate teaching materials whilst also engaging in a process of reflective practice and professional development.</p>	<p>ACTS grew out of a University-Industry Summit hosted by Macquarie University 2001. Participants at the Summit identified the need for university graduates to have attributes such as critical, creative and futures thinking skills, confidence to deal with uncertainty, and awareness of sustainability. The Summit also highlighted that many educators are grappling with the issue of how to</p> <p>Integrate knowledge and skills for sustainability into their discipline areas.</p>	<p>Curriculum developments recently in the UK have made the promotion of sustainability education more amenable.</p>	<p>STEEP is a Jamaican initiative and is operating in a post-colonial education system where didactics are still the dominant mode of instruction.</p>
Aims of initiative	<p>The project aimed to promote and support whole school approaches to sustainability within schools through the continued development of the SEEPS project. While the project mainly targeted</p>	<p>TaLESSI sought to enhance student learning outcomes in three main areas:</p> <p>1. <i>Interdisciplinarity</i>: the capacity to integrate knowledge derived from disciplines which may have different views on valid</p>	<p>The objectives of Teaching and Learning for a Sustainable Future are to:</p> <ul style="list-style-type: none"> ■ develop an appreciation of the scope and purpose of educating for a sustainable 	<p>The objectives of the Learning for Sustainability: Innovations in Teacher Education were to:</p> <ul style="list-style-type: none"> ■ develop a set of 	<p>ACTS goal is to promote and facilitate change within universities to enhance graduate knowledge and skills towards sustainability.</p>	<p>The project and associated research intended to answer the key question: Do newly qualified teachers enter schools with the ability and confidence to prepare their students to live in an interdependent, multicultural and</p>	<p>Aims for the STEEP initiative were informed by Jamaica's National Environmental Education Action Plan which broadly were to</p> <p>(a) disseminate the</p>

	<p>in-service teacher education, some aspects were also developed to address pre-service teacher education. These were specifically to:</p> <ul style="list-style-type: none"> ■ review priorities and approaches to environmental management, institutional change and self-evaluation in several EU countries ■ produce a series of professional development modules for pre and in-service teacher education on a variety of whole school approaches to sustainability accessible via the internet or on CD Rom ■ draw upon expertise from across the EU and form a regional network committed to supporting whole school approaches to sustainability within regional schools ■ the in-service version was also designed to allow locally specific adaptations of the resource. 	<p>knowledge.</p> <p>2. <i>Values awareness</i>: appreciation of the insights afforded by philosophy and ethics.</p> <p>3. <i>Critical thinking</i>: ability to reveal the bias evident in relation to many environmental questions.</p>	<p>future</p> <ul style="list-style-type: none"> ■ clarify concepts and themes related to sustainable development ■ enhance skills for integrating issues of sustainability into a range of school subjects ■ enhance skills for using a wide range of interactive and learner-centred teaching and learning strategies ■ encourage wider literacy of ICT. 	<p>culturally relevant, adaptable materials for professional development</p> <ul style="list-style-type: none"> ■ build capacity within participating teacher educators in teaching and learning strategies for sustainability ■ engage teacher educators in reflection about their own practice ■ strengthen regional networks of teacher educators ■ expand the range of innovation within teacher education to include educational purposes and teaching and learning strategies ■ support individual teacher educators as agents of change within their respective institutions through providing professional development and engaging a community of enquiry ■ contribute to the development of a model of teacher education for sustainability. 	<p>The ACTS project core objectives were to:</p> <ul style="list-style-type: none"> ■ explore sustainability as a generic skill across disciplines ■ explore research based activities to enhance professional and organisational development for sustainability ■ support teachers of postgraduate units innovate and include education for sustainability and ■ assist curriculum change through action research, with the ultimate aim of preparing postgraduates students for addressing sustainability within their professional work. 	<p>sustainable world?</p> <p>The aims were to:</p> <ul style="list-style-type: none"> ■ develop an effective, sustainable and replicable model for embedding EGCSD in pre-service teacher education courses in Wales ■ contribute to an effective strategy to support the implementation of EGCSD. 	<p>knowledge, know-how and skills needed to improve the understanding and management of natural resources thereby contributing to sustainable production and consumption patterns;</p> <p>(b) change values, ethics, attitudes, behaviours and lifestyles so as to facilitate improved management of natural resources</p> <p>(c) ensure an informed public which will support actions emerging from different sectors aimed at an improved environment and sustainable human development;</p> <p>(d) ensure an informed policy and decision-making directorate which will take a lead role on environment and sustainability issues;</p> <p>(e) ensure systems capacity which will sustain long-term support for initiatives on environmental education for sustainable development.</p>
Model	Collaborative resource development and adaptation	Collaborative resource development and adaptation	Collaborative resource development and adaptation	Action research	Action research	Whole-of-system	Whole-of-system
Process	<p>SEEPS produced a self-study guide, which is useful for teacher educators, teachers and education students. The guide is available free of charge on the internet or as a CD Rom. SEEPS' learning experiences are</p>	<p>Tal ESSI was undertaken in several ways:</p> <ul style="list-style-type: none"> ■ Forty-eight interdisciplinary teaching and learning resources focussing on critical thinking were developed collaboratively 	<p>The 25 different modules available employ a variety of different teaching and learning processes consistent with learning for sustainability. Strategies such as inquiry learning, reflective practice, experiential learning and action research form the</p>	<p>LSE employed an action research process of planning, doing, reflecting, revising.</p> <p>The manual produced by the process utilises a workshop approach to delivering Efs content.</p>	<p>The main aspects of the project were action research combined with phenomenographic research, professional development workshops and a peer support network of critical friends.</p>	<p>The process was one of deep engagement of teacher educators across <i>all</i> areas of the School of Education. This was achieved through curriculum audits, mentoring and support, resource provision and conferences and</p>	<p>Action research process of reflection and curriculum development for staff. Encouraged interdisciplinarity through theme days.</p> <p>Learner centred teaching and learning approaches.</p>

	based on collaborative, socially critical and constructivist approaches to learning, which emphasise the roles of culture, context and language as well as economy and power in shaping behaviour. Participation is also a fundamental principle of the resource. The resource is also designed to be adapted to local settings and instructions on how to do this are available on the CD Rom cover.	and pilot tested <ul style="list-style-type: none"> ■ conferences and workshops were held for academics wanting to improve their teaching and learning strategies using the resources developed ■ a website providing access to the resources and information of how to get involved was developed ■ the project was advertised widely and partnerships were negotiated with other similar projects and with other institutions. 	scaffolding around which the modules are based as participants learn about and through these processes. A dissemination toolkit also provides teacher educators and curriculum developers with guidelines for conducting training using the resource to ways to adapt the resource to make it locally relevant. The resource also provides support of the learning community through the setting up of an e-group.	Each workshop utilises appropriate teaching and learning strategies.	Important principles underpinning the project were: <ul style="list-style-type: none"> ■ ongoing communication of project outcomes to all stakeholders ■ providing opportunities for producing research, a priority for academics and universities ■ establishing equal relationships with participants based on mutual respect and democratic processes ■ genuine participation and powersharing ■ systemic thinking. 	forums. For students, practicum opportunities that encouraged development in EGCSID were encouraged and fostered to reinforce focus in lectures. At a university level, the project influenced the sustainability committee and resulted in several administration policies consistent with sustainability. Outreach was also extended to other pre-service teacher education providers in UK.	
Content	The Guide contains seven self-study units on a variety of management of whole school approaches topics: <ul style="list-style-type: none"> ■ Whole school approaches and pupil participation ■ Why bother with ESD? ■ Values and attitudes ■ Cultural perspectives on ESD ■ Leading and managing change ■ Teaching through the environment ■ School self-evaluation in ESD ■ Case studies and 	The teaching and learning resources ranged across a variety of environmental issues such as global warming, The Gulf War and oil, genetic modification of food crops etc. Under-pinning each resource is an exploration of bias and value, critical thinking and interdisciplinarity.	Content is centred on the principles and practices of education for sustainability. 25 modules cover a variety of topics from providing a curriculum rationale for Efs; investigating content issues with particular relevance to sustainability; exploring ways Efs may be integrated across the curriculum; and developing skills in a variety of quality teaching and learning strategies.	Some content in terms of innovative teaching and learning strategies within the professional development materials, but main focus on professional development of participating teacher educators	Some content was delivered in workshop format centring on each participant constructing their own meanings and relevance of sustainability; however the majority of learning came out of the action research process. During this process, participants explored ways to incorporate sustainability into their courses.	General content area is global citizenship and sustainability, but the process allows for specific specialised content to be provided for each subject area.	For teacher education staff: Content revolved around LFS concepts and processes, action research as a model of professional development and reflective practice, learner centred active teaching and learning strategies. For student teachers: environmental monitoring (water, waste, electricity etc), and environmental stewardship. For JBTE, institutional admin and ancillary, modelling best practice environmental management of campus and curriculum development.

	action research. The study guide focuses not only on innovative teaching and learning pedagogies but also on management of schools and on initiating and managing change.	Focus group interviews, workshops, materials development, piloting of resources and outreach to other institutions.	Materials available online and implementation dependant on individual institutions. Facility to continue engagement with the issue through e-lists and groups. Most importantly, the resource has been designed to allow for local adaptations and some countries have undertaken this.	1. Writing draft teacher education materials 2. Trialling materials by critical friends through ▪ review and analysis ▪ cultural adaptation ▪ trial and evaluation ▪ reflection and reporting. 3. Dissemination and Implementation	There were three main stages to the project ▪ Development: stakeholder mapping and team meetings to design the pilot project. ▪ Implementation: recruitment of participants, phenomenographic research, professional development program and action research process ▪ Evaluation: ongoing evaluation with participants and external post program evaluation of process.	Implementation occurred in five main areas: ▪ mentoring teacher educators ▪ with Student teachers ▪ with partnership schools ▪ within the university. ▪ Outreach to other pre-service teacher education institutions. This was mainly achieved through consultation, individual and/or team mentoring and support and resource provision.	Reviewed existing pre-service courses to gather baseline data. Recruited two teacher education colleges already attempting to infuse EE into their courses. Worked with teacher education, admin and groundstaff on reviewing curriculum documents. Coordinators were engaged at each institution to manage their school's response. Ran professional development workshops on LfS approaches (including action-research) and pedagogies for all staff (including ministry and Joint Board of Teacher Registration staff) Interdisciplinarity proved difficult so STEEP adopted environmental theme days to facilitate this. Theme days were also supported by environmental NGO partners. Residential colleges ran stewardship programs engaging students in energy, water and waste monitoring. Outreach to other institutions.
Program implementation	Partner institutions around Europe were recruited to begin cooperative selection of topics and drafting of modules. Modules were trialled and adapted for uploading to web format. SEEPS is currently available on the internet. The SEEPS project also undertakes training courses, hosts conferences and works with schools to design and run in-service education for sustainability programs.						

Participant incentives	<ul style="list-style-type: none"> Gain innovative teaching and learning strategies Ease of access Opportunity for local adaptations. 	<ul style="list-style-type: none"> Improved teaching and learning strategies Provided ways to achieve generic skills Opportunities to publish research. 	<ul style="list-style-type: none"> Minimal cost Open architecture to facilitate local adaptation and translation Affiliation and endorsement from UNESCO provides prestige and quality guarantee Utilising popular ICT platform providing skills in other areas Interactivity and development of skills in Efs 	<ul style="list-style-type: none"> Obtained funding from outside bodies for professional development Raised profile of project through cross-uni collaborations Well known partners and managers of project (UNESCO/GU link) give credibility and prestige and won support from the top Opportunities for professional development and publication Provided networking opportunities and support Travel Professional respect 	<ul style="list-style-type: none"> Interest in sustainability and/or action research Desire to improve post-graduate teaching To create and see change in the curriculum Professional development to learn more about action research and sustainability Opportunities to publish a paper Opportunities to create linkages with industry partners. 	<ul style="list-style-type: none"> Student surveys and interviews revealed dissatisfaction with their preparation. The head of school (also the Vice Chancellor) was committed to the project and provided informal approval. Chance to participate in lecturer exchange programs. 	<p>Campus coordinators were volunteers and did not receive financial reward.</p> <p>Possibilities to gain standing and respect of colleagues and more importantly administration and principal.</p> <p>Prestige</p> <p>Time away from teaching to engage in research.</p> <p>Recognition of good practice through awards.</p>
Difficulties and Lessons Learnt	<p>Evaluation outcomes would help ascertain the effectiveness of the resource.</p>	<p>Difficulties with the project stemmed mainly from culturally rooted resistance to change, particularly from hard scientists who found the alternative epistemological paradigms difficult to accept. There was also resistance from academics unwilling to compromise their authoritativeness and change their didactic pedagogy to more active strategies. Longevity of initiative can be tied to funding provision.</p>	<p>Easy access provided internet and computer are available.</p> <p>Self-guided tutorials eliminate the need for a skilled facilitator to lead learning.</p>	<p>Extra work for participants with limited time.</p> <p>Limited access to teacher educators from other disciplines.</p>	<p>Lecturers required more support than anticipated.</p> <p>University staff found it difficult to relate to the idea of sustainability.</p> <p>Engaging industry proved challenging.</p> <p>Timetabling meetings was also difficult.</p>	<p>Access to a well stocked resource centre and a full-time support officer may not be replicable in other institutions.</p> <p>Unstructured open process also hampers replicability.</p>	<p>Action research process was difficult as there is no culture of reflective practice. Interdisciplinary teaching also difficult due to strong disciplinary boundaries and structures of inquiry, inherited from post-colonial education systems.</p> <p>One of the most important lessons was to capitalise on already existing energies and efforts in this area and also to attempt easy issues early and celebrate success.</p> <p>Dedicated sustainability coordinators helped keep the message current.</p>
Evaluation of initiative	<p>Evaluation of the <i>prizes</i> was undertaken regularly by an internal evaluator and reflected the issues emphasised by the funders (Trans-European collaboration) and was little use to the field.</p>	<p>Evaluation was mainly concerned with the number of academics attending focus group sessions and workshops and with the number of resources produced. Evaluation of the process by which TaLESSI operated was not evaluated. An</p>	<p>UNESCO undertook an informal evaluation of the first trial version in 2001. Questionnaires were sent to teacher educators and curriculum developers from 14 different countries and to a variety of international</p>	<p>Evaluation a central component of action research process.</p> <p>Clearly provided in-built external evaluation targeted</p> <p>Quality of teacher</p>	<p>Evaluation was undertaken on a variety of levels including individual participant evaluations, an ACTS team self-evaluation and externally.</p>	<p>Evaluation mainly consisted of measuring the increase in borrowing from the resource centre and the differences in student perception pre and post project.</p>	<p>Several evaluations were undertaken for the project.</p> <p>One formal evaluation from the funding body and several internal evaluations for research purposes.</p>

	However, no record of an evaluation of the <i>resource</i> has been found.	external evaluator was also commissioned.	educational bodies. Evaluation mainly targeted the content and utility of the resource.	education resources developed Quality of action research. Long term evaluation would have been helpful.		Course outlines were also analysed to scope the number of teacher educators who had infused EGCSd or changed courses considerably.	
Key findings from evaluation	Internal evaluation found the <i>process</i> to be participatory and inclusive of all partners. No information is available, however, as to the effectiveness of the resource. (Funding was not tied to environmental education and perhaps drove the agenda)	<ul style="list-style-type: none"> ■ Evaluation found that the resource provision was useful and provided a link to a wider range of subjects than were anticipated. ■ Transferability of the project to more generic contexts was possible but difficult to negotiate. ■ The partnerships that were formed provided important platforms for further outreach. ■ Resistance to change was unexpected. 	<p>TLSF was received extremely well by most evaluators.</p> <p>Initiative has been adapted for use in other countries such as South Africa and Kyrgyzstan. Evaluation of completed version has not yet been undertaken.</p>	<p>Variety of changes effected throughout the region:</p> <ul style="list-style-type: none"> ■ Some systemic changes to course structure that either includes EE as a compulsory subject, or a specialised curriculum stream ■ Establishment of national EE resource centres ■ Agents of change advocated for higher priority of EE within political processes of institutions, teacher education boards and government...thus beginning to spark change at a variety of levels 	<p>The external evaluator found the ACTS project effective and appropriate. Key participant impacts identified were:</p> <ul style="list-style-type: none"> ■ evidence of change to existing teaching and learning ■ demonstrated understanding of action research, EFS and sustainability ■ demonstrated capacity to design and implement action research projects aimed at aligning existing courses toward EFS. <p>The project was also successful in raising the awareness of sustainability/EFS and action research throughout the university and led to the emergence of external partnerships and inter-department networks.</p> <p>Widespread interest in the approach in creating change in curriculum</p>	<p>Evaluation revealed the students did feel slightly more prepared to teach this area and that borrowings had increased. The evaluation also revealed the comparative ease of infusion of EGCSd into primary courses because of the lengthier course time than secondary post-graduate certificate courses. As a result of the project, 26 members of staff introduced EGCSd related content into their sessions. Evaluation also revealed there were inconsistencies in supporting the project through the partnership practicum schools and further work needed to be undertaken in this area.</p>	
Level of impact	No long term evaluation undertaken. Teacher educators across Europe involved in creating the resource have continued to be interested in the	Within the university the level of impact was mixed: students participating in TalESSI improved learning situations and greatly appreciated the impact. Widespread reach of the project,	No long term evaluations have been conducted. Short term evaluations and informal communications show	ACTS had a multi-dimensional impact that was not only on the participant researchers, but also to some extent on raising	Impact of this project happened effectively at the individual lecturer level, and at the faculty level. There was also some small outreach impact on other universities as a result of conferences and	The project has certainly affected the two pilot colleges deeply. Although the funding has finished, staff are continuing to look for funds to implement new	

	issue of promoting whole school approaches. No evaluation has been undertaken on the effectiveness of the resource as a pre-service teacher education tool.	however, was limited.	teaching. Comments from countries that have adapted the resource to suit a local context have also been very positive.	that participants have in many instances continued to advocate for the inclusion of Education for Sustainability and have negotiated a higher profile for this area within their respective instructions.	the profile of sustainability in the university. Other universities also expressed interest in the process. Some of the specific impacts were: <ul style="list-style-type: none"> ▪ All participants have instigated some degree of change to their courses to align more closely with EFS and appear committed to continuing the process. ▪ Prompted wider dialogue with colleagues about EFS, sustainability and action research. ▪ Initiated cross-discipline and cross-institutional partnerships and developed a collaborative culture which supported participants. ▪ Contributed to growing body of research in this area through publication. 	collaborations with other teacher education institutions. Although the campus-based component of this project was relatively effective, the school-based component was problematic. This was generally accorded to the fact that EGCSd was not featured in the school experience handbooks.	ideas developed from the initiative.
Innovation	This initiative unlike other teacher education for sustainability resources focuses specifically on the sorts of change management skills needed to undertake whole school approaches to sustainability. Units such as <i>institutional change</i> and <i>evaluating whole school approaches</i> are concepts	The focus on epistemological conflict across disciplines addressed by active teaching and learning strategies based upon critical thinking. Focus on interdisciplinarity.	TLSF utilises a popular ICT enhanced approach to teacher education in a way that maintains a high degree of interactivity and learning engagement but also maintained flexibility and ease of local adaptation.	Innovation in using an holistic approach to professional development that recognises the interdependence between, curriculum development, professional development, research-in-action and networking and the use of action research not just as a research method but also	ACTS combines action research and phenomenographic research methodologies with the intention of exploring the diversity of approaches to infusing EFS into a postgraduate education. Another innovation is in the focus of a cross disciplinary research	EGCSd focussed on utilising an existing resource centre in order to facilitate interdisciplinary communication and collaboration across the School of Education. The project recognised the importance of continuity between the university and practicum schools and targeted several partnership schools also.	This is the only example of an initiative found that attempts to implement a whole-of-institution response to sustainability. The focus was specifically on creating sustainable schools in which environmental education is institutionalised and all staff and learners work to create a sustainable school culture

	not previously featured in EE training. The resource has also been designed to be adapted to suit local contexts.			a process of professional development.	team.		which encompasses classroom, campus and community.
What were the critical success factors	<p>Engagement with organisational change theory</p> <p>Funding</p> <p>Focus on whole-school approaches</p> <p>Participatory process of development from wide cultural backgrounds led to inclusion of minority perspectives.</p>	<ul style="list-style-type: none"> ■ Funding ■ Well funded core resource team ■ Linked to a recognised generic graduate attribute skill such as critical thinking ■ Strong support from Schools of Environmental Sciences and Humanities. ■ Building of relationships with potential clients ■ Targeting of less committed groups for hosting workshops ■ Intensive provision of support. 	<ul style="list-style-type: none"> ■ Cost effectiveness ■ Use of ICT technology ■ Reached a broad range of participants ■ Prestige gave buy in and quality assurance ■ Flexible learning delivery ■ Ongoing management of project by UNESCO ■ Ability to be adapted to local contexts. 	<ul style="list-style-type: none"> ■ Deep engagement with participants ■ Long lasting multiplier effect ■ Initial support from top due to prestige factor ■ Some amount of multi-level change where curriculum developers and ministry of education workers were included 	<ul style="list-style-type: none"> ■ Cross-discipline and multi-level participants ■ Diverse make up of project team ■ Dedicated project manager with time and resources to oversee project ■ Detailed project design and planning. ■ Deep participant engagement ■ Flexibility and open door policy to allow direction to be guided by participant researchers. 	<ul style="list-style-type: none"> ■ Funded project officer to manage project and provide support ■ Resource centre ■ Partnerships with international universities provided exchange opportunities for lecturers ■ Deep engagement with subject teams led to better outcomes than on an individual basis. 	<ul style="list-style-type: none"> ■ Strong leadership and support from ministries of education and environment , JBTE, NEEC and college principals ■ Committed sustainability coordinators ■ Following the interests and energies of teacher education staff ■ Being sensitive to organisational culture and building the program within the institution not dictating from outside ■ Undertaking small projects early and celebrating success ■ Building broad-based multi-level partnerships.

Glossary

Competencies

Competencies are the abilities, knowledge and skills teachers need if they are to be successful teachers. Competency frameworks act in the same way as professional standards frameworks. Competencies are now more commonly referred to as 'professional standards'.

Critical thinking

Critical thinking challenges us to examine the way we interpret the world and the ways in which our knowledge and opinions are shaped by our world. Critical thinking leads to a deeper understanding of interests behind our communities and the influences of media and advertising in our lives.

Education for Sustainability

Education for Sustainability builds on education for the environment. Education for Sustainability seeks to motivate, equip and involve individuals and organisations in reflecting on how they currently live and work in order to assist them in making informed decisions and creating ways to work towards a more sustainable world. Education for Sustainability aims to go beyond individual behaviour change or single actions often associated with education for the environment. It seeks to implement systemic change within schools, universities, technical colleges, government, business, industry and society.

Environmental Education

Environmental Education refers to the overall field of education that engages learners with their environments, be they natural, built or social. The practices and approaches evident in Environmental Education have evolved significantly since the term was first used in the late 1960s. In the 1970s educators initially perceived Environmental Education as 'education about the environment' that focuses on developing knowledge and understanding. Environmental Education then progressed to favour the approach of 'education for the environment' with its focus on participation and action to improve the environment. 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 towards sustainability.

In-service teacher education

In-service teacher education refers to the ongoing education and training undertaken by practising teachers. In-service teacher education tends to occur during pupil-free days or on an afternoon a week over several weeks.

Initial teacher education

Initial teacher education refers to the initial period of training a prospective teacher undertakes. It is used interchangeably with the term 'pre-service teacher education'.

Mainstreaming

Mainstreaming refers to the inclusion of the content and practice of a particular idea (such as Learning for Sustainability) within an organisation, institution or system (such as pre-service teacher education) to such an extent that it becomes embedded within its policies and activities.

Model

The term 'model' in this report, refers to a variety of generic approaches to professional development that have been used within pre-service teacher education programs. The models identified in this report are particularly revealing with regard to effecting change. Each model has a uniquely different process and set of assumptions about the way change happens, particularly within teacher education institutions and the way professional development is offered.

Multi-sectoral

Multi-sectoral refers to the involvement of stakeholders from more than one discipline or sector. If a program has stakeholders from more than two sectors then it can be said to be multi-sectoral. For further information see also 'sectors'.

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 Australian 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.

National Environmental Education Network

The National Environmental Education Network is an intergovernmental (federal and state) agency network that seeks to co-ordinate the delivery of environmental education in Australia.

Pedagogy

Pedagogy refers to the science or art of teaching children (as opposed to andragogy which refers to the teaching of adults). The term pedagogy is also used to refer to the principles, methods and activities of instruction, or teaching strategies, that teachers use.

Pre-service teacher education

Pre-service teacher education refers to the initial period of training a prospective teacher undertakes. It is sometimes used interchangeably with the term 'initial teacher education'.

Professional development

Professional development refers to the ongoing in-service training of teachers. However, continuing professional development is a broader term that refers to the gamut of professional development opportunities available to teachers such as in-service training, further and higher degrees such as graduate certificates, diplomas, master and doctorate degrees. Continuing professional development opportunities enable teachers to keep up to date with the profession and to further their career through improving their qualifications.

Professional standards

Professional standards for teachers outline the abilities, knowledge and skills teachers need. They are usually developed by teacher registration authorities to act as a guide for assessing whether or not pre-service teacher education graduates are professionally prepared enough to be able to register to teach in schools. Professional standards thus also guide the form and focus of pre-service teacher education programs. Professional standards are also referred to as professional competencies.

Systems thinking

Systems thinking is a thinking methodology based upon a critical understanding of how complex systems, such as environments and ecosystems, function. Systems thinking considers the whole rather than the sum of the parts. Systems thinking offers an alternative to the dominant way of thinking, which emphasises analysis and understanding through deconstruction. In comparison, systemic thinking offers a way to understand and manage complex situations because it emphasises holistic, integrative approaches, which take into account the relationships between system components. Systemic thinking offers an approach to looking at the world and the issues of sustainability in an interdisciplinary and relational way. Closely related to holistic and ecological thinking, systemic approaches shifts focus and attention from 'things' to processes, from static states to dynamics, and from 'parts' to 'wholes'.

ARIES is the Australian Research Institute in Education for Sustainability based at Macquarie University, Sydney. ARIES is primarily funded by the Australian Government Department of the Environment and Heritage.

Its core business is to undertake research that informs policy and practice in Education for Sustainability across a range of sectors including: business and industry, school education, community education, and further and higher education.

ARIES adopts an innovative approach to research with a view to translating awareness of sustainability issues into action and change. ARIES is concerned with how we inform, motivate and manage structural change towards sustainability.

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ISBN 1 74138 179 7
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