

Climate change: Building leadership capacity within a higher education institution

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Abstract: *Learning how to address climate-change and live more sustainably is a ‘social learning process’ which is in its infancy and in which the University, its graduates and community will need to assume significant leadership roles. This exploratory paper reflects on the experience of a cross-disciplinary group of researchers and educators from an Australian university, who came together in 2009-2010 as a community of practice to research cross-disciplinary leadership capacity building for learning and teaching sustainability within our university. The group worked on the premise that the scale of change needed and the complexity of sustainability demands a more broadly based approach than that offered by traditional disciplinary arrangements within the University. We engaged in a collaborative learning process focusing initially on developing a common agenda and establishing some preliminary learning outcomes for the development of cross-disciplinary ‘sustainability literacy’. On the basis of these initial outcomes, a review of the literature and our own reflective process, we developed an applied model for collaborative learning based on Scott’s (1999) Workplace Action Research Framework. Our intent is to build on this groundwork to develop an engaged, problem-based cross-disciplinary university-wide learning program that develops leadership in sustainability in our students, in us as academics and the wider university in its regional partnerships. Our paper ends by enumerating the lessons we have learnt and some speculative future directions for where we plan to take this research.*

Keywords: *Sustainability Literacy, Climate Change, Community of Practice, Leadership Capacity Building, Workplace Action Research, Action Learning, Cross-Disciplinary*

Introduction

“What people see or do not see is not determined by their visual acuity, nor does it depend on their attentiveness, it is essentially codetermined by what they know or do not know. Knowledge unblocks the view. Someone who knows more and different things also sees more, sees differently, sees different things” (Beck 1995, p.13).

This exploratory paper documents the experience of a group of educators and researchers from different disciplinary fields at the University of Western Sydney (UWS), Australia, who came together in 2009-2010 as a “community of practice” (Wenger, 1999) to research cross-disciplinary leadership capacity building for learning and teaching sustainability within our university. Cross-disciplinarity refers to teaching, learning and research activities involving interactions between different disciplines. The project team includes key staff across this institution representing agriculture, engineering, humanities, communications, business, environmental law, education, and population health. The UWS Pro Vice-Chancellor for Learning and Teaching has also contributed to the team as a member of the UWS executive.

The initial reason for coming together was a shared concern about the emerging impacts of climate change and a desire to enhance our ability as a university community to effectively respond to these impacts. What the team also shared was experience in and passion for sustainability in higher education, and a felt need for a more holistic teaching approach to sustainability. Through round table discussions that took place over seven months, we arrived at a project plan for the development of sustainability literacy, via a community and industry-engaged, cross-disciplinary and problem based learning program. This paper mirrors the various stages of our social learning process, which led to the articulation of a theoretical framework for action within our university. First, we

reflect on the broad context of the project and outline the principles underpinning our shared agenda; then, we explore the notion of *sustainability literacy* and its meaning within the specific context of our university. Finally, we discuss the theoretical framework that emerged from our reflections, discussions and the main lessons learned from this experience.

Problem context

Adapting to human-induced climate change is possibly the most important challenge of our time. Our preliminary research on sustainability literacy revealed that very little is actually known about what a climate-changed future holds and what a transition to sustainable modes of being will involve (Fry, 2009 p. 5). In 1990, the Association of University Leaders for a Sustainable Future (ULSF) identified a shortfall in sustainability literacy and laid out a ten-point action plan for incorporating sustainability and environmental literacy in higher education with the following rationale: “Universities educate most of the people who develop and manage society's institutions. For this reason, universities bear profound responsibilities to increase the awareness, knowledge, technologies, and tools to create an environmentally sustainable future” (ULSF, 1990). The resultant *Talloires Declaration* (of which our university is a signatory) put sustainability literacy on the agenda for higher education internationally. Similarly, in 2002, the United Nations General Assembly adopted a resolution to put in place the Decade of Education for Sustainable Development (DESD), spanning from 2005 to 2014, which focuses on promoting and improving quality education, reorienting educational programmes, building public understanding and awareness of sustainability issues, and providing practical training (UNESCO, 2005). These measures all promote the need for holistic, consensual action in the higher education sector.

It is clear that the community, including industry, will be increasingly looking to university graduates for direction and know-how in relation to taking adaptive action on climate change. Yet for universities to effectively take up the charge to lead the community toward more sustainable futures, there is a need for an internal process of discovery and learning so that existing disciplinary knowledge about sustainability can be negotiated and optimized. Therefore, the most significant challenge to higher education is that knowledge on sustainability issues is not “out there”—it has to be developed from within the University itself, but with close community and industry engagement (Fullan and Scott 2009, p. 50). Universities have a moral obligation to address sustainability and climate-change issues and have been widely charged to take action.

We learnt, however, that there are significant barriers faced by universities to pursue this new agenda. Fullan and Scott (2009) suggest, for example, that universities are ‘change averse’ because of their tendency to be “hyperrational, prone to talk, individualistic and dominated by research” (p. 25). Moreover, the cross-disciplinarity required to engage with the complexity of climate-change is not easily achieved within universities structured (and funded) according to individual disciplines (Cortese, 2003, p. 16). This tendency for universities to be structured into separate disciplinary ‘silos’ has also shaped the discourse and thinking on sustainability (Graedel & van der Voet, 2010).

Our community of practice was committed to grappling with the rift between the ideal of cross-disciplinarity and its practice, by reflecting on our process of negotiation and mutual, collaborative learning. With a better idea of the broad problem context within which we were to work, we proceeded, with a clear rationale for action, ready to draw out and articulate our own assumptions and understandings of what sustainability literacy is with reference to the literature.

Developing a shared agenda

Our reflections and discussions led to the development of a set of five principles that would help set a shared agenda which we felt was a necessary first step given the very different ways of thinking represented by our different disciplines.

1. *Recognising anthropogenic climate change*

Starting with the most basic shared assumption, we all recognised the impact of human activity on the environment and the anthropogenic nature of climate change. This is of course well evidenced in the scientific literature and is the basis of the now global imperative to promote alternative human actions in all sectors of society (IPCC, 2007). In order for humanity to secure a viable future we need to dramatically reduce the carbon intensity of our lifestyles and support the acquisition and deployment of the skills needed to enable this reduction across the many facets of everyday life.

2. *Taking precautionary action*

We all agreed on the importance of the *precautionary principle*, which highlights the many unintended and unpredictable impacts of human actions on the biophysical environment, on human health and society. This principle advocates conducting human activity more carefully and cautiously than in the past, “even where some cause-effect relationships have not yet been established” (Wingspread, 1998). The precautionary principle highlights the dangers of “technofix”, that is, the belief that environmental problems can be solved by technology. The call to dramatic action on climate change needs to be measured by the precautionary principle both in terms of decisions made on behalf of others and in terms of soft and hard design interventions. This is not to say ambitious action should not be pursued, rather that these actions should be thoroughly responsive to existing environments, structures, systems, behaviours, skills: the complexity of “what already exists” (Manzini, 2002, p.9).

3. *Linking Global and Local Imperatives*

We also shared a concern about the impacts of climate change within our region, Greater Western Sydney. This is the fastest growing region of the fastest growing city in Australia. Its population is culturally and socioeconomically diverse and includes significant disadvantaged sub-groups, such as migrant and Indigenous groups. The availability of health services, education, employment and recreational opportunities and access to public transport is limited when compared with other more advantaged areas of Sydney. The region also has a relatively heavy burden of underlying chronic disease including diabetes, heart disease and their precursors – conditions which will increase the impacts of climate change on mortality and morbidity

We decided that our agenda should proactively link global imperatives—the need to transition to a low carbon economy, to secure our future energy, water and food, and to cope with population displacement and growth (whilst supporting the well being of human communities)—to local concerns. Building regional concerns and opportunities into a cross-disciplinary sustainability education program would ensure relevance, and provide a ‘real-world’ problem context, opportunities for regional partnerships and practical learning.

4. *Thinking relationally*

As we progressed our discussions about shared assumptions and cross-disciplinary practice, the significance of *relational thinking* emerged. Relational thinking is coextensive with ecological literacy, which, as Orr (1992) has shown us, recognises at its base the interdependence of everything. Ecological events do not occur as single, observable realities—which is how we tend to experience them—but relationally. We recognised that a significant value of cross-disciplinarity is that it enables us to build a more relational approach to our research. While we share the aim of building the university’s leadership capacity in sustainability, the ways in which this might be achieved are diverse and mutually valuable to the process of collaborative learning.

5. *Thinking with foresight*

There is a common concern about the inadequacy of short-term, reactionary thinking in response to long-term issues such as climate change. Climate change orients us toward an unfolding future in which the world may look and feel very different from the world we have now. In addition to the need for relational thinking, we recognise the need for foresight, that is, thinking that accounts not only for what is, but what *could be* the consequences and impacts of current actions. Universities

charged with preparing graduates for an uncertain future clearly require foresight and imagination. Although we might call it by different names within each of our disciplinary contexts, we commonly valued forward thinking and understood it as an essential sustainability skill. It is also understood as a way toward new thinking: As Einstein has famously suggested, we cannot solve our problems with the same thinking we used when we created them.

6. *Recognising the agency of the higher education sector*

Perhaps the deepest assumption, the one that brought us all together, was the assumption about the agency of the higher education sector to affect change and lead the community toward more sustainable ways of living and foster resilience in relation to climate change.

Defining Sustainability Literacy

Equipped with our basic principles for a shared agenda, we then proceeded to carry out a literature review to find out what has been written about sustainability literacy within the context of higher education. Further, we wanted to discover how this literature might inform the development of 'learning outcomes' for a cross-disciplinary sustainability education program and provide indicators of its success.

Developing Sustainability Literacy: Literature Review

Our literature review indicated that there are well-established theories to inform an educational framework. The key themes that emerged from the literature supported our tacit understandings that sustainability education should be reflexive, engaged, problem-based, collaborative and cross-disciplinary.

A common theme in many of the texts consulted was that education for sustainability is about a change of values and attitudes. As noted by Thomas (2004a) "education for sustainability" in higher education is based, amongst other things, on fostering "an attitude of care or stewardship" (p. 35). Similarly, Murray and Murray (2007) point out that sustainability education involves developing "the right attitudes and values" in addition to the right knowledge and skills "to ensure we take knowingly right decisions and actions now and in the future" (p. 286). These authors stress, however, that values will not be changed just "by listening to lectures or appeals", but teachers must "help learners explore and reflect upon their values for themselves in an open ended manner" (p 289). Drawing on Marton and Saljo (1997), Warburton (2003, p. 45) puts forward his view that "deep learning" (the ability to critically analyse new ideas and link them to already known concepts) is crucially important in education for sustainability. In their work, Murray and Murray (2007) promote an Enquiry-Based Learning (EBL) approach for sustainability education which makes learners "more deeply aware of the complexities of big issues facing mankind" (p. 289).

Another common theme was that education for sustainability requires experience-based, engaged pedagogical approaches. For example, Domask (2007) recommends an experiential approach to sustainability studies in which students "learn by doing". Domask's approach has four goals: 1) to connect 'the academic with the practice'; 2) foster an interdisciplinary curriculum; 3) link students to work experience and job opportunities, and 4) engage and empower students. Resonating with Goal 4, Hopkins and McKeown (2002) note that education for sustainable development is successful when it provides "practical skills that will enable people to continue learning after they leave school, secure sustainable livelihoods, and live sustainable lives".

The need to go beyond disciplinary boundaries for an effective sustainability educational program was often pointed out in the literature (see for example Barth et al. 2007; Domask, 2007; Foster, 1999; Hansmann et al. 2008; Marinova & McGrath, 2004; Rosow, 2003; Scholz et al. 2006; Sibbel, 2007; Warburton, 2003). Alluding to sustainable development (a specific manifestation of sustainability associated with the United Nation's Brundtland Report), Hopkins and McKeown (2002) acknowledge that this notion "encompasses the interaction between environment, economics, and

society”; therefore, “a knowledge base from the natural sciences, social-sciences, and humanities” is needed to understand the principles of sustainable development, the values involved, and how these principles and values can be enacted. Warburton (2003) identifies a “critical awareness developed within an integrated interdisciplinarity framework” as a desirable outcome for sustainability education (p. 44). Similarly, Domask (2007) emphasises the importance of interdisciplinary curricula in sustainability studies to equip students “with the knowledge and skills they will need prior to entering the workforce” (p. 61). Barth et al. (2007) also agree that education for sustainability requires ‘interdisciplinary cooperation’ to solve complex problems. To this end “new forms of communication and cooperation” are needed (p. 419). Sibbel (2007) expresses her view that higher education should be restructured to include academics from various disciplines, collaborating and sharing ideas (p. 79). However, as noted by Hopkins and McKeown (2002), each discipline should continue to develop its own discipline and subject areas, with its own perspectives, strengths and skills. From a similar perspective, Sibbel (2007,) urges academics to consider, “how their area of expertise relates to other disciplines and how their teaching could contribute to developing graduate attributes necessary for work towards sustainability” (p. 79) . Writers such as Marinova and McGrath (2004, p. 2) and Scholz et al. (2006, p. 231) go a step further proposing transdisciplinary approaches to sustainability education.

A number of works in the literature highlighted the crucial role played by leadership in sustainability education (see for example Hargreaves & Fink, 2003; Pepper & Wildy, 2008; Tilbury et al. 2002). Sustainability leadership, write Hargreaves and Fink (2003) “is a shared responsibility, that does not unduly deplete human or financial resources, and that cares for and avoids exerting negative damage on the surrounding educational and community environment”. It has an “activist engagement with the forces that affect it, and builds an educational environment of organizational diversity” to promote cross-fertilization of ideas and successful practices in communities of shared learning (pp. 3-4).

The Sustainability Literate Graduate

The literature review strongly validated our process and aims. We were further informed by the definition of sustainability literacy provided in *The Handbook of Sustainability Literacy* (Stibbe, 2009) as the skills, attitudes, competencies, dispositions and values that are necessary for surviving and thriving in the current world climate. *Literacy* in this definition does not refer to the capacity to read and write. Rather it refers to the particular “collection of skills that allow for effective participation and influence in diverse areas of social life” (p.11). To be literate in sustainability means more than knowing about sustainability, it means *being able to act on that knowledge* – to judge and take appropriate actions in a given context. It, therefore, entails cross-disciplinarity and implies leadership, as will be seen later.

Our initial thoughts on what a prototype set of ‘learning outcomes’ for a cross-disciplinary sustainability education program at our university might be, are listed, below. These resulted from initial discussions about the key abilities the sustainability-literate graduate might possess, supported by what we learnt from the literature review and the development of a shared agenda.

In particular, sustainability literacy requires:

- being able to read consequences of past actions and apply foresight to the impacts of new response strategies;
- being able to recognise what is needed for a project in terms of knowledge input, team creation and listening to the needs and knowledge of others;
- being able to judge existing solutions from an ecological perspective;
- conceiving and implementing innovative solutions to clearly identified problems that mitigate environmental impacts, and adapt to what a climate-changed future may bring;
- being able to critically reflect on those solutions and the processes by which they are achieved;

- being able to account for the ecological footprints of our life and work styles, and the ability to assess the ecological impacts of our professional practices; and,
- developing specific indicators of success that recognise dynamic and long-term change as well as short-term milestones.

Sustainability, the University and its region

The emphasis in the literature on community engagement for the development of sustainability literacy led us to recognise the potential leadership role for our university within the Greater Western Sydney region. We began to consider how i) the role of our particular university in its region might be enhanced through community-engaged sustainability learning programs, and ii) how such programs might respond to the moral obligation of higher education to address sustainability imperatives more broadly. Below we briefly describe our local context and reflect on the potential of our university to play a role in the climate change agenda by responding to community concerns in a service frame, and facilitating and transforming community learning in the process.

Our local context

UWS is one of the largest universities in Australia with more than 35,000 students and almost 2,500 staff. UWS is a multi-campus university with six large campuses across Greater Western Sydney (GWS), an area of 2,175 sq km. Its students are diverse, with domestic students alone representing 174 countries of birth. Many are first in their family to attend university, nearly 85% work while studying and many engage in their courses solely as a means to paid employment.

Stretching from the Blue Mountains to Canterbury, GWS is historically defined by three rivers—Hawkesbury, Nepean and Parramatta. It has a vital agricultural history that depended on these river systems, which has been rapidly encroached upon by urban development in recent years. The university is, therefore, situated in a region in which the impacts of human industrial development on the environment—particularly development pressures at the peri-urban edges of our cities—have been keenly felt. It is also an area of particular vulnerability and disadvantage within a developed nation due to high levels of migrant and indigenous populations (ABS, 2008), mixed levels of socio-economic status and the fastest growing population in Australia. GWS also has the third largest economy in Australia behind the Sydney CBD and Melbourne, home to more than 150 of the nation's top 500 companies and is a global centre for trade, innovation and learning. GWS is, therefore, an ideal barometer of the effect of climate-change while UWS, being geographically dispersed, is ideally placed to invent ways to work together, across distances and disciplines to rapidly build sustainability leadership capacity.

Through our research we found that UWS is in a unique position to be an exemplar because of its geographic character, demography, existing research expertise, and cross-disciplinary and industry partnerships. We already have a large number of committed academics working on climate change through research and curricula development in a wide range of fields, including, Green Building, Sustainable Design, Sustainable Agriculture, Environmental Law, Corporate Sustainability and Population Health. What is needed for the development of sustainability leadership, however, is the project space to bring together these disparate areas of expertise, and to work with and learn from each other, industry and the wider community.

The potential to raise the bar on the role of University Education

Climate change presents UWS with a new social role and an opportunity to promote its unique qualities as an educational institution. As the broader community is constrained to 'business as usual' with environmental ameliorations that disturb the status quo as little as possible, the university can be understood as a place (and space) dedicated to the exploration, trialling and creation of exemplars of change, as part of its core business. In this respect—and contra to the "ivory tower"

concept of the university or the “university in ruins” emptied of its collaborative, socio-cultural potential (Readings 1996)—the ‘hypothetical’ space of the university should be embraced to explore the ‘real world’ to come, and to produce graduates with the appropriate knowledge, skills, values and motivation to deal with the problems posed by non-sustainable states. Hence, rather than lacking relevance, the reputation of the university should be that its graduates set the agenda for what is relevant across possible futures.

Our reflections led us to conclude that engagement in relation to a climate change agenda means not only responding to community concerns in a service frame, but also facilitating and transforming community learning in the process. However, community engagement around climate change is challenging because the object is not to meet existing community agendas, but to collaboratively set new agendas that need ‘climate-change ready’ graduates. This role for the university is particularly poignant if we take on board Manzini’s (2003) and Manzini and Jégou’s (2003) understanding of the transition to more sustainable ways of living as a “social learning process”; that is, the university can provide the educational framework for its graduates and community to collaboratively ‘learn by doing’.

A Theoretical Framework for Action within the University

We found Fullan and Scott’s (2009) ideas extremely useful to help us reflect on the University’s sustainability capacity, to bridge the gap between disciplines and to foster sustainability literacy in graduates. These writers propose the application and development of applied and engaged *practical reasoning* in educational programs, which shifts from the analytical to the practical. Fullan and Scott define practical reasoning as “a more integrated conception of the role of knowledge that combines collaborative engagement with real-world issues, analysis and application” (2009, p. 43). Here, as in Fry (2009) and Phillips cited in Stibbe (2009, p. 210), there is an emphasis on collaborative *action*. Practical reasoning prescribes learning by doing through reflection-in-action which has significant potential for the University itself to become a learning community; for its students to become responsible professionals and for ensuring the relevance of the University to its community partners. Fullan and Scott’s (2009) notion of practical reasoning, and Scott’s (1999) Workplace Action Research model inspired us to develop our own model fostering ongoing collaboration and learning in our university. Below we examine its core features.

A model fostering collaboration and learning

Our project design applies Scott’s Workplace Action Research model (1999) as a tool for the development of educational leadership, which mirrors the process of understanding revealed in Donald Schon’s concept of *reflection-in-action*; that is, a process of reflection used by practitioners “to deal well with situations of uncertainty, instability, uniqueness and value conflict” (1983, p.50). This process spirals through stages of *appreciation*, *action* and *re-appreciation* as a means to circular quality improvement or learning program innovation (Schon 1983 in Scott, 1999, p. 161).

Scott’s model provides a means for educators working collaboratively as “participant observers” of their own practice to develop their educational leadership capacity. Scott argues that in order for an educational institution to become a ‘learning organisation’, individual educators should “become skilled in the tactics of workplace action research and self-directed learning” (1999, p. 110). According to Senge (1990), a learning organisation provides the context wherein individuals can “continually expand their capacity to create the results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free, and where people are continually learning to see the whole together” (p. 3). These concepts will serve as a basis for us to develop a set of systematic, multi-level strategies to build leadership for learning and teaching sustainability literacy across UWS.

Scott’s Workplace Action Research framework is based on four interconnected actions: *sense*, *read*, *match* and *act* (see diagram below). Scott’s Workplace Action Research model, enables participants

to learn to *sense* (when something needs to change), *read* (what is problematic in the unique situation), *match* (assess the problem and suggest a solution drawing upon a repertoire of tools and reflection on experience) and *act*. This was very much aligned to our findings from our review of sustainability education literature and initial learning outcomes. It gave us a strong foundation for the development of a methodology for our own process and that of any program we might develop.

The new approaches we develop will need to be trialled; experience will need to be compared with best practice; discussion with colleagues will be needed about what works; and colleagues will need to be observed in action (Scott 1999, p. 163). It is in the implementation of a solution that the

problem is more deeply understood, thus ongoing evaluation and reflection is imperative for continuous quality improvement.

It is our view that by following the Workplace Action Research Model, teachers and researchers like ourselves as well as our students will be developing their educational leadership capacity as they investigate successful sustainability practices elsewhere, implement and reflect systematically on new practices (as reflective



practitioners), engage with problems, collaborate, learn, and develop their own communities of practice. They will *listen, link, lead, model, teach* and *learn* (Fullan and Scott, 2009).

Lessons learnt and future directions:

We are yet to trial our model but our experience so far shows that developing cross-disciplinary measures for sustainability education is challenging, slow, but necessary work. We are convinced our model will yield rich results in terms of cross-disciplinary learning programs as we take up opportunities to test it. However, the process so far has been a rewarding learning experience in itself, underscoring for us the particular necessity of such cross-disciplinary learning for the development of sustainability leadership capacity.

Some of the key lessons learnt include:

- Sustainability is a dynamic and multi-faceted field of human knowledge. Time is needed to develop a shared language around sustainability and to develop a consensual agenda and action plan for change.
- Education for sustainability is about a change of values and attitudes – not through abstract knowledge imparted to students in the classroom, – but through encouraging learners to explore and reflect upon their own values through experience-based, engaged pedagogical approaches.
- Sustainability literacy must provide students with practical skills that will enable them to continue learning beyond university years in order to ensure sustainable livelihoods.
- Action research—which closes the gap between theory and practice—appears to be the method most conducive to the development of new knowledge in sustainability for Higher Education Institutions HEIs.

- No-one can achieve anything vis-à-vis sustainability by jealously guarding their knowledge base and worldviews. We need to work together to affect change. The development of communities of practice committed to finding that shared ground, is a crucial first step.

Future Directions:

We intend to:

- Develop curricula for the enhancement of cross-disciplinary sustainability education and find potential opportunities and difficulties in improving existing 'work experience' and 'industry service learning' subjects or variations of these across the different colleges of the university
- Develop regional partnerships to find 'real world' problems to enhance student engagement and the development of sustainability literacy outcomes, particularly in the interrelated and regionally relevant areas of agriculture, food security and population health. For example, at UWS third year medical students participate in a 'community medicine' component, Medicine in Context, where they are attached to a local community organisation over a period of several weeks and are involved in the day to day activities of that organisation. This frames 'medicine' in a very non-traditional, transdisciplinary way as students are 'learning by doing' outside any clinical setting. This provides a unique opportunity for students to experience first-hand the challenges facing community organisations as they implement more sustainable practices and face the complex demands of responding to climate change. Fourth year Honours students have a substantial opportunity to take these relationships further and explore these complexities through research partnerships.
- Model graduate pathways for new vocations to meet the challenges of responding to the impacts of climate change.
- Develop effective mechanisms for the identification, development, dissemination and embedding of good individual and institutional practice in learning and teaching for sustainability across existing disciplinary arrangements

Conclusion

This exploratory paper has reflected on the experience of a group of researchers and educators who came together to research cross-disciplinary leadership capacity building for learning and teaching sustainability within a particular university.

The process so far has taught us that in spite of our considerable combined experience, we as scholars are somewhat *unpractised* in the sort of collaborative cross-disciplinarity that is now needed to address complex, multi-faceted problems such as climate change. Nevertheless, our cross-disciplinary collaboration has thus far gained considerable insights into how leadership capacity building for sustainability across the university might be developed. Our plural 'sustainabilities' became a shared agenda and proposed set of learning outcomes for a yet to be cross-disciplinary program. Our comprehensive review of the literature supported an emphasis not on the acquisition of knowledge *per se*, but on 'learning by doing'. We adapted an existing action research method to our own needs to develop a model for future practice valued across each of the disciplines involved.

These developments provide us with a means to move from a disciplinary-based approach to sustainability wherein discrete disciplines consider how to lessen their impact on the environment to a more ambitious cross-disciplinary approach that can creatively consider more systemic change. We have developed a platform for the development of climate-change leadership: in the University, within its region as relevant, engaged and forward-looking; and more especially in our graduates, to whom society will turn for ideas and action strategies for climate-change adaptation and mitigation.

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