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# Embedding EfS in Teacher Education:

## An introductory guide to using the Systems Change Model

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## Foreword

Welcome to this introductory guide on using a systems change model to embed Education for Sustainability (EfS) into teacher education.

Pressing sustainability issues such as climate change, biodiversity loss and depletion of non-renewable resources pose new challenges for education. The importance of education in preparing future citizens to engage in sustainable living practices and help create a more sustainable world is widely acknowledged. As a result many universities around the world are beginning to recognize the need to integrate EfS into their teacher education programs. However, evidence indicates that there is little or no core EfS knowledge or pedagogy in pre-service teacher courses available to student teachers in a thorough and systematic fashion. Instead efforts are fragmented and individually or, at best, institutionally-based and lacking a systems approach to change, an approach that is seen as essential to achieving a sustainable society (Henderson & Tilbury, 2004). The result is new teachers are graduating without the necessary knowledge or skills to teach in ways that enable them to prepare their students to cope well with the new and emerging challenges their communities face.

This guide has been prepared as part of a teaching and learning research project that applied a systems change approach to embedding the learning and teaching of sustainability into pre-service teacher education.

The processes, outcomes and lessons learnt from this project are presented here as a guide for navigating pathways to systemic change in the journey of re-orienting teacher education towards sustainability. The guide also highlights how a systems change approach can be used to successfully enact change within a teacher education system. If you are curious about how to introduce and embed EfS into teacher education – or have tried other models and are looking for a more encompassing, transformative approach – this guide is designed to help you.

The material presented in this guide is designed to be flexible and adaptive. However you choose to use the content, our aim is to help you and your students develop new perspectives, promote discussion and to engage with a system-wide approach to change.

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# Introduction

**This Section**

**Introduces:**

- **The rationale for this guide**
- **Key terms and concepts**
- **How to use this guide**
- **Implications for teacher education**

Sustainability is on the global agenda and education has been internationally identified as a key strategy for bringing about the necessary shift towards sustainability. Contemporary and future socio-ecological challenges set an overarching context for teacher education by predicating the kind of attitudes, understandings and competencies that will enable our future teachers to adequately prepare the citizens of tomorrow for what is predicted to be a volatile and uncertain future. Unfortunately, in practice, there is little evidence of this agenda in teacher education. This may be because of a lack of understanding of sustainability, why it is important to teacher educators, or how to engage with these ideas. We see this guide as one way in which to begin to address these issues.

First, we provide a few **Key Terms and Concepts** to help unpack this issue:

**Sustainability:** Socio-cultural, economic, political and ecological wellbeing now and for the future - on any scale (local, regional, global) - where these dimensions are seen as systemically interdependent and inseparable. The complexity of this concept and its value-laden dimensions makes it difficult to arrive at a commonly agreed definition of sustainability. The most commonly used definition is from *Our Common Future*, also known as the Brundtland Report: "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their needs" (UNWCED, 1987). However, this definition raises more questions and issues than provides clarifications and resolutions.

**Education for Sustainability:** An approach to education, teaching and learning that prepares people to cope with, think critically about, and shape social, economic, political and ecological conditions characterised by change, uncertainty, risk and complexity.

**Systems thinking and learning:** A holistic non-linear perspective that highlights connections and relationships between different elements of a system. An understanding of this concept is key to an understanding of sustainability and EfS, given the complex interconnections and systemic interdependence necessary for sustainability.

These introductory definitions of complex concepts are explored further in Section 2.

**What is the rationale behind this guide?**

Australia has a range of policy statements and whole-school programs aimed at promoting environmental and sustainability education in both the early childhood and general school education sectors. A number of frameworks and initiatives provide planning and practical support, including:

- *Educating for a Sustainable Future: A National Environmental Education Statement for Australian Schools* (NEES) (2005)
- *Living Sustainably: The Australian Government's National Action Plan for Education for Sustainability (2009)*
- *Sustainability Curriculum Framework: A guide for curriculum developers and policy makers (2010)*
- Whole-school initiatives such as the Australian Sustainable Schools Initiative (AuSSI) and Queensland Sustainable Schools Initiative (QESSI)
- Research projects for the education sector carried out by the Australian Research Institute for Education for Sustainability (ARIES)

Pre-service teacher education, however, lags behind in building the capacity of new teachers to initiate and implement such approaches (Steele, 2010). As a result, evidence suggests that the teacher workforce is poorly prepared to implement such initiatives. **There is, therefore, a need for innovative teacher education approaches and strategies that integrate EfS and assist future teachers to become well-prepared for the new and emerging challenges they, and their students, face now and into the future.**

This guide incorporates the findings from a number of research projects initiated in 2006 (Ferreira et al., 2006), which began to investigate how best to achieve change across a whole

teacher education system. This multi-stage project has developed a systems approach to embedding EfS in teacher education that is aligned with the Australian National Curriculum and other national and state policies. This guide describes the model and outlines strategies for its use, based on lessons learnt from efforts to implement the model in *practice*.

**Who is this guide for?**

If you, your organisation or institution:

- are conscious of the role teachers have in preparing future citizens to engage with sustainability;
- are interested in how to incorporate EfS into teacher education;
- are interested understanding the barriers to embedding EfS and learning about how to overcome them;
- are concerned about fragmentation and segregation in educational structures, knowledge or policy making; and/or
- have attempted to bring EfS to teacher education, and are now looking for a model that overtly considers interrelationships

then you might welcome this introductory guide on using a systems approach to reorient teacher education towards sustainability.

**How to use this guide:**

This guide is designed to introduce and guide you through the application of a systems change model for embedding EfS into teacher education. There are signposts throughout the guide to illustrate particular concepts and key points, and to provide opportunities for questioning and reflection. Look out for these symbols:

| | | |
|---|---|---|
| ! | **Idea** | a key point for you to note |
| ? | **Question** | a question to provoke critical thinking and discussion |

You may want to use the guide as a 'cover to cover' read, or dip in and out of sections that are most relevant to you. This guide is **flexible** - it is not designed to be a step-by-step instruction

manual; rather it is a guide to introduce you to concepts and thinking about using a systems approach to embed EfS into teacher education. We strongly suggest you adopt and adapt the guide to suit the requirements of your own educational, organisational or institutional setting, that is, of your own teacher education system.

**What else is out there?**

There is an increasingly strong agenda to include EfS in education. A number of international and national documents support this agenda. For example,

The Australian Government has adopted the objectives of the Decade of Education for Sustainable Development, and outlined its policy response in Caring for our Future: The Australian Government Strategy for the United Nations Decade of Education for Sustainability, 2005 - 2014.

A number of priorities for action are identified in Living Sustainably: the Australian Government's National Action Plan for Education for Sustainability.

Mainstreaming Sustainability into Pre-Service Teacher Education, Stage 1, 2 and 3 undertaken by ARIES – provides an overview of whole-school approaches to sustainability in Australia and a review of models for professional development in pre-service teacher education, along with an analysis of enablers and constraints.

The Talloires Declaration - a ten-point action plan for incorporating sustainability and environmental literacy in teaching, research, operations and outreach at colleges and universities. The Talloires Declaration has been adopted by over 350 universities in over 40 countries, including in Australia.

UNESCO's Guidelines and Recommendations for Reorienting Teacher Education to Address Sustainability - offers suggestions on how to reorient teacher education to address sustainable development.

**So why *this* resource?**

As we have noted above, there is some material available about embedding sustainability into teacher education, including kits, policies and curricula objectives. **This guide**, however, is specifically intended as **practical tool** for taking a systems approach to bringing about change in a teacher education **system on a state/provincial, regional or national scale.**

# EfS in Teacher Education

**This Section**

- **Defines and describes sustainability and EfS**
- **Examines the role of teachers in sustainability**
- **Explains the importance of EfS in teacher education**

**What is sustainability?**

Sustainability is emerging as a key organising idea in shaping how we live and work in the 21st century. There are a number of terms with which you may be familiar around the concepts of sustainability, including 'sustainable development' and 'sustainable communities'. Given the complexities and disagreements in definitions of sustainability; we recommend that teacher educators seeking to incorporate sustainability into their teaching and learning take time to understand these concepts and debates, or if you are familiar with these terms, take time to revisit them, focussing on the systemic interconnections and values underpinning the concept.

**! Idea:** Be open to reconsidering and expanding your understanding of sustainability to account for its complexity.

In the broadest sense, our work is informed by the Brundtland definition: "**Sustainable development** is development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (UNWCED, 1987). A **sustainable community** is one that provides for an improved quality of life, protected and healthy ecosystems, social wellbeing and cohesion, and economic equity. *The Resources section of this guide provides additional links for exploring these concepts.*

**What is Education for Sustainability?**

Societies generally expect educational systems to prepare their citizens for the responsibilities of helping to shape the complex societies in which we live, and to be well prepared for the challenges of the future. The sustainability challenge is similar, and education for sustainability is

a key strategy for developing the knowledge, skills and understandings, and clarifying the values that are necessary if we are to shift towards more sustainable ways of living.

Terms that are used to describe such education include environmental education, sustainability education, education for sustainable development and education for sustainability.

> "We need a shared commitment to education that empowers people for change. Such education should be of a quality that provides the values, knowledge, skills and competencies for sustainable living and participation in society."
> ***Bonn Declaration, UNESCO World Conference on Education for Sustainable Development, Bonn, Germany, April 2009***
>
> "Education not only informs people, it can change them. As a means for personal enlightenment and for cultural renewal, education is not only central to sustainable development, it is humanity's best hope and most effective means in the quest to achieve sustainable development."
> ***UNESCO (2002, p. 8)***

In a number of countries including Australia, the term **Education for Sustainability (EfS)** is more commonly used than Education for Sustainable Development (ESD). Education for Sustainability (EfS) is a process that involves encouraging and building the capacity of people to explore the complexities and implications of sustainability, and to work towards sustainable futures. It is intended to empower individuals, organisations and communities to critically reflect on current practices, identify opportunities, and make informed decisions.

National Education for Sustainability Principles

*Living Sustainably, The Australian Government's National Action Plan for Education for Sustainability* (2009) outlines seven key principles underpinning EfS:

**Transformation and change:** EfS is not simply about providing information but involves equipping people with the skills, capacity and motivation to plan and manage change towards sustainability within an organisation, industry or community.

**Education for all and lifelong learning:** EfS is driven by a broad understanding of education and learning that includes people of all ages and backgrounds and at all stages of life and takes place within all possible learning spaces, formal and informal, in schools, workplaces, homes and communities.

**Systems thinking:** EfS aims to equip people to understand connections between environmental, economic, social and political systems.

**Envisioning a better future:** EfS engages people in developing a shared vision for a sustainable future.

**Critical thinking and reflection:** EfS values the capacity of individuals and groups to reflect on personal experiences and worldviews to challenge accepted ways of interpreting and engaging the world.

**Participation:** EfS recognises participation as critical for engaging groups and individuals in sustainability.

**Partnerships for change:** EfS focuses on the use of genuine partnerships to build networks and relationships, and improve communications between different sectors of society.

**? Question:** What themes would you emphasise in your teacher education institution and programs to ensure they reflect the environmental, social and economic conditions and goals of your communities, region and nation?

**Why is EfS important in teacher education?**

With education identified as the best hope for preparing citizens for a societal shift towards sustainability and the challenges of the future, teachers have a critical role to play (UNESCO, 2005). It is imperative, therefore, that teacher education courses prepare aspiring teachers to be able to educate for sustainability.

**Teacher education** is a *complex system* and **sustainability** is a *complex concept*.

While teacher educators have well-developed understandings of education systems, few have the knowledge and skills to incorporate EfS into the education of pre-service teachers (UNESCO, 2005). Hence, a big challenge for teacher education is to develop teachers who understand and can apply an EfS framework to guide their teaching and learning practices (UNESCO, 2005). A systems approach provides one pathway for teacher educators to develop this understanding, as illustrated in Figure 2.1.

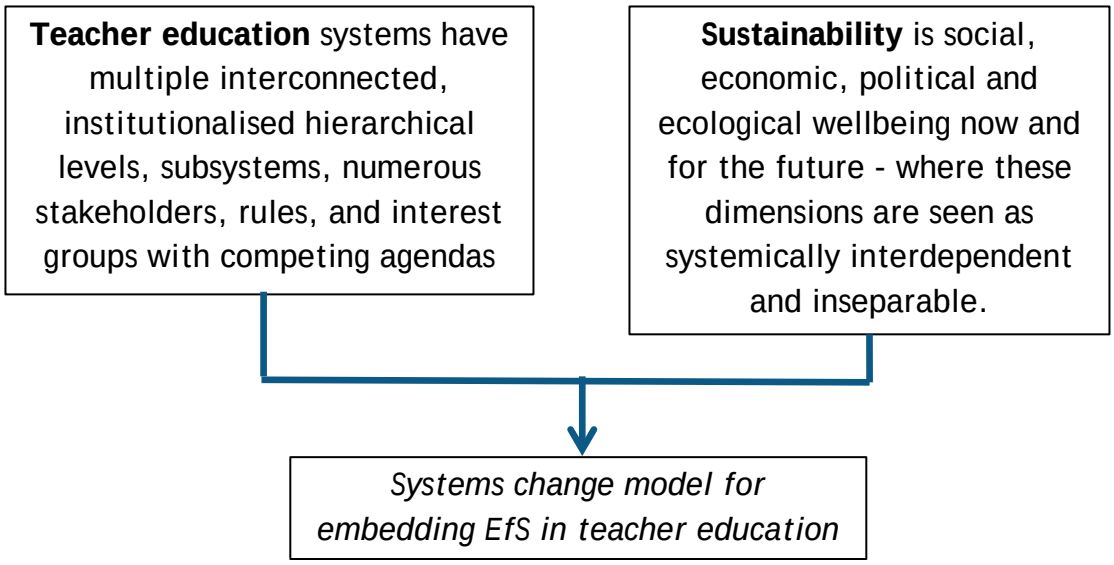


**Figure 2.1 Conceptual framework behind using systems thinking in teacher education**

**? Question:** What do you think are the particular complexities within your teacher education system?

There are a number of reasons for teacher education to engage with sustainability:

- The need to prepare current and future citizens for local, national and global challenges
- Rising public interest and global concern about the environment
- Enrichment of curriculum and enhancement of teaching and learning
- Policy and mandates from government and funding bodies
    - *Sustainability as a cross-curricula priority in the Australian Curriculum* (ACARA, n.d.): The *Australian Curriculum* identifies knowledge, skills and understandings relating to sustainability in natural, social, cultural and economic environments as central to a world-class, futures-focused national curriculum.
    - *The Sustainability Curriculum Framework* (Australian Government Department of the Environment, Water, Heritage and the Arts [DEWHA], 2010): A guide for curriculum developers and policy makers that provides information and guidance on ways to structure EfS to support progressive learning from Kindergarten to year 10.
        - *National Quality Framework for Early Childhood Education and Care*: Learning frameworks that recognise children learn from birth, and outline practices to support and promote children's learning. The National Quality Standard 3.3 is explicitly about sustainable practices in early educational settings.

# The Systems Change Model

**This Section**

- **Describes the background to the systems change model**
- **Describes the systems change model**

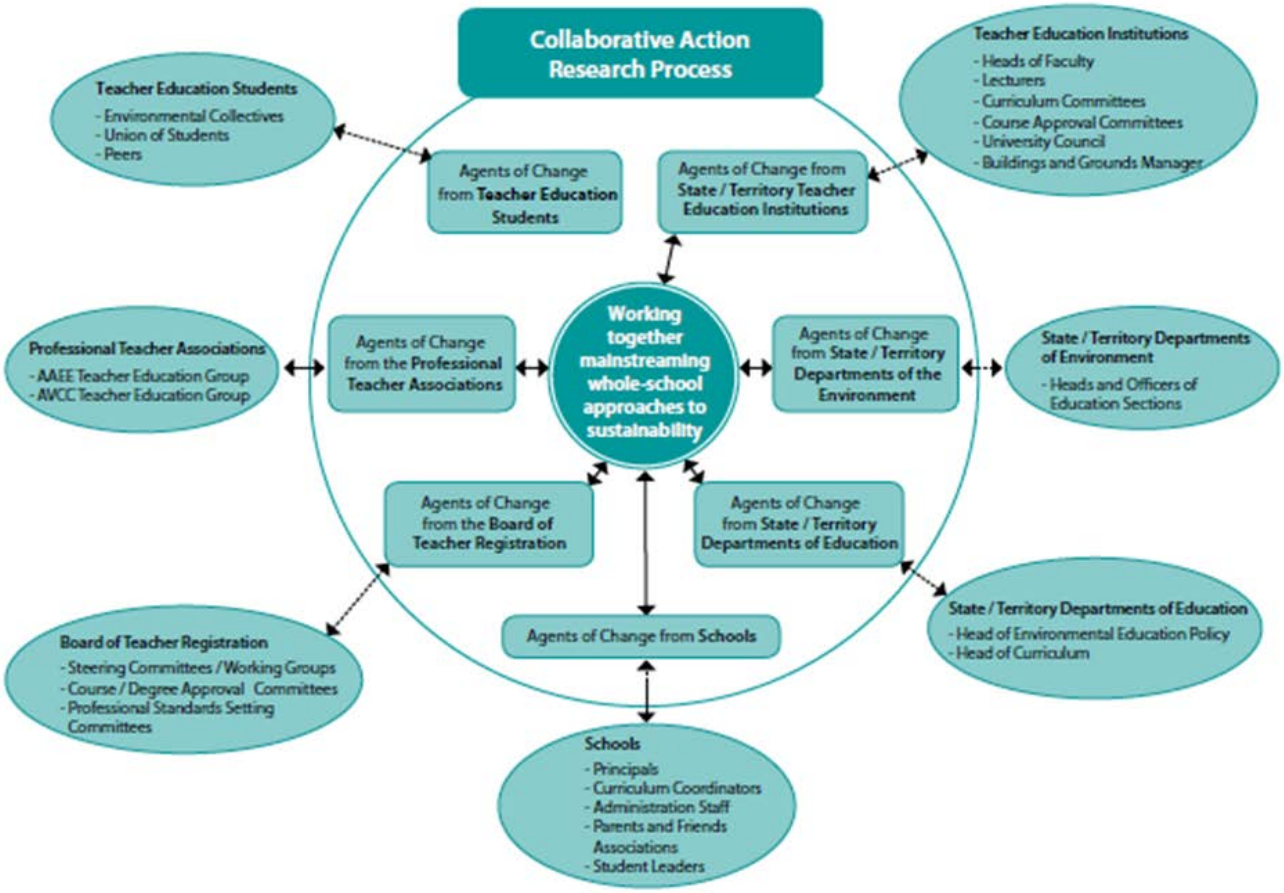


**Figure 3.2 The systems change model for embedding EfS in teacher education (Ferreira et al., 2009)**

**Background**

The mainstreaming EfS model was developed from a multi-stage project (Stages 1-3) begun by ARIES in 2006. What can be considered a fourth stage of this process was undertaken in 2012 by a team from James Cook University, Queensland University of Technology and Griffith University with funding from the Australian Learning and Teaching Council (now the Office of Learning and Teaching). This most recent project sought to investigate methods for mainstreaming EfS into pre-service teacher education, with the aim of developing and trialling a model for a state-wide systems approach to change in teacher education.

**Stage 1:** Whole-school approaches to sustainability: A review of models for professional development in pre-service teacher education and proposal of a systems-based model for change. (2006)

Outcomes from across the four stages:

- *Development and piloting of a systems-wide framework for embedding learning and teaching in EfS in teacher education that can serve as a **model** for other Australian states and higher education institutions.*
- *Identification of key organisations, stakeholders and **agents of change in the systems model** to target for participating in change.*
- *Identification of **enablers and barriers** to mainstreaming EfS in pre-service teacher education, with fragmented and institutionally based approached being identified as a significant constraint, hence the systems-wide framework.*

**Thinking behind the systems model…**

Stage 1 of the project investigated a range of models for embedding EfS into teacher education, and argued that a whole of system model may be the most successful and useful approach. The theory and practice of a systems approach to change shows why:

System-wide change (theory)

Systems change theory is founded on the principle that everything in our world is connected to something else; therefore, sustainable change cannot take place in isolation (Centre for Ecoliterary, 2012). If we consider that most systems contain other *sub-systems* and are nested within larger systems; then changing a system affects both the system within it and the system in which it is nested (Capra, 1997; Centre for Ecoliteracy, 2012; Ferreira et al., 2009). Engaging this system creates **networks** and **pathways for change**.

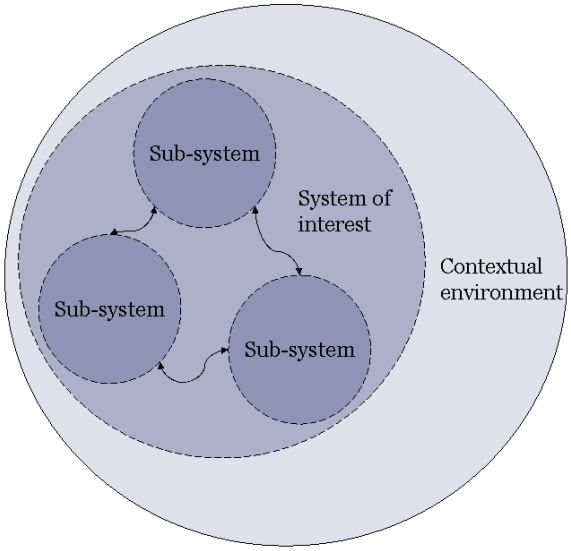


**Figure 3.3 A Generic System Model (Ferreira et al., 2009)**

System-wide change (practice)

In the teacher education context, teacher education institutions – while systems in themselves - cannot be understood apart from the larger system in which they exist and operate. Therefore, enacting change requires a consideration of micro and macro contexts such as faculty and university policies, State and Federal education policies, social and political pressures, and local community settings and aspirations.

The mainstreaming EfS model (Figure 3.1) offers a system-wide strategy for reorienting teacher education towards EfS. Underpinning the model is an assumption that deep and long lasting change requires broad engagement with and between participants across the wider teacher education system as well as their active and deep participation in the process of change. Such an approach would ensure that multiple contexts, sub-systems and levels within a system are aligned in their efforts to reorient the system towards sustainability.

# How to Use the Systems Change Model

**This Section**

- **Describes strategies and tools for implementing the model to create pathways to change**
- **Identifies barriers to the change process, and how to overcome them**
- **Identifies possible outcomes and initiatives**

This section provides advice on how to **implement** the *systems change model* to create **pathways for embedding EfS in teacher education.** The examples used in this Section are the processes we used to implement the systems change model.

**STRATEGIES AND TOOLS**

**Getting started – structuring and scoping the process:**

You may like to view your approach to embedding EfS in teacher education as "a project". This will help provide scope and structure for how you implement the systems change model. We suggest you begin by assembling a project team from various sub-systems in the teacher education system. This will allow you to move beyond individual, siloed attempts at embedding EfS to establish the systems-based networks necessary to create system-wide change.

*Example:*

To initiate implementation of the systems model for embedding EfS in teacher education we assembled our project team - this consisted of teacher educators at the tertiary level from a number of institutions. We then engaged stakeholders from academic, government and professional organisations, as our list of project participants in Appendix A shows.

Scoping your project will also help you to consider and manage timeframe, budget and resources.

*Example:*

Our project was carried out over a 12 month period. The contact activities over this time included ***three workshops (2 days each)*** and ***monthly teleconferences*** and ***email*** contact. This allowed for regular interaction between participants and opportunities to incorporate reflection into the process.

Workshop 1: Introduction of EfS concepts, systems mapping and status of EfS in teacher education, developing networks.

Workshop 2: Focus on leadership, processes for enabling change, Pecha Kucha presentations from participants about *current* status of EfS in their teacher education institution, opportunities for research from the project.

Workshop 3: Pecha Kucha presentations (short format style of presenting – details provided in the *Tools* section below) from participants about the *new* status and *progress* of EfS in their teacher education institution due to initiatives undertaken as a result of this project along with a reflection on the ways in which the model for change and involvement in the project had facilitated this change.

Teleconferences: Monthly check-in with participants to maintain focus, provide support, problem-solve, discuss new knowledge, encourage reflection and continue development of the network.

**Participants and their roles in the process of change:**

Previous stages of the project and the literature on organizatonal change indicated that leadership is an important consideration when seeking to effect systems-wide change. This means it is important to clarify the roles and expectations of the project team and the project participants. We suggest you consider leadership in order to encourage horizontal and vertical leadership to be built through the project.

*Example:*

We explored the theories of leadership with participants in Workshop 2 and examined how they aligned with principles of EfS. Participants found these discussions helped to clarify their positions in the project and their roles within their own teacher education institutions. Most importantly, it helped participants to see themselves as leaders of change in their institutions.

? Question: What kinds of leadership fit best with EfS? That is, what forms of leadership are philosophically consistent with EfS?

**Strategy 1: Engaging and developing the network**

Networks have been identified as a strategy to embed and scale up change within and across systems. It is argued that they offer new ways of building capacity for, and creating the cultural changes required, of large-scale organizations and systems such as teacher education institutions and schools (Ferreira & Davis, 2012).

In implementing the systems change model, you will be creating a network that engages multiple levels of a teacher education system, as shown in Figure 3.1. This is necessary to form the sorts of relationships that will allow for collaboration on key issues and embed change throughout a system.

*Example:*

The project team engaged representatives from teacher education institutions, faculties/ schools of education and relevant professional bodies across Australia in a multi-level systems approach, involving collaboration at the state, institutional and program levels, to develop curriculum practices that reflect a shared vision of EfS.

1. The project commenced in Queensland and first identified and engaged key participants at the faculty level. Together these participants developed of a vision of EfS in teacher education for the project as a whole and worked together to identify what was meant by the Queensland teacher education system, the key components or sub-systems, and the relationships between these parts.
2. The network was then expanded to include all other sub-systems such as teacher registration authorities, government agencies and professional associations.
3. Next a national network that included a representative from one teacher education institution from every other state and territory in Australia was developed with the aim of establishing strong state-based teacher education networks, all working to embed education for sustainability, in each state and territory.

Benefits of the state network included: participants felt they became part of a broader network that could have an impact, rather than feeling isolated; participants learnt about the status of EfS in different universities in different parts of Queensland, and shared and learnt from each others experiences.

For these Qld representatives, the initiation of a national network enabled them to share their knowledge, understandings and experiences that they had gained over the life of the project. For the national representatives, the network enabled them to draw from more experienced change agents, and to share and compare stories of EfS from a wide range of contexts.

These networks and relationships were created and nurtured across the three project *workshops* and monthly *teleconferences*, supported by the National Teacher Education for Sustainability Network – an online space developed as an initiative of the project.

**Key Lesson:** Networks create relationships within a teacher education system and provide commitment and support for systems change initiatives.

**Strategy 2: Systems Mapping**

Given the systems focus of the change model, it is important to explore and identify the elements of the system within which the change is intended to occur. Systems mapping is a strategy that helps to identify the components of a system (the sub-systems) and the relationships and interactions between them.

Systems mapping supports ***strategic action*** by helping to map out ***spheres of influence***. For each component in a system, try to identify the key agents of change. Also think about how the components interact with one another and how the *system interacts with its environment*.

In pre-service teacher education, key agents of change could include teacher education institutions (administrative and academic staff, students), departments of education and the environment, boards of teacher registration, professional teacher associations, and schools.

Systems mapping complements Strategy 1 Engaging and developing the network because the very relationships formed to create the network will also work to facilitate change within the system. Put another way, collaboratively developing a **systems map** provides the *structure for change*, and the **networks** provide the *relationships for change.*

*Example:*

We engaged our participants with this strategy through the use of a systems mapping exercise. The exercise was carried out during Workshop 1 using the template shown in Appendix 2.

While the template provided trigger questions to engage participants to consider key elements within the system, we did not prescribe what the output should look like. As a result, these system maps took shape in the form of drawings, mind maps and PowerPoint slides. Examples are included in Appendix C.

Participants found the systems mapping provided a sense of purpose and a clear strategy. The systems mapping exercise also enriched their understanding of the system – both its complexity and their role in it. Participants indicated they found the systems mapping exercise worthwhile – and were also then able to develop systems maps of their own institutions.

**Key Lesson:** Systems mapping provides opportunities to broaden understanding of a teacher education system and the relationships between its component parts. It also encourages creative and critical thinking.

**Strategy 3: Providing, Sharing and Developing New Knowledge and Information**

As with any new project, process or model, there may be varying levels of understanding amongst participants around key concepts such as EfS, systems change and systems thinking. It is important to develop shared understandings of these concepts such that participants are able to communicate effectively on these issues and decide on appropriate actions to take to enable change.

*Example:*

To explore conceptions of EfS we carried out the following tasks with participants in *Workshop 1*:

- Small group discussions about sustainability and what it means for educators
- Discussing and identifying characteristics of EfS
- Discussing implications for teacher education curriculum and pedagogy
- Asking participants to share current status and approaches to EfS in their teacher education institutions

This allowed members of the group to develop a vision of EfS that is appropriate to their institutional situation and an understanding of the implications for teacher education, and how embedding EfS into teacher education may best be achieved. These activities also allowed participants to identify opportunities for change within their own institutions.

Under the guidance of the project team, each of the representatives within the state network went on to work with their teacher education colleagues to identify and map approaches to embedding EfS in their teacher education curriculum that were consistent with the project's shared vision of EfS. Support for this process of change was provided through monthly *teleconferences*, *email, a website* and *workshops*.

We also used *Pecha Kucha presentations* in the second workshop to allow participants to share the current status of and experiences with embedding EfS in their teacher education institutions. Pecha Kucha were also used in the third workshop to allow participants to illustrate changes they had achieved over the life of the project. This provided valuable insights and lessons for others in the network, including members of the national network, to the barriers to and opportunities for change.

**Key Lesson:** Some shared understandings and some key common elements of a vision of EfS is required within in the system for system-wide change to occur. Sharing and developing knowledge within the network allows for the development of a system wide vision and approach to change.

**Strategy 4: Action research/Reflection-on-action**

When working to effect change within a complex system – such as the teacher education system - cause and effect can be hard to recognise and measure. Influences and actions undertaken may have unexpected results, and these often manifest in non-linear ways. Action research, with its strong reliance on reflection, provides an approach to understanding the impact of actions and interventions within a system (Kemmis & McTaggart, 2005). Critical versions of action research are conceptually consistent with EfS (Stevenson & Robottom, 2012).

Action research involves a systematic process of cycles of planning and action followed by observations and reflection. Participants define a problem, such as embedding EfS in teacher education, plan and undertake actions, then monitor/evaluate and reflect on observations of these actions. Additional cycles of action are initiated to incorporate the lessons from previous action/reflection cycles. Reflection-on-action is a less formal and systematic process than action research.

*Example:*

In this project we employed reflection-on-action that involved reflection and reflexivity throughout the implementation process. The workshops and teleconferences included activities and discussion on how the project was progressing, what initiatives were taking place in other institutions, and the challenges being faced along the way. These opportunities for reflection allowed actions to be revised – to incorporate new learning - as the project progressed. The reflection-on-action processes encouraged and enabled participants to deeply engage with the process of change.

**Key Lesson:** Action research or reflection-on-action are useful approaches when undertaking a systems-based approach to change as it provides opportunities for deep engagement, reflection and change.

**Tools**

There are a number of tools that can be used to implement the strategies described above. When selecting tools, keep in mind the principles of EfS to ensure the tools align with these principles. For example, collaborative, participatory tools are most appropriate for engaging people in networks and creating partnerships The tools we used in the project are outlined below.

A note on the use of *reflection and reflexivity*: no matter what approach you take to embedding EfS in teacher education, how you use the resources here, or whether you even choose to use this specific model or not, reflection is an essential tool to incorporate into your process.

? Question: Which of the tools listed below might work for you and your team – or perhaps are already working for you? What other tools and tactics might you or your colleagues have in your toolkit?

**Workshops**

This tool provides a safe, face to face space within which to:

- Create new relationships and networks
- Collaborate, participate and support
- Develop knowledge and understanding
- Think critically
- Reflect on processes of change

Our project held three workshops, of two days each, around 3 months apart.

Participants gained important benefits from the workshops including: building support through being part of a broader network, creating new relationships within the teacher education system, clarification of purpose and process, exposure to new knowledge and perspectives, and understanding that people are at different stages and were doing different things in the EfS journey.

Key activities used in the workshops are included in *Section 5: Resources* under the **Activities** heading.

*Tip:* Workshop minutes are valuable research data. Make sure you have ethics approval to use this data!

+

**Teleconferences**

This tool provides opportunities to:

- Use technology to overcome location and cost barriers
- Maintain contact within a network over time
- Achieve similar outcomes from workshops in a more efficient way, eg. group discussion, develop networks

Our project used monthly teleconferences to encourage participants to discuss emerging issues, understandings of EfS, constraining factors, to reflect-on-action and systemic change processes. Participants liked the sharing nature of these meetings as they helped them to stay focused on the project, and to discuss and clarify issues as they emerged.

*Tip:* While we found it useful, Skype can be problematic given the variety in bandwidth participants have access to. A number of alternatives such as UStream are now emerging.

**Pecha Kucha**

This is a presentation tool that allows for short, sharp presentations.

- 20 slides x 20 seconds each, automatically timed = 6min 40sec
- The format makes presentations concise, and keeps things moving at a rapid pace

We used this tool for participants to showcase EfS in teacher education at their institutions, and to highlight the progress that had been made as a result of systems change.

Participants enjoyed this style of presentation and were glad to have the opportunity to share and discuss progress on their initiatives.

*Tip:* Varied interpretations of the concept of Pecha Kucha can result in interesting presentations. There are many websites with information and advice on Pecha Kucha.

**Case Studies**

This tool is used to report, investigate and analyse an individual unit. They can be presented in many formats.

Participants were asked to prepare a case study as part of the project (we provided them with a template, included in Appendix D). Preparing a case study helped participants to capture and evaluate their initiatives for embedding EfS in teacher education. Participants reported that they found the case studies enjoyable to write, as they provided them with an opportunity for reflection, and to identify potential areas of research.

*Tip:* Although we referred to these documents as case studies, they were in effect a personal narrative of participants' lived experiences.

**BARRIERS and OPPORTUNITIES**

The systems change model we are proposing here is not designed to uphold the status quo. Rather, its intent is to create change within a system. Consequently, there are likely to be barriers to implementing such change. Listed below are some of the common hurdles to embedding EfS in teacher education people mention. Following this, we offer a number of possible ways to overcome such barriers. The barriers presented here emerged from our own research in this project (Stage 4) as well as Stage 3 (Steele, 2010).

***Engaging the system:*** Research shows individual teacher educators are largely motivated to change and have the ability to incorporate EfS (Steele, 2010). The greatest constraint is providing overall systemic support for this action to happen.

***Crowded curriculum:*** Teacher educators often feel that there is no space for more material within their curriculum.

***Systemic structures***: The siloed nature of organisations responsible for policy and curriculum direction provides a challenge to integrated, interdisciplinary change.

***Economics/financial support for change:*** Lack of resources or additional funds are often cited as a barrier to change.

***Volatility of the higher education sector***: The higher education sector is undergoing significant change, including restructuring in many institutions. There is uncertainty of the outcome of such restructures. e.g., how will staff profiles be reshaped, will key academics still be available to undertake new work, etc.

***Limited awareness or expertise in staff and/or institution*****:** Individuals' understandings of EfS are often limited if they are viewed solely through the lens of individual disciplines. For example, a science educator may not see the relevance of discussing the social justice or economic dimensions of EfS, making it difficult for those seeking to enact change to convince others of their role in that change.

***Limited institutional commitment***: Disconnect between different levels – e.g., there may VCs who endorse sustainability at an institutional level, which may not align with the priorities of those who are concerned with managing budgets.

? Question: Which of these barriers do you recognize from your attempts to introduce or embed EfS into your teacher education programs? Are there any additional factors at play in your setting?

While these barriers to change may at times be overwhelming, we list below a number of strategies for overcoming these barriers.

| | **Barrier** | | | |
|---|---|---|---|---|
| | Engaging the system | Crowded curriculum | Systemic structures | Economics/financial support for change |
| **Pathway to Change** | A systemic approach to change provides opportunity to ensure systemic support for embedding EfS. Individual educators can employ systems thinking and tools to engage the system. | Embedding EfS in teacher education does not necessarily mean adding significant new content; often it is a matter of modifying existing content. Start with an audit to see what is already relevant, and what can be built upon. | Shifting the view from 'silo' to 'system' allows for links to be made between disciplines, faculties and institutions. Use these links to create support and increase the spread and efficiency of EfS initiatives. | See what existing resources can be reoriented; seek opportunities to apply for grants internally and externally. |
| **Example** | *Involvement in a state-wide system has given the activities of individuals involved in the project status, legitimacy and a high profile within their institutions.*<br>*When there is support from higher levels, eg. Govt, other parts of the system feel supported and there is less resistance to change.* | *At one of the participating institutions a curriculum refresh was underway at the time stakeholders were investigating embedding EfS into the teacher education programs. What was intended to be a minor revision to programs became an unforeseen opportunity to make links between faculties, leading to a major restructuring of courses.* | *The involvement in the EfS project has enabled the sustainability voice to be heard. The project has provided me with the voice to offer suggestions to our program developer about where sustainability can be included.* | *For some institutions the project was able to be piggybacked to a curriculum refresh initiative, hence the project was supported and given prominence through the refresh process. In this way, more people were engaged in talking about EfS than might have been otherwise.* |

| | **Barrier** | | |
|---|---|---|---|
| | Volatility of higher education sector | Limited awareness or expertise in staff and/or institution | Limited institutional commitment |
| **Pathway to Change** | The higher education sector is changing all the time. However this dynamic atmosphere presents opportunities for deeper and wider change as existing systems, structures and processes are dismantled. | It is not necessary to be an expert to begin to explore possibilities for EfS in teacher education.<br><br>Professional development, connecting with EfS networks and experienced colleagues can help establish new knowledge and understanding of EfS.<br><br>See the Resources section for information on further developing your own understandings of EfS. | While there may not be explicit mandates for EfS in your institution, there are often EfS dimensions that can be explored within existing teacher education agendas.<br><br>Find these openings to build alliances, interest and commitment. Develop a business case for EfS in your faculty. |
| **Example** | *While we couldn't see changes at the start of the project, they ended up coming about very quickly – hard and fast.* | *Through knowledge gained and connections made in this project, links have been made between professional experience and EE centres. As a result, there are now two students undertaking their professional experience placement in EE centres, extending the teacher education experience of EfS beyond the tertiary setting and out into the system.* | *This project and process has provided a voice for EfS at my university. It has created awareness (even though some people are still not interested). Prior to the project, we never had sustainability as a university theme and it has now become one.*<br><br>*As a result opportunities have arisen at different levels – (1) units of work now have to be explicitly accountable at institutional level to meet sustainability outcomes. (2) opportunities for research to try to understand how universities are interpreting sustainability.* |

**INITIATIVES and OUTCOMES**

The bubbles below describe initiatives implemented by our project participants. Which of these would you like to experience as a result of your efforts to embed EfS in teacher education at your institution?

Create a local sustainability network at your education faculty level. Use this as a platform to map the teacher education system and expand your network

Contribute to the development of a vision of EfS in teacher education for your university

Map current EfS practices and needs within at least one teacher education subject/program at your university, and where this fits within the greater teacher education

Extend the repertoire of curriculum and resources for embedding sustainability in teacher education and major disciplinary areas

Improve pedagogy through creating communities of EfS practice across schools of education and select disciplinary areas

Develop and implement activities to enhance participation and engagement of academic staff across schools of education and disciplinary specialisations

Apply action research principles to your network communications and initiatives to create opportunities for learning, reflection, and revising actions as needed

Use tools like case studies to create data for potential research on embedding EfS in teacher education

Capitalise on the networks that have been created within the system to generate future projects

Use your approaches to and projects for embedding EfS in teacher education as opportunities for your own research or as material for paper

Upon completion of our project the following short-term and anticipated long-term outcomes were identified:

*Immediate outcomes*

- Expansion and strengthening of a Queensland state network to include all Queensland teacher education providers and relevant stakeholders.
- A range of case studies providing examples of ways of implementing EfS in teacher education, reflective of a various contexts and starting points.
- Establishment of a national network.
- Showcasing a range of strategies for participants on key sustainability concepts, pedagogies and ways these can be embedded in existing practices.
- Introduction of EfS into universities that previously had not addressed this body of knowledge and practice.
- Strengthening of pre-existing initiatives in universities that were already engaging in EfS.
- Sharing lessons through conference and seminar presentations.
- Enhanced understanding of systems theory
- Use of the systems change model in other teacher education contexts.
- Beginning of National Teacher Education for Sustainability network with a web presence (http://groupspaces.com/NationalTeacherEducationforSus/)

*Anticipated long term outcomes*

- Change in teacher education towards sustainability.
- Teacher registration standards addressing EfS.
- Impact of EfS on teaching and learning pedagogies and practices.
- Enhanced teacher educator capacity to embed EfS into pre-service teacher education.
- Enhanced teacher workforce capacity to embed sustainability into teaching and learning practices for all ages of schooling.
- Increased interdisciplinary partnership capacity.
- Added impetus to higher education initiatives through a flow-on effect that can link, support and add to existent initiatives.

These outcomes and anticipated outcomes present many opportunities for you to take advantage of the *existing momentum* created by this project and to implement your own approach to using the systems change model for embedding EfS in teacher education. Remember, this is just a beginning – we anticipate that interest in embedding EfS in teacher education in Australia will continue to expand. We welcome you to be part of this journey.

# Resources

**This Section**

- **Provides resources and links to help you understand EfS, use the systems change model, and use the implementation strategies and tools presented in this guide.**

Key websites, help guides, policy papers, reports, books, journals and conferences are outlined here as additional resources to support you when using the systems change model.

Websites

**National Centre for Sustainability**
http://www.ncsustainability.com.au

The NCS is a collaboration of several educational institutions providing educational leadership and work in partnership with industry, government and the community to undertake program delivery, resource development, project work and applied resource, to support the development of sustainable practices. A useful training kit is also available at this site: http://www.ncsustainability.com.au/PDKit/index.htm

**The Education for Sustainability Professional Learning Hub (the Hub)**
http://www.efslearninghub.net.au/

The Hub is an interactive online learning network that supports sustainability professionals who use Education for Sustainability (EfS) to create change. The Hub is a platform for learning and exchange, working to connect, equip and motivate people who work in EfS.

**The Australian Research Institute for Environment and Sustainability**
http://www.aries.mq.edu.au/

ARIES promotes learning and change for sustainability incorporating both research and practical facilitation.

**Australian Government Sustainability Education**
http://www.environment.gov.au/education/

Australian Government Department of Sustainability, Environment, Water, Population and Communities

**University Leaders for a Sustainable Future**
www.ulsf.org

The Association of University Leaders for a Sustainable Future (ULSF) promotes sustainability as a critical focus of teaching, research, operations and outreach at colleges and universities worldwide through publications, research, and assessment. ULSF is also the Secretariat the Talloires Declaration, a ten-point action plan committing institutions to sustainability and environmental literacy in teaching and practice.

**Sustainability Curriculum Framework: A guide for curriculum developers and policy makers**
http://www.environment.gov.au/education/publications/curriculum-framework.html

Australian Government Department of the Environment, Water, Heritage and the Arts, May 2010

**National Quality Framework for Early Childhood Education and Care**
http://acecqa.gov.au/national-quality-framework/

National learning framework for early childhood education managed by the Australian Children's Education and Care Quality Authority (ACECQA). National Quality Standard 3.3 is about sustainable practices in early educational settings.

**James Cook University Education for Sustainability LibGuide**
http://libguides.jcu.edu.au/sustainability

This online EfS resource bank has been designed for teacher educators, researchers, pre-service teachers, school teachers and students. The tabs above provide access to resources that support EfS across different learning areas and phases of learning. We hope that you find the resources interesting and useful! We encourage you to provide feedback so that the bank continues to grow.

**Centre for Research and Innovation in Sustainability Education (CRISE)**
http://www.jcu.edu.au/cairnsinstitute/research/JCU_098314.html

Housed in the Cairns Institute at James Cook University, CRISE encourages and supports a range of collaborative research projects on sustainability education.

**Australian Campuses Towards Sustainability (ACTS)**
http://www.acts.asn.au/

An association promoting sustainability in the Australian and New Zealand tertiary sectors. ACTS' mission is to promote the integration of the principles of sustainability within learning and teaching and across campus operations.

**Help guides**

Teacher education

- Guidelines and recommendations for reorienting teacher education to address sustainability (UNESCO)
  http://www.unesdoc.unesco.org/images/0014/001433/143370e.pdf
- Teaching and Learning for a Sustainable Future (TLSF) (UNSESCO)
  http://www.unesco.org/education/tlsf/
- Competencies for ESD Teachers (ENSI) http://www.ensi.org/media-global/downloads/Publications/303/CSCT%20Handbook_11_01_08.pdf

Higher education

- Drivers and barriers for implementing sustainable development in higher education (UNESCO) http://unesdoc.unesco.org/images/0014/001484/148466E.pdf
- Turnaround leadership for sustainability in higher education http://www.uws.edu.au/__data/assets/pdf_file/0012/401241/TLSHE_executive_summary_final_version_for_web.pdf
- The FutureFit Framework: A guide to teaching and learning for sustainability in higher education http://www.eauc.org.uk/the_future_fit_framework_an_introductory_guide_1

**Activities**

**Kotter's 8 step process for leading change**
http://www.kotterinternational.com/our-principles/changesteps/changesteps

**Kotter's Our Iceberg is Melting**
http://www.kotterinternational.com/our-principles/our-iceberg-is-melting

**Policy**

Caring for our Future: The Australian Government Strategy for the United Nations Decade of Education for Sustainability, 2005 - 2014.

Living Sustainably: the Australian Government's National Action Plan for Education for Sustainability.

**Reports**

Mainstreaming Sustainability into Pre-service Teacher Education – Stage 1: Whole-school approaches to sustainability: A review of models for professional development in pre-service teacher education (2006)

Mainstreaming Sustainability into Pre-service Teacher Education in Australia – Stage 2 (2009)

Mainstreaming Sustainability into Pre-service Teacher Education in Australia – Stage 3: Enablers and constraints (2010)

**Books**

Turnaround leadership for higher education (Fullan & Scott, 2009)
Education for sustainability (Huckle & Sterling, 1996)
Sustainable education: Revision, learning and change (Sterling, 2001)
International Handbook of Research on Environmental Education (Stevenson, Brody, Dillon & Wals, 2012)

| Journals |
| --- |

Environmental Education Research
The Journal of Environmental Education
The Australian Journal of Environmental Education
Sustainability Education
International Journal of Sustainability in Higher Education

| Conferences |
| --- |

Australian Association of Environmental Education Conference (AAEE)
Australian Campuses Towards Sustainability Conference (ACTS)
Australian Teacher Educators Association Conference (ATEA)
New Zealand Association of Environmental Education Conference (NZAEE)
American Educational Research Association Annual Meeting (AERA)
World Environmental Education Congress (WEEC)
North American Association for Environmental Education Conference (NAAEE)

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# Appendices

Appendix A – Project Participants

Stakeholders from Queensland universities:

- The Cairns Institute and School of Education, James Cook University
- Faculty of Education - Early Childhood, Queensland University of Technology
- Griffith School of the Environment, Griffith University
- The School of Education, James Cook University
- Faculty of Science, Health, Education and Engineering, University of the Sunshine Coast
- Faculty of Education - Early Childhood, Queensland University of Technology
- School of Education and Professional Studies, Griffith University
- Faculty of Education, University of Southern Queensland
- School of Education, Central Queensland University
- School of Education, The University of Queensland
- Faculty of Education, Australian Catholic University

Stakeholders from universities outside Queensland:

- Faculty of Education, University of Canberra
- Faculty of Education, University of Tasmania
- School of Education, University of South Australia
- School of Education, Charles Darwin University
- School of Education, University of Newcastle
- Faculty of Education and Arts, Edith Cowan University
- School of Education, RMIT University

Stakeholders from government and professional organisations:

- Education Queensland
- Queensland College of Teachers
- Australian Association of Environmental Education (AAEE)
- Australian Teacher Education Association (ATEA)

**Appendix B – Systems Mapping Exercise Template**

**ALTC/OLT EMBEDDING SUSTAINABILITY IN TEACHER EDUCATION**

**SYSTEMS MAPPING EXERCISE**[1]

This exercise seeks to help you in identifying the components of your system (the sub-systems) and the relationships and interactions between them.

Remember that these systems are social systems so in seeking to change or improve how a system functions, we need to be able to identify the purpose of each component (what are their ends?) and how this affects their interactions with other components in the system.

For each component in your system try to also identify the stakeholders and enabling members. Also think about how the components interact with one another and how the system interacts with its environment.

**1. IDENTITY**

What is the **identity** of your system (the inner circle)? What distinguishes it? How would you recognize it? If you were to name it, what would you call it?

What is the identity of the wider system (the environment) in which your system is located?

**2. PURPOSE**

What is the **purpose** of your system?

What is the purpose of the wider system/environment in which your system is located?

[1] Based on ARIES Critical Systems Approach handout; Mackenzie, B. (2007) Systemic Development Institute workshop; and Gharajedaghi, J. & Ackoff, R. (1984) Mechanisms, Organisms and Social Systems. *Strategic Management Journal*. Vol. 5, Issue 3, pp. 289-300.

**3. TWOCAGES**

**T-** What is the **TRANSFORMATIONAL** statement, that is, what do you want to transform? Work from the present to the desired situation.

**W - WHY** is this issue/ change important? What is your interest in the issue?

**O –** Who **OWNS** this, that is, who has the power and/or influence to allow/enable this change?

**C –** Who are the **CLIENTS** of this transformation? Consider both beneficiaries and sufferers.

**A –** Who are the **ACTORS**, that is, who is going to do the work to make the transformation happen?

**G –** Who will be the **GUARDIAN** or custodian of the transformation process? This is someone who is independent/ has no power but who can give voice to the consequences of the actors' actions that they may not see.

**E –** What are the **ENVIRONMENTAL** factors that affect the system? That is, what will expand or restrict the process of transformation – think about resources, social norms, institutions, policies, regulations and legislation, technology, communications, research, individuals, etc.

**S -** What are the **SUB-SYSTEMS?** The sub-systems are the **components** through which the system is able to be transformed – think of them as functions and/or activities. Describe the purpose and function of each sub-system: what does it do, how does it make an important contribution to the larger system?

Next think about the all-important **relationships** between the sub-systems, as these are more important than the sub-systems themselves when seeking to transform a system.

**4. MODELLING**

Develop a model of your system – look at the ARIES reports and papers we have shared with you to see examples.

What is most important in your model is to think deeply about the relationships and interactions between the sub-systems. Develop a 'demand' model by asking what each sub-system needs of every other sub-system. Think also about resources, information, products, power, influence, communication within and between your sub-systems.

You could number or letter your sub-systems to make it easier to write down, so, what does sub-system A need from sub-system B, etc. for it to function/ achieve its purpose? Do this for each of the relationships between each of the sub-systems.

Appendix C – Case Study Template

**TEMPLATE FOR CASE STUDIES**

1. Title (of your project)

2. Your contact details (that you are happy to have up made public in an OLT report)

3. The context/ background (to your sub-system/system) – approximately 200-300 words – generic information about your institution, student load and type, etc.

4. How you became involved in your project (that is, what your history / interest in EE/EfS is and in teacher education and therefore in this project) – approximately 200-300 words

5. Describe the key characteristics of EfS that have underpinned your work in this project?

6. Key players and their roles (in your project)

7. Describe one – or a couple – of stories that best capture the most significant impacts and outcomes that have come about as a result of this project; including why this was significant for you and your system/ sub-system) – 1-2 pages, can include images

8. Working systemically (what new connections – and old ones you have built on - have you made in your teacher education system through and as a result of this project?) – approximately 200-300 words

9. What have been the biggest challenges or impediments to change? – approximately 100 - 200 words

10. What have been the biggest opportunities for change/factors critical to success? – approximately 100 - 200 words

11. Looking to the future (what future plans do you have for your system) – approximately 200-300 words