Creating Change for Sustainability in Universities in Australia, One System at a Time

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Abstract

Higher education should be advocating for future citizens to engage in creating a more sustainable world. Teacher education, however, lags behind in building the capacity of 21st century teachers to facilitate such a transformation. This chapter discusses a decade-long Australian research program that has agitated for change using systems theory to build teacher educator capacity in education for sustainability (EfS). The program works to achieve change across the whole teacher education system, thereby overcoming many challenges inherent in the small-scale, fragmented initiatives that are typical in higher education and teacher education. Through collaborations between teacher education academics, policy makers and representatives from professional and non-government organisations, the program has effected change for sustainability through new policy directions, curriculum initiatives, and leadership capacity-building for EfS. Within universities, particularly, the program has engaged change agents at all academic levels, with different EfS expertise, and across disciplines. Reports, papers, case studies and a guide on using systems change are specific outcomes of the research program. A national network of EfS teacher educators continues the collaborations. Drawing on this example of academic engagement with sustainability in a discipline area that has been slow to engage, this chapter offers a theoretically robust way to scale up sustainability across the whole of a university.

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1 Introduction: Higher Education, Teacher Education and Sustainability

Higher education institutions have an unavoidable responsibility to place education for sustainability (EfS) at the heart of their concerns (Gale et al. 2015) and should be advocating for future citizens to engage in creating a more sustainable world. Yet, the practice of embedding 'higher education for sustainability' (HEFS) into university courses and programs has encountered significant implementation barriers (ALTC 2010; Adomssent and Michelsen 2006; Moore 2005; Sterling 2014). This is despite the fact that many higher education institutions around the world have committed to embedding sustainability as a strategic initiative into core activities and despite international impetus from, for example, The United Nations Decade of Education for Sustainable Development 2005–2015 and a multitude of international declarations. These include, since the early 1990s, the Talloires Declaration of University Leaders for a Sustainable Future (1990), the Swansea Declaration (1993), and CRE Copernicus Charter (1993), and more recent initiatives such as the International Green Gown Awards, initiated in 2004. Indeed, many institutions have built significant research profiles and capabilities around sustainability-related research and have embraced, quite enthusiastically, campus greening initiatives, such as reducing energy and water footprints, constructing iconic 'green buildings', reducing waste and improving recycling efforts. Our concern, however, is that reshaping Higher Education (HE) curriculum towards sustainability has been a much harder task. The voices that speak for sustainability education remain few and are often marginal, lost in, for example, a seemingly global fixation with STEM (Science Technology Engineering and Mathematics) education (Freeman et al. 2015) as offering the best way forward for universities and societies to meet and overcome future challenges to environmental sustainability.

With such poor focus on reorienting university curricula to sustainability, it is little wonder that specific disciplines often fail to engage with EfS in their programs and courses. In this chapter, the focus is on sustainability within teacher education faculties and departments in higher education institutions, and specifically on pre-service teacher preparation programs. As Stevenson et al. (2015) argue, "threats to the wellbeing of current and future generations brought about by disruptions to social and ecological systems highlight the urgent need for schools and teachers to deliberately engage with educational strategies aimed at [embedding] sustainability issues" (in press), with recognition that pre-service teacher education provides an accepted strategy for ensuring that future teachers "develop the knowledge,

understanding, values and skills necessary to embed education for sustainability (EfS) into their teaching and learning practices" (in press). However, embedding EfS in teacher education has been identified as a neglected or ad hoc area of practice and scholarship (Ferreira et al. 2014a, b; McKeown-Ice 2000; United Nations Educational, Scientific and Cultural Organisation [UNESCO] 2009).

Stevenson et al. 2015 note that EfS initiatives in teacher education have mostly occurred, to date, through relatively short-term professional development in education for sustainability for pre-service education academics—either individually, or in small groups (Ferreira et al. 2014a) or, more commonly, arising from the particular interest and/or dedication of individual academic staff members within their own pre-service teacher education institutions (Ferreira et al. 2015). Evidence suggests that such superficial—though well-intentioned—efforts are most likely the case in other faculties and departments within universities. Research, both internationally and in Australia, indicates that such limited efforts do not adequately prepare teachers for teaching education for sustainability in schools (Miles et al. 2006; Ferreira et al. 2014a, b; Boon 2010). Indeed, in the Australian context, recent research identifies that around 80 % of teachers are either unaware of education for sustainability or do not understand what it is, and that only 2 % use EfS teaching practices in their classroom (Australian Education for Sustainability Alliance [AESA] 2014).

As has been noted by several authors with an interest in educational change (Fullan 2013; Hargreaves and Shirley 2012; Frost 2012; Tom 1997), sustaining curriculum change within education institutions is notoriously difficult. The loss or relocation of key champions for education for sustainability in teacher education, a range of contextual constraints such as the increasing publication and teaching demands on teacher education academics (Wergin 2007), an ever-expanding casualized academic workforce, and a constantly changing policy environment in pre-service teacher education have resulted in fragmented and poorly planned EfS projects (Russell et al. 2001; Steele 2010; AESA 2014), all of which impact on engagement with, and enthusiasm for, further change initiatives. Additionally, as McNamara (2010, p. 49) argues, curriculum change is difficult because teacher education institutions are "loosely coupled systems with a unique culture of collegial, bureaucratic, political, and anarchical systems and values" (Ferreira et al. 2015, p. 195).

In recognition of such constraints, the authors of this chapter assert "that embedding EfS in pre-service teacher education requires a more coordinated and coherent system-wide approach" (Davis et al. 2015, p. 10). This chapter draws on the reports, chapters, papers, case studies and an implementation guide that these authors have produced over the past decade that report on and discuss initiatives aimed at changing the whole of the teacher education system rather than small, piecemeal components. In so doing, the change program has sought to go beyond simple adaptations or variations of content and courses that 'fit in' with existing educational structures, objectives and processes, instead, advocating for EfS as a core focus and activity of teacher education curriculum policies and practices. For this to occur, deep and wide transformative curriculum change in how teacher

education is implemented is necessary, rather than adaptive responses that are seen as shallower and narrower (Ferreira and Davis 2015).

2   The Purpose of Our Research: Systems Change for Sustainability in Teacher Education

In an effort to bring about such deep and wide changes in how teacher education responds to sustainability, a research program using a systems approach has been established in Australia. From this program has developed a Systems Change Model (Ferreira and Ryan 2012), based in systems theory and systems change (Capra 1997; Sterling 2004) to build teacher educator capacity in education for sustainability within Australian universities. We believe there are opportunities to be shared and lessons to be learned from this decade-long change program that are relevant to other disciplinary areas within higher education. Additionally, there may also be pointers to how all universities might systemically transform their sustainability policies and practices in relation to greening the curriculum. At the core of this approach is the necessity to overcome the many challenges inherent in the small-scale, fragmented initiatives that are typical in higher education and teacher education. Contrastingly, the process works to achieve change across multiple systems and sub-systems within a faculty's or university's education system in collaboration with those outside the HE institutions who also have an interest in creating change for sustainability.

In this systems change program, collaborations between teacher education academics from within and across universities, along with policy makers and representatives from professional and non-government organisations such as teacher registration and employer groups, were brought together to effect change for sustainability. This has led to renewed policy directions, stronger EfS curriculum initiatives, and leadership capacity-building for EfS amongst teacher educators. Within the participating universities, the program has engaged a new set of change agents for sustainability at all academic levels, with different amounts of EfS experience from 'old hands' to newcomers, and from across a wide range of disciplinary backgrounds. The changes within the teacher education faculties/departments also directly impacted other disciplinary fields within the universities and, in some cases, connected with—often for the first time—longer-running campus greening programs and initiatives.

A key part of the systems change program was bringing together EfS leaders and potential leaders in teacher education from a number of universities that were somewhat connected through their geographical locations (the north-eastern part of this large continent). This 'coming together' encouraged change agents for sustainability to draw strength and ideas from each other in support of institutional HE change, and helped overcome the isolation many teacher education academics have felt working within their own teacher education organisational units. Thus, cross-university teams have now been working over the last decade to mainstream

and embed sustainability within Australian teacher education curriculum using the Systems Change Model (Ferreira and Ryan 2012) that has developed from this program. This is a participatory system-wide model aimed at facilitating change across a whole system by building partnerships that include higher education institutions (primarily teacher educators and students, but not exclusively), teacher registration authorities, teacher employing organisations, teacher professional associations, non-government organisations with an interest in sustainability and EfS, and government departments of Education and Environment. The strategic goal of this approach is for change to occur concurrently across a range of policy-to-practice 'levels' within a pre-service teacher education system, including governmental policy, accreditation and registration standards, course provisioning and teaching and learning processes (Ferreira et al. 2015). Its premise is that the deep and long-lasting embedding of EfS in teacher education requires broad engagement with, and the strong participation of, key agents of change *across* the teacher education system, in conjunction with active and deep participation *within* the system (Davis et al. 2015). It must be emphasised, however, that the model does not offer 'a one size fits all' approach to embedding EfS into a teacher education system. Indeed, one of its key strengths is that its application is context-driven, as is explained in the three case studies that come later in this chapter.

3 The Systems Change Model and the Systems Change Research Program: Theoretical and Practical Aspects

Systemic inquiry is a particular means for facilitating movement towards social learning that is understood as concerted action by multiple stakeholders in situations of complexity and uncertainty (Ison et al. 2007). A characteristic of systemic inquiry is that it has the potential to orchestrate practices across space and time which address an issue of social concern—such as sustainable development within teacher education—when it is unclear what would constitute an improvement. It builds on and extends on Churchman's (1971), Checkland's (1981, 1993), and others epistemological assumptions about human systems as emergent systems where reality is the creative construction of human beings (Jackson 1991), and social reality is the construction of people's interpretations of their experiences (Flood 2001). Sometimes referred to as 'soft systems thinking', this approach generates and works with an evolving appreciation of people's points of views and intentions. Flood further explains that, in soft systems thinking, authentic understanding of any action context requires participation of all stakeholders, that is, all the people involved in taking action as well as those affected by the actions. This can only be achieved, he states, if people enter into an action context as both actor and researcher. Hence, there are very strong parallels between systems methodologies and action research, and this explains why, as action researchers, our team was attracted to systems change literature.

As has been mentioned, cross-university teams have been working over the last decade to mainstream and embed sustainability within Australian teacher education using what was first called the Mainstreaming Sustainability Model (Ferreira et al. 2007), later renamed the Systems Change Model reflecting its evolution. The model combines the strongest features of participatory action research with a whole-of-system approach in order to concurrently initiate change across the whole system (rather than within just one sub-section i.e. one teacher educator or one university), through deep, meaningful, but flexible engagement with many participants. The premise of this approach is that deep and long-lasting change in teacher education requires broad engagement with, and the strong participation of, key change agents across the teacher education system, as well as active and deep participation within the system. In sum, this approach aims to ensure that multiple levels and contexts within the system are aligned in their efforts to work towards sustainability, thus overcoming the fragmented and small-scale achievements that have typified past efforts. To date, there have been 5 stages in this teacher education systems change program (Table 1):

When taken collectively, this 10-year program has revealed a range of theoretical and practical processes and strategies that have enabled EfS to become more embedded within pre-service teacher education programs in Australia, and one could argue that the process is now unstoppable. In particular, the change agent participants within faculties and other organizations that impact on teacher education have been able to engage productively in building capacity for embedding EfS in pre-service teacher education at individual, institutional, and state levels, and increasingly at the national level. Collectively, the program's multi stages have provided a system-wide framework that offers a range of context-specific strategies, exemplars, insights and shared resources that can serve as a model for other faculties and HE institutions wishing to implement EfS in a systematic and coherent fashion (Stevenson et al. 2015).

4 University Case Studies Snapshots

To provide further explanation of how this systems approach has functioned, the chapter now offers three snapshots, drawn from the seven case studies that were developed from the HE institutions involved in stage 4 of this systems change program. These serve to capture critical context-based experiences and the diverse ways in which the Systems Change Model was used to embed sustainability within the pre-service teacher education faculties/departments of Australian universities.

4.1 University A: Changing the Curriculum

University A's case study documented a regional, multi-city university undergoing significant change as it sought to position itself as a 'University of the Tropics' with

Table 1 The 5 stages in the 'mainstreaming sustainability into teacher education' project

Stage and years	Key attributes
Stage 1 (2006)	An international review of initiatives used to facilitate change in teacher education identified 3 main approaches (resource development i.e. kits, action research and whole of system). A new approach—the mainstreaming sustainability model—was proposed that uses the best features of these in combination
Stage 2 (2007–09)	The model was piloted in two of the eight states and territories of Australia—Queensland (5 teacher education institutions) and the Northern Territory (2 teacher education institutions). Using action research as its methodology, the pilot built on and supported existing informal teacher education networks of academics and professionals with an interest in EfS, thus strengthening communication across teacher education faculties and departments, and expanding the range of people and organisations that directly or indirectly impact on the work of teacher educators
Stage 3 (2009–10)	Replication of the pilot in two other locations—New South Wales and the Australian Capital Territory—identified five key factors that strengthened change towards sustainability in teacher education programs. These were: collaboration; developing a shared vision/ethos of sustainability and sustainable practice; connecting up existing EfS content and practices; using experiential and active learning processes; and creating opportunities for integrated programs within teacher education
Stage 4 (2012–13)	This stage involved a state-wide systems change process (this time involving all universities that have pre-service teacher education faculties or departments in Queensland) to further enhance capacity for change across the Queensland teacher education system; the development of multi-site case studies for each of the universities; and testing, refining and extending the Model. Additionally, as wider interest in the systems change process was gathering momentum, a national network of teacher educators with an interest in EfS was initiated by bringing representatives from each of the other Australian states to the final meeting of Stage 4 participants in Queensland. They were given a small amount of funds to identify teacher educators in their own states who wished to network
Stage 5 (2014–15)	Drawing on the emerging network, a series of state-based workshops with teacher educators for sustainability were held across Australia in May 2015. At these meetings, the systems change research project and the re-named systems change model were presented and discussed. These meetings served to further consolidate and strengthen the national network

an explicit interest in sustainability issues (Stevenson et al. 2014a, b). This was evidenced during 2009–2011, for example, when as part of a university-wide Curriculum Refresh Project, the Education department of the university adopted a whole-of-school approach to embedding EfS in its Bachelor of Education (B.Ed.) program. This involved embedding sustainability more deeply than previously within a core education subject (Early Childhood Education and Care) as well as the development of two new sustainability subjects, including a dedicated core subject (Foundations of Sustainability in Education and Environmental Education for the Tropics). Specifically, changes resulted in engaging early childhood and primary

pre-service teachers in EfS through innovative pedagogy assessment and the use of online technologies; promoting early childhood EfS pedagogical content knowledge through learning activities that reflected the Australian *Early Years Learning Framework* and *Queensland Kindergarten Learning Guidelines*; and revising and reshaping a sustainability elective to embed education for climate change.

In making these changes, University A's curriculum project identified the challenge, oft repeated in the literature, of bringing EfS into 'core' curriculum business. In particular, it identified the importance of professional development for teacher educators to overcome the lack of sustainability knowledge, skills and dispositions in graduate teacher professional standards. These skills, dispositions and knowledge, when they exist, provide a policy lever for Australian universities to embed EfS within their teacher education programs (see Thomas et al. 2013 for more on the place of graduate learning outcomes in sustainability as a lever for guiding student learning about sustainability). In addition to the changes to teaching and learning around sustainability and EfS, an unexpected outcome of involvement in the systems change project was that it also provided a pathway for the stimulation of research into pedagogical practice, curriculum innovation, and student engagement to support EfS.

4.2 University B: Policy Change

University B's Education department is in a large, established university that has provided teacher education programs since 1945. At the time of the systems change project, over a 1000 students were enrolled in a suite of undergraduate programs with an education focus. This case study snapshot illustrates the importance of engaging with the university's own hierarchies and existing committees in the promotion of EfS. As a result of her engagement in the systems change program, the key change agent at University B was invited to join the pre-existing Teaching and Learning Education for Sustainability working party, a group tasked with developing a proposal for embedding sustainability into all of University B's curricula for consideration by each Faculty's teaching and learning committee. The proposal promoted strategies such as the inclusion of EfS principles in the University's graduate attributes, development of a web portal of EfS resources, consideration of EfS during department and discipline reviews, creating sustainable teaching spaces, and collating elective information related to sustainability. The response to the working paper's proposal within the faculty in which Education resides showed preference for the development of initiatives to address EfS at the department level to encourage greater ownership and therefore greater momentum to enact education for sustainability. Overall, the recommendation to embed sustainability into the University's graduate attributes was supported by the Deputy Vice-Chancellor for Teaching and Learning and a university-wide proposal has now been made.

A central outcome of this institutional approach was that education for sustainability now has a clear presence within Education programs in this university. Furthermore, there have been ongoing discussions, surveys, interviews and inclusion of education for sustainability resources in Education's weekly updates, and sustainability-focused morning tea gatherings. Such formal and informal practices have brought sustainability issues to the forefront of Education's consciousness whereby, from its more visible position, there is greater scope for further action to address education for sustainability within teacher education and the university more broadly.

4.3 University C: Student Engagement

University C is a large capital city university spread across three campuses. Its Faculty of Education is one of Australia's largest providers of undergraduate and postgraduate education for teachers, and is recognised as one of the top three Australian Education faculties in research. Within this faculty, participation in the Systems Change for EfS program and use of its Model focused on raising awareness of EfS and building capacity for teaching and learning about EfS amongst both teacher educators and pre-service (student) teachers. In regard to the latter, for example, a group of student teachers become directly involved in project activities, forming a cross-institutional committee to promote EfS as a key student concern. Together, these student teachers created a Student Charter, *Embrace, Embed, Empower: Call to Action on Sustainability by Pre-Service Teachers* (Ferreira et al. 2009, p. 69), using Facebook as the means of collaborating, learning and communicating. They also participated in a number of project events including a *United Nation Australia Conference* and a *Patches of Green Forum* that was organised as the means of delivering the Student Charter to the Queensland Minister of Education. The participation of student teachers in various events illustrates the power of engaging students in advocacy work for EfS within the faculty and within the teacher education sector more generally. This is important because, as the teachers of tomorrow, these student teachers gained new knowledge about sustainability, developed collegiality and ongoing relationships with each other and with academics, and strengthened their capacity to continue to advocate for EfS in their courses and classrooms (Ferreira et al. 2009).

Over time, as a result of continued lobbying, presentations and ongoing dialogues that began with the Systems Change for EfS program, sustainability and EfS have become a trans-disciplinary theme embedded into faculty teaching, learning, and curriculum and research strategies. A post-graduate research niche in EfS has developed and there is a growing number of teacher education academics who feel comfortable embedding EfS into their specialisms, including the Arts, Literacy, Social Sciences and Science.

5 Lessons Learned and Further Opportunities for Teacher Education and Sustainable Development

A significant outcome of this systems change for sustainability research program is that the collective efforts of the teacher education change agents within individual universities have led to changes in the way EfS is embedded across individual faculties and departments and also within teacher education more broadly, at both the state-level and increasingly at the national level. The Model that is at the core of the program began by identifying those key individual agents of change with the capacity to advocate for EfS, and those key institutions, organizations and structures that comprise a teacher education system (e.g., Heads of Schools/Faculties, academics and student teachers, curriculum committees in teacher education institutions, teacher registrations authorities, employers, and the like). Our experience is that 'getting the right people' is vital. Even if they may not come into the role as an expert in sustainability or EfS, their capacity to learn and to grow into the role, advocate for EfS, and bring others along with them is essential in creating systems change (Ferreira and Davis 2015). Building foundations for embedding EfS in teacher education is further assisted "by making connections to current structures, policies and programmes that support EfS and/or being opportunistic in taking advantage of changing circumstances" (Stevenson et al. 2015, in press). In other words, systems change agents need to be willing to learn and lead, be good networkers, and have sound knowledge of policies and structures which they can use to advance their change agent efforts. Further, results of this systems change research program suggest that the Systems Change Model contributes to building capacity for change at multiple levels of a system. At the level of the individual, participation in this program has led to a range of innovative teacher education approaches and strategies across a significant number of universities that aim to assist academics to embed EfS into teacher education. This is regardless of their experience with EfS, or as an academic, or their content specialisation.

6 Implications for Universities

The Systems Change Model discussed in this chapter has encouraged inclusive and systemic approaches to building capacity for embedding sustainability, thereby encouraging a shift away from the fragmented approaches that have traditionally pervaded teacher education and higher education. Over the years, our research program has provided a range of context-specific case studies, insights into using a systems approach over a number of iterations, and a large range of practical resources for other teacher education departments to use to guide their change processes. Having had some success within teacher education, we now see that there are opportunities to extend the use of the approach to other faculties, disciplinary groupings, and, indeed, to whole universities. To this end, we encourage others to access and apply our publicly-available materials that may offer starting

points or ideas to guide ongoing work in this challenging arena within higher education.

Further, as researchers, we welcome opportunities to extend on, and critique, our efforts. Australia's university system, for example, is comprised of a relatively small number (about 40) of quite homogenous universities in structure and outlook, and largely funded at the national government level. While there is competition amongst institutions, universities are more like each other than different. It would be of interest to see how our approach plays out in contexts where universities more vigorously compete for students, and where private fees contribute substantially to a university's funding base. How well do our resources fit a range of international contexts? Would inter-university competition, for example, undermine the cooperation and sharing that a systems approach demands?

7 Conclusion

It is hard to imagine that the societal changes required to create sustainable futures will occur without the leadership of higher education institutions around the world (Haigh 2005). And, while in higher education there is now increasing interest and sometimes debate—not before time—about their leadership for sustainability role in education (Scott et al. 2012), the sector as a whole continues to be underwhelming in its response. Fortunately, new opportunities and policy drivers are emerging that may offer renewed impetus for the engagement of the higher education sector in leading sustainability education. In particular, UNESCO's (2014) 'roadmap' for implementing its Global Action Plan (GAP) on ESD over the next five years (2016–2010) offers a possibility. Priority Action Area 3, in particular, is focused on 'Building capacities of educators and trainers', and advocates for ESD to be integrated into faculty training in higher education institutions to enhance capacity in teaching sustainability issues, conducting and supervising solution-oriented interdisciplinary research, and informing policy-making on ESD and sustainable development' (p. 35). Further, the roadmap includes the considerable challenge for higher education institutions to develop 'whole institution' approaches' to embedding sustainability. This calls for systemically reorienting universities' teaching, learning and curriculum practices and policies for sustainability, an overdue addition to strengthening their campus and facilities' sustainability management practices which many higher education institutions see as the endpoint of their sustainability commitments. With the elaboration of this teacher education systems change program in Australian universities, we believe we are able to offer a theoretical and practical way forward as universities' grapple with the demands and complexities of changing their current rhetoric about sustainability into reality within the core business of higher education teaching and learning.

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