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DEMONSTRATING DISTRIBUTED LEADERSHIP THROUGH CROSS-DISCIPLINARY PEER NETWORKS: RESPONDING TO CLIMATE CHANGE COMPLEXITY

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LNCC

Leadership Networks for Climate Change

UTAS

UNIVERSITY OF WOLLONGONG

UNSW THE UNIVERSITY OF NEW SOUTH WALES

Murdoch UNIVERSITY

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Executive Summary

The ALTC project reported here, *Demonstrating Distributed Leadership Through Cross-Disciplinary Peer Networks: Responding to Climate Change Complexity* extended a successful pilot project at the University of Tasmania. Hereafter referred to as *Leadership Networks for Climate Change* (LNCC), the project created cross-disciplinary teaching networks at four higher education institutions; the University of Wollongong, the University of New South Wales, Murdoch University and the University of Tasmania. These networks of around eight to twenty teaching staff employed a 'communities of practice' approach, whereby tight-knit teams of teachers from diverse disciplines collaborated around an issue of shared concern. This LNCC model identified two key network roles: that of the catalyst or 'activator' and that of the facilitator or 'integrator'. While activators were involved in the original grant application and held teaching positions at each institution, integrators were employed using the resources of the ALTC grant.

Each network developed collaborative teaching approaches to the goal of promoting interdisciplinary student learning about climate change. As participation was voluntary, the project relied upon the intrinsic motivation of network members and opportunities created by the paid position of network integrator. Some networks also included research staff, academic developers and students. Rather than imposing a predetermined pedagogy of interdisciplinary teaching about climate change, the LNCC model was primarily aimed at helping teaching staff to innovate within existing teaching structures and workloads. Innovation took a variety of forms, including team-teaching, sharing of teaching materials, the use of a common problem in the curriculum of units in different disciplines, collaboration between students in different disciplines, student-staff collaboration in curriculum design and delivery and public communication by staff and students on the topic of climate change.

Flexible collaboration encouraged leadership

In pursuing the goal of promoting interdisciplinary student learning about climate change networks faced significant challenges. In the main, these challenges stemmed from two sources: first, disciplinary and administrative compartmentalisation within universities and, second, the real-world complexity of climate change issues. Networks met these challenges through cultivating distributed forms of leadership. Distributed leadership is characterised by actions identifiable as leadership that are enacted within and by groups rather than by individuals holding prescribed hierarchical roles. Development of this leadership capacity enabled network members and networks as a whole to find innovative and inspiring ways to take responsibility for improving teaching about climate change.

Network participants developed individual leadership capacities through collaborative processes including peer mentoring, interdisciplinary roundtable discussions, team-based curriculum development and teaching delivery. The combined effects of these collaborative processes were demonstrated in a number of ways. Development of leadership capacity was evident in new and innovative teaching practice, curriculum change, professional development and career advancement. An additional outcome was an increased capacity to inspire and motivate colleagues and students. Collaboration within networks also built collegial relations based on trust and reciprocity across disciplinary boundaries. As a result, group interactions exceeded the sum of individual contributions and enabled the network to share leadership responsibilities fluidly, according to the capacities of members and the issue at hand, and to exhibit leadership collectively. This group-based leadership enabled networks to facilitate changes within their institutions.

The specific details of challenges faced at each institution varied considerably, as did the institutional context of the network, the disciplinary mix of network members and the backgrounds and career stage of activators and integrators. A chief finding of the project has been that the LNCC model has proven highly flexible and adaptable to these different circumstances and that distributed leadership development is the key to maximising and maintaining this flexibility.

Key roles in the teaching networks

While the structures, processes and activities adopted by the networks varied considerably from institution to institution, the role of the integrator as a paid position unaligned with any specific discipline or institutional unit was central to the success of networks. Although teaching staff were enthusiastic about collaborating directly with teachers from other disciplines, the restrictions of workload, time and administrative barriers required the additional impetus provided by the integrator. This individual was often able to act as a go-between, translator and mediator between network members. Integrators have also undertaken much of the documentation of network activities underpinning the learning that has flowed from the project.

A core finding of this project is therefore that the role of integrator offers significant returns in terms of cross-disciplinary communication for a modest investment. The future viability of the LNCC networks is likely to be dependent at most if not all participating institutions on securing further funding for the integrator position. This report recommends that participating institutions continue to support the role of LNCC network integrator. The report also recommends this role to the higher education sector more generally as a cost-effective mechanism for facilitating interdisciplinary teaching collaboration. In addition, as observed by the project's external evaluator (see Appendix 1), the role of integrator provides a valuable model for academic developers in their efforts to increase their level of direct involvement with teaching staff in the disciplines. Indeed, the LNCC model has been adopted by academic developers at the University of Tasmania in a newly launched 'Communities of Practice' initiative.

While there was considerable diversity in how the role of activator was understood and developed at each institution, all four network case studies indicate that this role has been important in building the leadership capacity of networks. Importantly, activators holding both junior and senior positions within hierarchical career structures reported that they had developed their leadership capacity through the network. Activators were especially important in the establishment of the network, providing advocacy and inspiration as a way of attracting colleagues into the teaching collaboration. They were also crucial in providing on-going practical, intellectual and moral support for integrators and in showing initiative when challenges threatened to overwhelm the network. Finally, all activators and integrators have been engaged in the process of cross-institutional reflection and evaluation on which this report is based.

Embedding and up-scaling

Dissemination activities have included an exciting array of face-to-face and online initiatives. Formal dissemination related to the project includes the preparation of scholarly papers presentations, a collection of practice-based curriculum resources in addition to this report. Project members have also promoted the LNCC model as a valuable tool to the Australian higher education sector in a variety of fora and to international scholars of learning and teaching. Participants in this project were able to upscale through the establishment of additional communities of practice and by making connections with institutions outside the named members of this project team.

Acknowledgements

The LNCC project team has had the good fortune of working with a series of excellent and enthusiastic project managers over the life of the project. Our thanks to Millie Rooney, Anna Egan, Jules Dunne and Fiona McKeague for taking care of the nitty gritty, but also for believing in the mission of the project and for contributing valuable ideas and perspectives along the way.

Emma Pharo, Kristin Warr and Aidan Davison particularly thank: Fiona for her deft herding of cats and for taking charge of the editing and production of this report and other project deliverables; Millie for agreeing to step into the breach and taking up the role of UTAS network integrator in early 2011 with gusto and skill; and Anna for heading up the German annex of the project and taking charge of the curriculum resource. They also thank Paulene Harrowby and Patricia MacKay of the UTAS School for Geography and Environmental Studies for rock-solid administrative support.

The project team is deeply indebted to Professor Gail Hart for the care and grace with which she has carried out the role of external evaluator of the LNCC project since its inception. Gail has been unstintingly generous in contributing far beyond the formal bounds of the role of evaluator, becoming a firm friend of the UTAS project leaders and a rich resource for the project team as a whole. Gail's support of the UTas pilot project in 2008, while Pro-Vice Chancellor of Learning and Teaching, was also vital in encouraging the project leaders to pursue ALTC funding.

The project team is grateful for the active engagement of the project's expert Reference Group: Professor Gary O'Donovan (Chair), Professor Mitch Thomashow, Associate Professor Geraldine LeFoe, Dr Rick Cummings, Associate Professor Neil Trivett, Dr Sara Booth and Professor Gail Hart. Gary deserves special recognition for his unstinting support and genuine belief in the project as acting UTAS Pro-Vice Chancellor (Students and Education) during 2009 and 2010.

Finally, the project team extends heartfelt thanks to all members of the LNCC networks and to all the students who participated in network activities, without whom the project would be meaningless. We hope that all participants feel that they have received at least as much as they have given through this collaboration. We hope also that the project lives on in the relationships that have been forged between teachers in diverse disciplines and in the learning of students enriched by this collaboration.

The dynamics of human-induced climate change have continued to unfold over the course of this project, far outstripping still tentative and fragmented societal responses to a changing reality. A vast amount of social learning is required if human and environmental well-being is to be sustained over the remaining decades of this century. It is our hope that this project has contributed, even if in a small way, to ensuring that higher education is able to accept responsibility to lead much of this learning.

1. Rationale, Aims and Outcomes

Emma Pharo, Kristin Warr and Aidan Davison

1.1 Introduction

There have been many attempts to promote interdisciplinary learning and teaching within Australian higher education institutions over the past four decades. These attempts have often focused on institutional reform to overcome internal compartmentalisation within universities (Davies and Devlin 2007; Franks et al. 2007; Gibson 2007). While such structural reform has produced notable results—such as the founding of Griffith and Murdoch Universities in the 1970s and the recent introduction of the 'Melbourne model' at The University of Melbourne—disciplinarity remains the predominant criteria shaping curricula and professions in Australia. In this context, the present project was directed not to structural reform, but towards building positive relations of trust, reciprocity and collaboration between teachers within existing institutional structures.

This report describes how four partner institutions, University of Tasmania (UTAS), University of Wollongong (UOW), Murdoch University (MU) and University of New South Wales (UNSW), applied a distributed leadership methodology to the goal of promoting interdisciplinary teaching and learning about climate change through the ALTC project *Demonstrating Distributed Leadership Through Cross-Disciplinary Peer Networks: Responding to Climate Change Complexity,* hereafter referred to as *Leadership Networks for Climate Change* (LNCC). The latter parts of the report outline the achievements of the project, challenges faced and evaluate its relevance for the sector.

The LNCC project cultivated interdisciplinary leadership by creating small teams of teachers drawn from a wide range of different disciplines and administrative units within each participating university. The broad composition, cohesion and shared purpose of these teams were achieved by linking interdisciplinary teaching to a complex problem relevant to a wide range of disciplines. While the project methodology can be applied to a variety of challenging problems, climate change was chosen as the focus for this project because of the pressing need for the university sector to show leadership on an important topic presently mired in divisive debate, fragmented decision-making, conflict between professions and public confusion.

1.2 Project Rationale

1.2.1 Taking the lead on climate change

A central premise of the project was that while many problems demand disciplinary responses, they also transcend disciplinary boundaries. Climate change is one such problem that simultaneously calls for both disciplinary and interdisciplinary responses. While universities have made many contributions to social, environmental and human well-being through their various intellectual disciplines, they have been much less successful in ensuring that disciplines work cooperatively with each other to foster interdisciplinary coalitions that are capable of grasping complex problems whole. Indeed, the failure of universities to promote cohesion between disciplines may be a contributing factor in the struggle to address many serious social problems, including climate change.

In addition to its interdisciplinary complexity, climate change was chosen as the focus for this project for four reasons:

1. Complex, far-reaching and pressing issues related to climate change are already addressed across a wide range of teaching and research programs from the sciences to the humanities. However in most Australian universities this occurs in a largely uncoordinated, piecemeal, multidisciplinary fashion.
2. Many current undergraduates will shoulder responsibility during their professional and personal lives for responding to climate change issues (Burandt and Barth 2010).
3. Given the highly charged nature of public debate on this topic, students stand to benefit a great deal from climate change teaching that seeks to be relevant not simply to academic interests but to public and policy contexts and needs.
4. The extent of uncertainty associated with climate change, and present extent of research effort addressing this uncertainty, demands innovative approaches to interdisciplinary learning that emphasise problem-based pedagogy and the linkages between teaching and research. These linkages are especially important in the context of climate change as interdisciplinary approaches are presently more common and sophisticated in climate change research than in climate change learning and teaching (Hulme 2009).

1.2.2 The need for distributed leadership development in higher education

A second premise of the LNCC project was the belief that universities have a responsibility to show leadership on the topic of climate change through promoting innovative forms of interdisciplinary teaching and learning. Disciplinary fragmentation within universities is often reinforced by hierarchical, top-down modes of leadership and strongly individualised and competitive pathways of career progression, as well as by administrative and financial structures premised on competition between sub-organisational units. For these reasons, interdisciplinary teaching is often presently restricted to small interdisciplinary organisational units offering niche programs for a minority of students rather than being embedded across the curriculum through collaboration between disciplines.

Traditional models of hierarchical, 'command-and-control' leadership have come under increasing criticism for lacking flexibility, for failing to utilise opportunities for leadership at levels below senior management, and for being poorly suited to the contemporary institutional context of universities. Over the last two decades attention has been given to models of authentic leadership that emphasise both collaborative forms of leadership and the leadership environment (Avolio et al. 2009; Bennett et al. 2003). One of the most prominent of these new models of authentic leadership is that of distributed leadership. While now influential in many secondary and primary teaching institutions (Bennett et al. 2003; Harris et al 2003), distributed leadership remains an under-utilised approach within the higher education sector.

Distributed leadership is characterised by initiatives and actions identifiable as leadership that are enacted within and by groups rather than by individuals acting out prescribed hierarchical roles. Models of distributed leadership highlight the benefits of collaboration, reciprocity and shared purpose. They aim to facilitate mutually supportive relations between individuals and collaborative modes of leadership development. In so doing, they resist representations of heroic leaders and passive followers. In addition to identifying opportunities for groups to become leaders, distributed leadership strategies highlight the importance of institutional factors, such as organisational history, culture and structure, in creating an environment conducive to group-based leadership. These models also offer strategies to embed leadership development as part of normal duties, delivered through internal programs better placed to produce context-appropriate and timelier outcomes.

While not denying the value of formal modes of externally-driven professional development, models of distributed leadership highlight the presently neglected value of informal and peer-based forms of leadership development which can be integrated within everyday working environments and relationships.

Inspired by distributed leadership approaches, this project promoted interdisciplinary learning and teaching about climate change by creating close-knit teams of teachers drawn from different disciplines, schools and faculties who shared a common focus of concern. These collegial hubs brought together predominantly junior and middle-level academics involved in teaching delivery as well as course and unit coordination; roles that offer important but underutilised opportunities for academic leadership development (Briggs 2001). Such roles require interpersonal skills of supervision, team-building and dispute resolution, as well as teaching-specific skills in curriculum design, innovation, quality assurance and evaluation (Ladyshewsky and Jones 2007).

1.3 Building on other ALTC projects

The LNCC project's use of collaborative modes of leadership development builds on the considerable advances made by earlier ALTC projects to develop capacity in Australian universities for distributed leadership (ALTC LE6-1, LE6-4, LE6-8, LE6-9). These earlier efforts have translated scholarship about distributed leadership into concrete strategies and processes for raising the professional standing and quality of teaching within Australian Universities, working with rather than against conventional forms of hierarchical leadership. The LNCC project is specifically indebted to the project, 'Distributive leadership for learning and teaching: developing the faculty scholar model' (ALTC LE6-9) and has drawn on the related Leadership Capacity Development Framework (LCDF) proposed by Lefoe et al. (2008) for the design and development of the distributed leadership teams that implemented this project in each of the partner institutions. Geraldine Lefoe, primary author of this framework, was a member of the LNCC project Reference Group and in this role provided ongoing advice to the leadership team around distributed leadership in higher education.

1.4 Project aims and outcomes

This report outlines how this multi-institutional project used a distributed leadership approach to facilitate academic engagement in cross-disciplinary dialogue, curriculum development and teaching collaboration to enhance interdisciplinary student learning about climate change. In order to do this, the project aimed to:

- extend the outcomes of the distributed leadership approach piloted at UTAS in 2008 to develop distributed leadership within meaningful and durable cross-disciplinary teaching collaborations in three other Australian universities;
- build the capacity of academics to better lead teaching relevant to the real-world complexity of climate change through participation in cross-disciplinary teaching networks;
- create opportunities for academics to develop their teaching leadership, and in turn inspire interdisciplinary leadership development in students entering diverse professional fields, through cross-disciplinary peer mentoring, dialogue and reciprocal exchange around a common problem;
- establish the interpersonal, intra-institutional and inter-institutional bonds that enhance distributed leadership through meaningful and durable cross-disciplinary teaching collaborations; and
- identify a sector-wide model for the proliferation of problem-based teaching networks that will support cross-disciplinary leadership.

The successes and challenges encountered in the project in relation to each of these aims are discussed in Part 4. The vision provided by these aims has led to the following achievements, and will guide dissemination activities and ongoing collaboration between project participants. Outcomes achieved by the LNCC project at the four participating universities are:

- creation of teams of teachers drawn from across disciplinary and administrative boundaries;
- development of collaborative and distributed leadership based on group relations of trust and reciprocity;
- increased capacity of teachers involved in both course/unit coordination and teaching delivery for more flexible and relevant forms of cross-disciplinary teaching and learning;
- development and delivery of demonstrably improved educational responses to the interdisciplinary challenge of climate change;
- adaptation of the original model of teaching developed at the UTAS to encompass different institutional settings and diverse groups of participating teachers, thereby demonstrating the flexibility of the model; and
- acquisition of valuable information about the strategic requirements needed to create and maintain distributed cross-disciplinary leadership environments.

1.5 Structure of the report

Part One of this report has provided a background rationale for the project, as well as outlining the inspiration, aspirations, specific aims and outcomes of this work at the four tertiary institutions involved. Part Two describes the approach and methodology of the LNCC project, introducing the distributed leadership model created at UTAS, and contextualised by teams at each of the three partner institutions. The results of this project are reported in Part Three through descriptive case studies from each participating institution, as well as an additional case study outlining the structure and outcomes of the 'network of networks', the project team, made up of the UTas leadership team and the activator and integrator from each of the four partner institutions. Common themes are discussed and an analysis of critical success factors and challenges arising from the case studies offered in Part Four through evaluation against each of the original project aims. Part Five outlines key deliverables of the project, including the curriculum resources developed, the main forms of dissemination undertaken and the prospects for the sustainability of this project in each of the partner institutions. Part 5, and the report, concludes by reflecting on the key lessons offered by the project to the higher education sector as a whole.

2. Approach and Methodology

Kristin Warr, Aidan Davison and Emma Pharo

2.1 Distributed leadership and the project methodology

Methodologically, the LNCC project was based on cross-institutional translation of a collaborative teaching model developed by a 2008 pilot project at UTAS (see Box 1). At the start of the LNCC project the UTAS model was shared with three partner institutions, UNSW, UOW and MU, in face-to-face introductory workshops. A number of model specifications where outlined as requirements for participation in this project. A great deal of scope was allowed, however, for the domestication and adaption of this model into the different contexts of each partner institution. This section of the report outlines the LNCC model and these specifications, as well as the timeline through which the project was implemented. Part 3 describes the ways in which this model was adapted to suit the different contextual needs of each participating institution, and the outcomes that resulted from its subsequent application.

While collaborative team work has long been highly regarded in academic research, the value of collaborative approaches to teaching in higher education has only recently gained wide recognition. Teacher collaborations are variously referred to in the education literature as ‘communities of practice’ (Wenger 1998, 2000), ‘learning communities’ (Cox 2001, 2004) and ‘teacher networks’ (Lieberman 2000). These terms all describe groups of academics who share a professional practice, and who seek to communicate with each other their knowledge, passion, uncertainties and confusions in relation to this practice to promote their shared professional development (Sherer et al. 2003; Viskovic 2006). Participation in such groups is commonly voluntary and their composition may be more or less diverse, depending on their intended function (Cox 2004). They may also be self-governed or include a dedicated facilitator (Ortquist-Ahrens and Torosyan 2008).

In order to establish ‘communities’ of teachers focused on the highly complex problem of climate change this project sought to recruit academics involved in unit coordination and classroom teaching from as wide a diversity of disciplines and intra-institutional units as possible. The methodological approach was to promote distributed leadership within these groups in relation to interdisciplinary learning and teaching. Drawing on the findings of previous ALTC projects concerning distributed leadership (Lefoe et al. 2008), participation in each teaching team or network was voluntary and network establishment focused on creating a supportive, non-hierarchical and informal environment conducive to building relations of trust and reciprocity. For this reason social activities such as sharing meals were regarded as being as important as substantive workshops.

This supportive environment was a precondition for the sharing of lessons necessary for distributed leadership and the risk taking necessary for teaching innovation. Collaborative leadership development was promoted by careful facilitation aimed at building mutual understanding and joint activities between different members of the group while respecting the autonomy and individuality of participants. The varied personalities, ambitions and approaches of participants in the teaching collaborations involved in this project were viewed as valuable contributions to the make-up of institutional networks, with various leadership development opportunities identified and supported to cater to each of these individual pathways. In this way, distributed leadership became a methodology through which both shared vision and diverse individual aspirations could be developed. The individual and group leadership development outcomes that occurred as a result of this project are outlined in Part 3 and discussed in more detail in Part 4.

Box 1: The UTAS Pilot Project 2008

In 2008, through an internal Teaching Development Grant Scheme, UTAS funded a group of eight academic teaching staff to develop a collaborative teaching model that would promote interdisciplinary student learning about climate change. The team sought to address identified student frustrations with institutional barriers inhibiting cross-disciplinary learning, reported in focus groups in 2006. Data revealed clear student demand for collaborative approaches to teaching and an overwhelming dissatisfaction with the lack of coordination in teaching across the university (UTAS Academic Senate Minutes, March 2007). Further informal feedback from students in first year classes indicated that many students found studying concurrently in several different disciplines confusing. Their confusion was not surprising given that differences between disciplinary cultures and pedagogies are often not made explicit to students and that schools, understandably, promoted their own disciplines ahead of others, therefore reinforcing the silo effect in learning. Students often then viewed first year experience as more of an opportunity for market research prior to selecting a preferred discipline than as a valuable opportunity to develop skills of interdisciplinary learning. The pilot project responded to both student and vocational demand for skills of interdisciplinary learning and an institutional need to promote collaborative teaching.

The project brought together eight teaching staff, the majority with first year teaching responsibilities, in the Faculties of Education, Business, and Science, Engineering and Technology, and the Australian Maritime College. In forming the original project team, project leaders (Pharo and Davison) considered targeting academics in key disciplines to participate in the climate change collaboration, but decided instead to target academics from all disciplines who were committed to teaching innovation. Success seemed more likely with a group of academics who shared a common educational perspective. A common perspective later provided a common language and practice that transcended disciplinary specialism (Lueddeke 1999). This approach recognised that it is not unusual for academics to regard interdisciplinary enquiry with skepticism, if not hostility (Newell and Green 1982). The project leaders thus sought participants with an open-minded approach to teaching and an interest in the real-world complexity of climate change.

Over the course of one full academic year, the work of the network was facilitated by an integrative curriculum designer/project manager (Warr) and focused on collaborative redesign of a number of climate change teaching activities in each of their participating classrooms. The specific outcomes, challenges and lessons from this pilot project are outlined in Case Study 1 in Part 3 of this report.

Because of their self-selecting membership, the LNCC teacher collaborations were held together by shared interest in both teaching innovation and the issue of climate change. In effect, the topic of climate change provided a strong interdisciplinary ‘anchor’ to facilitate the development of the shared purpose necessary for collaborative practice and distributed leadership (Barab and Landa 1997; Dale and Newman 2005).

Rather than approaching the need for interdisciplinary learning and teaching in abstract, conceptual terms, the methodology of this project relied on the 'wicked' (Brown et al. 2010) complexity of climate change issues to provoke group learning about the strengths and limitations of disciplinary knowledge. The aim of this approach was to lead the group past the serial collecting of disciplinary perspectives that characterises multidisciplinary approaches to curriculum development. This problem-based methodology takes advantage of the highly distributed nature of academic knowledge about climate change as an opportunity for collaboration, professional learning, and interdisciplinary innovation. Inspired by pedagogical interest in problem-based student learning, the shared problem of climate change provided the impetus for recruitment into the LNCC teams as well as a rationale for communication and collaboration across disciplinary boundaries.

2.2 The LNCC model

The LNCC model of distributed leadership through teacher collaboration brings together a cross-disciplinary group of teaching academics around a shared area of concern, in this case improving interdisciplinary climate change education. This model recognises that working directly with peers to solve problems, to identify shared goals and to exchange different perspectives and experiences is an important part of academic teaching (Di Petta 1998; Cox 2001, 2004).

The LNCC model specifies two key individual roles within the teaching networks: the 'network activator' (the catalyst) and the 'network integrator' (the facilitator).

2.2.1 The network activator

The network activator is a teaching academic who initiates or catalyses collaboration by identifying an issue of concern and recruiting other teaching academics who are interested in the same issue to participate in a shared inquiry or practice to address this concern. The activator at each participating institution was named as a member of the core LNCC project team on the ALTC grant application and was responsible for identifying and appointing someone to the role of integrator.

Domestication of the LNCC model at each institution resulted in variations to both the model and the ways in which the roles of activator and integrator were interpreted. Each institution has chosen to utilise their activator in alternative ways, as demonstrated in particular by the UOW and MU in case studies 3.3 and 3.4. For example, although the role of activator could be identified as a 'formal' or 'top-down' leadership role in the first instance, the experience in the 2008 UTAS pilot of the LNCC model was that this role became much less defined and significant once networks were established and the activator became an 'ordinary' network member. In the present ALTC project, however, the experience of partner networks has been varied in relation to the leadership role of activators. For a start, network activators have retained an important leadership role for the life of this project as named institutional leaders for the project on the original grant application and members of the overall project team with responsibility for reporting and delivering agreed outcomes.

In addition, as is reported in Part 3, at least two of the teaching networks (UNSW and UOW) required the activators retain a clear leadership role throughout the project in relation to network members as a vital way of maintaining the momentum and cohesion of the network.

2.2.2 The network integrator

The network integrator, on the other hand, maintains a defined and differentiated role throughout the teaching collaboration. With the objective of facilitating the process of collaboration between members of the group, the integrator is responsible for managing the practical needs of the network in terms of logistics, supporting group consensus-based decision-making, curriculum design support, facilitating the maintenance of a resource repository, facilitating cross-disciplinary communication between team members and disseminating the activities of the project accross the institution. This can be undertaken by an individual who may or may not have teaching responsibilities. The integrator is also responsible for managing the data collection and reporting requirements of the project. The role of the integrator responds to the ever-present time-pressure faced by teaching academics with full workloads and often substantial overloads that allocate little if any time to professional development activities, including leadership development, related to learning and teaching.

Other than overall project manager position hosted at UTAS, the integrator role was the only position funded by the LNCC project. These positions were therefore filled by staff holding part-time appointments. The decision to fund this position reflects its crucial importance in the LNCC model and the need to ensure there was always someone available to build and maintain team cohesion whilst network members were busy during teaching semesters. The financial value placed on this role also reflects the present lack of funding within the university sector directed to supporting teaching collaboration and distributed leadership more generally.

2.3 Domesticating the model in partner institutions

An important lesson of the UTAS pilot project and earlier research on distributed leadership - in particular that of the *Leadership Capacity Development Framework* - was the need to establish strong interpersonal relationships and shared vision as early as possible in a project (Lefoe et al. 2008). It was thus important that all members of the project team understood the aims of the project and had a good sense of the requirements of the grant and the essential specifications of the LNCC model. In keeping with the aim of linking teaching collaboration and distributed leadership development, it was also important that the project team understood something of the institutional context, history and working of the UTAS pilot project, so that scope for adapting the model to suit local context, opportunities and aspirations at each partner institution was maximised.

The multi-institution LNCC project thus began with two introductory workshops at UTAS: one for activators and one for integrators. Facilitated by the project leadership team, the objective of these workshops was to introduce partner institutions to the LNCC model and to support them in beginning to shape the model to suit their context and purposes. This was done through a number of approaches including roundtable discussions and group activities designed to share existing teaching approaches, teaching contexts, understandings of interdisciplinary learning and climate change, and opportunities for teaching innovation. These workshops also provided the opportunity for face-to-face relationship building to ensure that the project team itself functioned as an overarching ‘network of networks’ in which the activators and integrators worked as a collaborative team in meeting project requirements.

Four elements of the UTAS model were shared with the partner institutions as essential specifications. The trialing of these essential criteria was a deliverable of the grant. These four specifications were as follows.

1. The identification of a dedicated network activator to participate as part of the full LNCC project team.
2. The identification and hiring of a dedicated network integrator to participate as part of the full LNCC project team.
3. The recruitment of a cross-disciplinary team of teaching academics who were keen to collaborate around climate change education.
4. The development of a student-led activity that drew students together from across disciplinary curricular boundaries.

While these four specifications formed the basic foundation of the LNCC model, the model also provides scope for a great deal of flexibility in adaptation to new institutional contexts. This was important because each institution had different administrative and curricular structures, scale of operations and histories around interdisciplinary curriculum and climate change teaching. It was a fundamental premise of the project that while the key elements described above created a basic structure and purpose for the teaching collaborations in each institution, each teaching network was to be established and maintained as an autonomous network that could set its own goals, contextualise its approach and determine how best to create initiatives that could endure beyond the life of the project. Partner institutions were therefore free to innovate in terms of structures, methods, communication strategies, and relationships. This combination of a shared core methodology and local autonomy also enabled the LNCC project to maximise opportunity for the exercise of distributed leadership at all levels of the project.

In order to ensure that lessons from partner institutions' experience were shared across the project team, activators and integrators were asked to participate in a number of data collection activities. These included the documentation of network activities and reporting on these in quarterly reports and project team meetings; reflective journaling, and contributions to the project's main collaborative deliverable, a climate change teaching resource. This resource is outlined in Part 5 of this report. These data collection activities then served the purpose of building the case studies reported on in Part 3 of this report, and assisted with the final evaluation of individual case studies and the overall LNCC project.

2.4 Timelines

The LNCC project was rolled out in each of the partner institutions as a two-year, three-stage process as follows.

Stage 1: Network establishment

Stage 2: Network consolidation

Stage 3: Network cascading

UTAS began this project with the existing network established during the pilot project in 2008, and therefore began in 2010 in Stage 2, while UOW, UNSW and MU began in Stage 1. Given that the LNCC project funding was for two years, Stage 3 was completed only at UTAS, although this stage may be subsequently undertaken by partner institutions after the life of the LNCC project.

2.4.1 Stage 1 (YEAR 1): Network establishment

Following the introductory workshops held in early 2010, the activators and integrators at each partner institution worked together during the first half of the year to domesticate the LNCC model within their institutional contexts. The first step in this establishment phase was to identify and recruit a cross-disciplinary group of teaching academics to form a network that would:

- plan and implement a student-led interdisciplinary activity; and
- develop shared teaching resources to contribute to the LNCC curriculum resource.

2.4.2 Stage 2 (YEAR 2): Network consolidation

The second stage of implementation of the LNCC model included a process of review and renewal for each partner network. Network integrators gathered strategic information on the progress of stage one in order to re-evaluate their aspirations for stage two.

At some institutions, this was done by interviewing existing network members about their experiences in Stage 1 and their aspirations for how the project could continue to achieve interdisciplinary learning outcomes and provide opportunities for group and individual leadership development in relation to climate change teaching. Based on this data, the networks' goals and directions for implementing new student-led activities and developing new teaching resources were renewed. Strategies for recruiting new members, where necessary - either as a result of the loss of members or to meet new network goals - were also identified.

2.4.3 Stage 3 (YEAR 3): Network cascading

This third stage applied only to UTAS, reflecting the fact that LNCC project was of only two years duration and that UTAS had completed Stage 1 in 2008 during the pilot project. This stage provided an opportunity to test the ability of LNCC networks to self-seed new networks at their institutions focused on interdisciplinary student learning but around topics other than climate change.

This propagation of the LNCC model was seen to be one important strategy for disseminating and embedding the model at institutions beyond the life of the project. The approach outlined in the original grant was for the original UTAS integrator to catalyse a new network around a new area of shared interest or concern. The outcomes of this stage are reported in Case Study 1.

2.5 Evaluation

The LNCC project was evaluated through a combination of summative and formative methods applied to the overall project as well within each institutional context. Each partner institution was responsible for evaluating their own project outcomes against the goals identified by their institutional teaching networks. These evaluations are reported in Part 3 of this report.

The approach for evaluation at the overarching, multi-institutional level of the LNCC project included:

- formative and summative feedback from an external evaluator on an on-going basis from the commencement of the project;
- formative and summative feedback via two-way critical friend relationships established between a member of the UTAS project leadership team and the integrator and activator at each partner institution;
- collection of quarterly progress reports from each partner institution reporting on the ongoing achievement of project aims and outcomes;

- reflective journaling of project team participants (conducted primarily by activators and integrators);
- formative feedback from an external reference group;
- formal reporting to the ALTC; and
- surveys of participants at project team retreats and workshops.

The recently retired Pro-Vice Chancellor (Teaching and Learning) of UTAS, Professor Gail Hart, accepted our invitation to be the external project evaluator. She was actively involved at all stages of the project, attending all face-to-face project meetings, reference group meetings and participating in project web-conferences. Prof Hart also attended the introductory and mid-year workshops and read progress and final reporting documents. She was a fully engaged mentor for the three project leaders, providing critical advice on the direction and adaptation of the project at various intervals. All project data was shared with Prof Hart, and her formative feedback helped to shape evaluative tools used throughout the collection of data across the project. Prof Hart's final evaluation report can be found in Appendix 1.

3. The LNCC Case Studies

3.1 University of Tasmania
Kristin Warr and Millie Rooney

Acknowledgements

Millie Rooney, Kristin Warr, Aidan Davison and Emma Pharo wish to thank the following colleagues who have given generously of their passion and skill as members of the UTAS network for all or part of the past four years: Kim Beswick, Lucy Bleach, Sara Booth, Chris Burke, Richard Corry, Miranda Harman, Colin Jones, Penny Measham, Kate Nash, Melissa Nursey-Bray, and Erik Wapstra. They also thank Niel Trivett for helping to put together the 2008 team, Gary O'Donovan for providing additional funding for the network in 2011 and Corey Peterson taking on the role of activator in a second UTas network in 2011.

3.1.1 The institution

UTAS offers undergraduate, postgraduate and research higher degree education to over 20,000 students in Australia and worldwide. With three main campuses in Tasmania, and two in Sydney, UTAS offers higher education study to both on-campus and distance students. As the only university in the island state of Tasmania, UTAS prioritises both teaching and research, with a focus on excellence and distinctiveness in both of these areas. Enhancing teaching through active UTAS research and facilitating interdisciplinary learning opportunities for students are two institutional goals outlined in the university's strategic plan, known as EDGE 2. Among the goals outlined in EDGE 2, particular attention is given to the aim of interdisciplinary education through priority B6:

> Restructure and streamline the course profile to provide: common course structures; multidisciplinary and interdisciplinary learning opportunities; and flexible delivery options that are responsive to students' needs and the university's academic strategic priorities (UTAS EDGE 2 Agenda, pg 3).

Despite the strategic goal setting to promote interdisciplinary learning opportunities at UTAS, there are a number of structural and administrative challenges to creating truly interdisciplinary courses and units for students. Examples include the siloed structure of course design and administration; the funding model for student enrolments; the lack of a general education or preparatory structure for incoming students; and the casualisation of the workforce. These challenges have led to the promotion of a competitive culture for students and do so in an environment where increasing time and administrative demands are put on staff. While academic staff are asked to simultaneously increase both research output and teaching income, the reality of collaborative and interdisciplinary learning opportunities across these siloed structures becomes less and less likely. It is also difficult for teachers to prioritise excellence in teaching over research output in an institutional context that places greater value on journal publication.

It was in response to this context of competition and workload stress that the LNCC model was developed in an attempt to enable the motivation and desire to provide interdisciplinary learning opportunities to students through collaborative teaching opportunities for staff. Now, four years on, the UTAS project team offers some recommendations and responses as to how a project such as this works through the competitive culture of Australian higher education institutions.

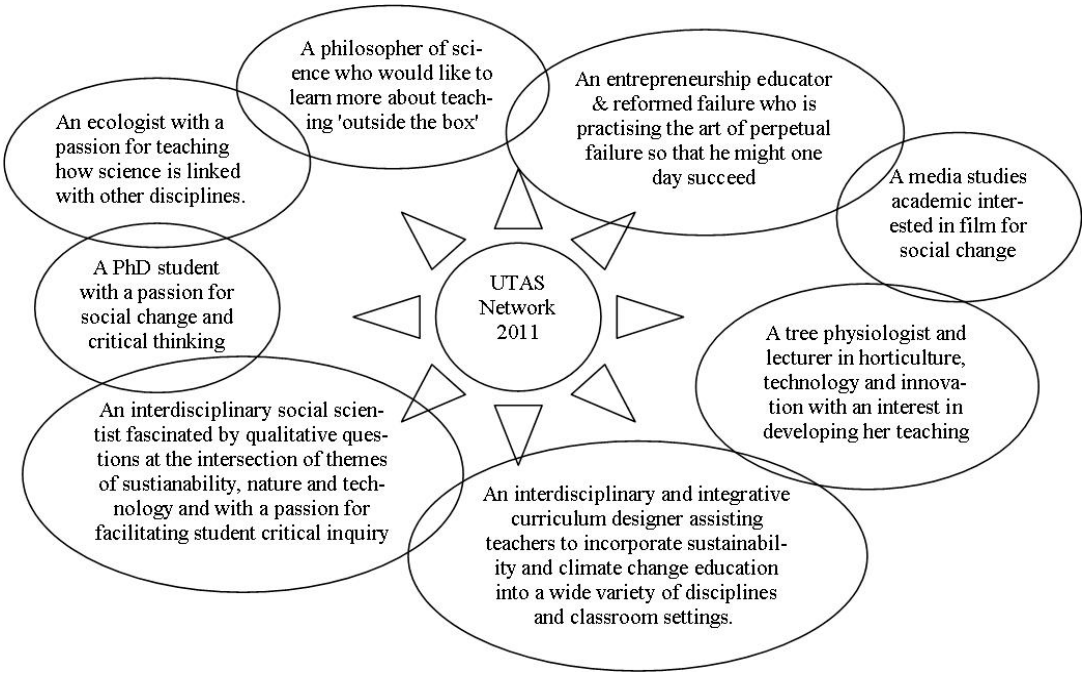
3.1.2 The network

The UTAS project began in 2008 with the development of an interdisciplinary network – a collection of level A and B academics from the Schools of Education, Management, Aquaculture, Zoology, Geography and Environmental Studies and the Australian Maritime College. The network was established by two Level B Lecturers from the School of Geography and Environmental Studies who acted as what later became called the 'network activators'. The six other network members were invited to participate based on recommendations from an Academic Developer in the Central Learning and Teaching Unit, the Centre for the Advancement of Learning and Teaching (CALT).

In recognition of the existing workload stress of network members, a 'network integrator' was hired as a professional staff member, to operate as a free agent unconnected to any specific school or administrative structure. The job of the integrator was to coordinate the network and act as a go-between and connector piece between the different schools and disciplines. This person has at various times been called the glue, bouncy ball, translator, mediator and organiser as network requirements shifted.

In 2010 the makeup of the network changed, with two of the original network members moving into new roles both within and outside of UTAS, one going on study leave and one undertaking a teaching fellowship. To compensate for this loss, and to further expand the network into other disciplinary areas, the network recruited three new members. The new members were all Level A/B academics from the Schools of Art, Philosophy and English, Journalism and European Languages. Figure 1 provides an overview of the discipline backgrounds of network members.

Figure 1: UTAS Network Members



The original integrator also moved into a part-time teaching role as part of the School of Geography and Environmental Studies; an opportunity, in part, attributable to her role in the LNCC project. By 2010 three of the original network members had been promoted to Level C, with their roles in the 2008 LNCC project contributing to their career advancement.

In 2011 the network underwent another expansion. Two new Level B network members joined the group from the Schools of Agriculture and English, Journalism and European Languages and the integrator from previous years became one of the network members. A new integrator was hired, once again from outside of the structures of any one School or administrative unit, to ensure the chance of more fluid movement between the disciplines. It is worth noting however that both integrators, along with the original activators, did have strong connections with the School of Geography and Environmental Studies as either administrative staff or postgraduate students. While both Integrators worked to ensure they were not viewed as being only loyal to the School of Geography, helped by the fact that neither at the time of their appointment had teaching positions in the School, their ability to work closely and informally with the originators of the project (as noted above the original three were all from the School of Geography and Environmental Studies) helped to provide a more energetic and inspired leadership to the network.

The network activators, two academics from the School of Geography and Environmental Studies but trained in very different disciplines (plant science and social science), were the catalysts of the original UTAS pilot for the LNCC project in 2008. Their interest in activating such a network at UTAS came from their frustrations as an interdisciplinary teaching team for a first year geography class. The original integrator was chosen based on her experience as a curriculum designer, and specifically her interest in education for sustainability. She was also inspired by the idea of the project and worked well on a personal level with the two Activators. This original team of three comprises the project leadership team of the cross-institutional LNCC project reported here.

This team of three worked collaboratively on all aspects of the UTAS network management, with decisions and directions being negotiated. The activators have taken on the roles of instigating and supporting the rest of the network, supported by the integrator. They have also contributed to the scholarship output of the network through the writing of the original grant application and a collaborative peer reviewed journal article for the UTAS network.

The integrator has taken on the role of project manager for all network activities, with the support of the activators. The integrator has also taken on the role of a network curriculum designer and teaching assistant at various times. As this team has worked together closely over the last four years, the levels of trust and reciprocity between them is strong. With the introduction of a new integrator in 2011, roles have shifted slightly. The new integrator has taken on curriculum support activities for the network, while the original integrator has moved into a activator position to support the network because the original activators were on study leave for part of the last year of the project. It is also worth noting that the new integrator had already worked as a project officer for the larger LNCC project team and was well known to the UTAS activators.

Of the original network, about half were already involved in teaching climate change as part of their core disciplinary curriculum, with the other half willing to trial this topic as a focus for interdisciplinary collaboration. Once identified, network members met face-to-face. The motivations for being involved all centered on a passion for teaching, teaching development and a belief that interdisciplinary collaboration and teaching opportunities were limited but essential in the current UTAS climate. Additional motivations of some members included a concern about the way in which complex real world problems such as climate change were being taught, a desire to publish as part of an interdisciplinary collaboration and goals of individual career progression in the teaching and learning space.

In the second and third stages of the network, new members were recruited by the activators and integrators via face-to-face and phone calls. These new members had been identified by original network members through other professional networks, past experiences working with these individuals, or their expressed interest in interdisciplinary collaboration, climate change teaching, or both. Each of the *new* members showed an explicit commitment to improving the teaching of *climate change* through their participation in this project.

The outcome of this motivation in 2010/2011 was the use of the network as a resource for testing ideas, drawing on expertise and accessing networks of the network. For example, a new unit, while being developed before participation in the network, was able to draw on the encouragement and support of network members in trialling a new approach. Emails were also sent out to the network by individual members seeking access to a range of students, staff and expertise to attend disciplinary based classes. This sense of collegiality has remained a key strength of the network.

In each stage of the project, getting all network members into the room at the same time was the primary challenge. An attempt was made by the integrators to ensure there were at least two face-to-face meetings of the whole group each year, although in most cases at least one or more network members were always missing. In these instances, the integrator would arrange to have follow-up meetings with those network members to bring them up-to-date on network activities and make sure their input was included in network decisions. This often led to decisions and activities being dragged out longer than would be desirable, but it maintained the inclusiveness.

In the first stage of the project the network members worked together on an interdisciplinary student led activity in which 30 students from across the range of disciplines involved developed a 13-week interdisciplinary climate change class. The intention was to have the class offered, and taught, as an interdisciplinary cross-program class that would be available to all UTAS students. Following interest from senior managers and the Associate Deans (Teaching and Learning) to create this interdisciplinary class, the activators and integrator were able to negotiate a spot in the Geography and Environmental Studies Curriculum. The unit was to be a team taught, interdisciplinary offering that would be open to all later year students without a pre-requisite.

One of the great strengths of the UTAS network is the way in which it has provided a space for a number of different, and differing, aspirations and goals. When asked about their teaching and networking goals a number of different responses emerged from network members including “I want to get confident teaching first years. They scare me pantless!”, “the opportunity to discuss teaching methods with others”, “I want to be more directly involved in teaching with other people from different disciplines” and “I want to raise the profile of climate change in the units that I teach”. As a group the broad goal of the network was to find ways to challenges the barriers to interdisciplinary teaching at UTAS, especially in the context of teaching climate change.

3.1.3 Network activators

As explained above, the UTAS network has two activators, Davison and Pharo. Their personal reflections upon this role are offered below.

3.1.3.1 Aidan Davison

In beginning this project I had four main aspirations and goals for the network.

1. To locate myself within a community of colleagues from all walks of academic life for whom teaching was a primary passion and not a second class bother.

2. To face up to the colossal challenge of climate change as a teacher with the strength of numbers.
3. To get a better grasp of interdisciplinary complexity of climate change and in the process support students to do the same.
4. To contribute, in however small a way, to the making of just and ecologically robust climate change futures.

At the same time there were also broader structural goals and for me this meant pursuing modest strategies. These strategies were about subversive activity within existing structures rather than tackling those structures head-on and importantly were strategies to promote interdisciplinary teaching and learning based on cultivating collegial relations. This is especially important in the context of an institution riven by disciplinary and administrative segmentation.

Another key reason for my participation in the network was to gather courage and imagination in the task of innovating in my teaching practice and to do this through being educated and inspired by other teachers in the network.

I have learnt a great deal in the course of this project, since 2008, but I'm not sure that this learning has transformed my original goals and aspirations. I certainly have more language now for expressing the value of collaborative and collegial approaches (communities of practice, in the currently fashionable lingo) in the professional development of academic teachers, and am able to use this in the context of distributive leadership. I also think I now do grasp more than I previously did the value of a very wide range of disciplinary perspectives on climate change. But the four goals as outlined above remain clear for me: we have gone a little way towards these goals in our UTAS network, but there is much, much more I think we could do.

3.1.3.1 Emma Pharo

My goals have changed according to opportunity. When the project began, we weren't sure what was possible. Our achievements in the first year were fairly modest, but we gained momentum and a couple of really good activities have come out of the network. In particular, the new unit I coordinate (KGA319 Making Sense of Climate Change) has been a great experience. Teaching together has been something of a revelation after 15 years of tutoring and lecturing in relative isolation.

Maintaining our community will be difficult if there is no ongoing funding. We are all too busy to keep it going on good will alone. The integrator is very important in keeping things moving.

3.1.4 Network integrators

The UTAS network integrator from 2008-2010 was Kristin Warr. As a result of moving into the network as a regular teaching member, she was replaced in 2011 by Millie Rooney. Their personal reflections on this role are offered below.

3.1.4.1 Kristin Warr

My initial aspirations for the network were for all participating academics to begin to integrate and ‘renew’ their disciplinary curricula in light of their observations and realisations about the complexity of teaching climate change in a disciplinary context. It was the half of the network who had no interdisciplinary teaching experience that I was most excited about working with. Coming from a background in integrating sustainability across an integrated curriculum, I was excited to be working with teachers who were keen to try something new, learn something outside of their areas of expertise, and give students an opportunity to realise the real-world context in which they were working.

My secondary goal for the network was to address the structural barriers that seemed to stifle so much creativity in course and curriculum design. While individual unit coordinators in the network seemed to have a significant level of autonomy in designing their units, in most cases it was still done within a strict disciplinary framework to meet the needs of the course or degree into which they were contributing. I hoped that the network would provide a supportive environment in which innovation could be risked. On a more personal note, my own goals for participation in the network were to gain experience and confidence in teaching about climate change in a number of disciplinary contexts, as well as build networks across the institution with engaged and innovative teachers.

While my goals and aspirations for the network remained relatively constant over the several years, the way in which these were able to be sought did change. The shift in focus from a real grass roots approach, to one in which a select few of the network appeared on grant funding acted to shift the dynamic of the group in 2009/10.

Strong relationships were established across the group, which led to a number of individual and group successes. The outcomes of the shared interdisciplinary activity between students from across the network was an exciting and unexpected success, and this really gave a boost to the network as a whole in terms of their confidence in what could be achieved through participation in a committed teaching collaboration.

The grass-roots and revolutionary approach to interdisciplinary collaboration in 2008 was stifled somewhat when we decided to take the easy road and take up the opportunity to launch the student-created unit within the traditional administrative structure of the university and place the unit within the ownership of one school. While in the context this was the best that could be achieved, it was unfortunate because subverting the traditional structure had been one of the goals of the project for promoting ongoing interdisciplinary work. Regardless of these mistakes we worked hard in 2010 to renew the network and its focus. We canvassed for new members, focused on bringing a rich interdisciplinary flavour to the student-created unit and worked to rebuild the relationships begun in 2008. These goals worked to varying degrees, but in the end we realised that the momentum of the network had shifted and was now centred around the delivering the student-centred unit. We had to make adjustments to the way we framed our conception of the network and its goals.

From all this we took a number of important lessons, including the reality that the network will change and the goals and aspirations of individuals and the collective will also change over time. The nature of distributed leadership as a methodology for collaboration must give space for all individuals to be flexible and adaptive to the various forms and directions that the collaboration might take, and this may mean both losing and gaining people, momentum and direction along the way.

3.1.4.2 Millie Rooney

In taking up the position of integrator, I wanted to maintain the quality of support, enthusiasm and vision that the previous integrator had provided. I expected that this would be a difficult position given that I had not been integral to the development of the initial project.

Given that I am at the beginning of my career, I was quite excited at the prospect of being exposed to some creative and innovative teachers and having the opportunity to engage with the teaching process. I hoped that in my role as integrator I was able to properly support the networking of such busy teachers.

From my own undergraduate experience at university, the units which have remained with me today and inspired me to remain in the tertiary sector were those based on interdisciplinary and transdisciplinary teachings which engaged in critical thinking and real world problems. The integrator seems like the perfect position for assisting in the development of such a practical problem based unit that also provides for space to connect with the wider community.

My visions of what the network could achieve, while remaining the same in essence, have been somewhat downsized. This is due to the practical realities of moving into the position, a new and developing network, and the constraints of staff time. It has been far harder than expected to get the network to respond to emails, phone calls, etc., despite their keen interest and enthusiasm.

The difficult transition from being a integrator who was core to initiating the network to one relatively unknown has provided an interesting insight into the importance of project ownership and clarity of project goals.

3.1.5 Network members

While the network was made up of a collection of people with different perspectives on the way in which they see the network as benefitting them, as a group there was general consensus about the importance of the group process. One network member, who is no longer a part of the active team due to moving to a non-teaching position, sums up the value of the project by saying “you should *never* drop this project just because people don’t have time. It is *important*”. In practice, however, this meant that the goals of the network were dynamic, often revisited and subtly tweaked depending on the energy and interests of the changing group.

It became apparent as the project progressed that the primary role of the group was to support teaching practice and development. Climate change was a driving issue which the majority of the group felt very strongly about, but the model of interdisciplinary collaboration has become the primary driver of the group. As one member said “sharing teaching is like showing each other your underpants. It’s quite personal”. This highlighted the significance of having a safe space in which to explore teaching practices.

The shift from an initial focus on interdisciplinary teaching, to teaching about climate change and back to a stronger focus on teaching was a result of changing group dynamics and an eventual recognition that members were not so much climate change experts as facilitators of knowledge exchange and integration. To be a good facilitator of knowledge on climate change required an interdisciplinary understanding and an access to other types of expertise within the network. Support to access this expertise proved a crucial element of the project.

Another interesting dynamic of the group was the way in which it recognised the existence of the network as being of greater importance than individual class initiatives. As such some members were willing to support larger group initiatives which they would otherwise not have chosen to put their energies towards. This shows the strength and value placed on the network in and of itself. The integrator had an important role to play here in ensuring that the group initiatives that were really pushed were those that had the most energy as well as an appropriate level of consensus. While many of the network aspirations and goals were realised, the network has faced many challenges and while many of these have been overcome, others remain significant issues.

3.1.6 Network challenges

Challenges which were identified at the start of this project continued to crop up throughout the three-year implementation. These included the reality that most teaching academics are time poor and over committed, as well as the reality of the administrative and budgetary structures that limit interdisciplinary collaboration and curriculum design. When explicitly asked about the challenges to the network member comments were inevitably around time; “[the biggest challenge was] time management’, “I was totally swamped” and “The major challenge for me is lack of time to be able to engage in a meaningful way. My engagement to date has been sporadic, and as such it is difficult to foster and facilitate student projects that reflect the intentions of the network”.

In the later years of the network it is worth noting that staff were increasingly pressed for time as career achievements, such as promotion, added extra time stress. Given that maintaining long-term planning and participation commitment from all members of the group has proved a significant challenge, the integrators have had to work exceptionally hard to maintain momentum and ensure collaboration between and within the group. Some of the successful approaches implemented by the integrators to maintain the network included hosting out of work-day meetings such as breakfasts and after work drinks; holding one-to-one and small group catch ups over lunch and tea on campus; and sending light, short and sweet email updates to the whole network about network activities, celebrations and ideas that cropped up along the way. At the conclusion of each stage of the network, members could not overstate the value of the integrators as the critical link for the network. Without this key role, network participants in current academic climates continue to be time poor, over committed and influenced by disciplinary administrative structures that challenge the existence of interdisciplinary collaborations.

These constraints affected each of the network members, including the activators involved in the project. The only members of the network who were really able to overcome these challenges were the integrators who, as noted above, existed outside of the administrative and disciplinary structures that constricted the involvement and commitment of the other members. Additionally, the network integrator role was the only paid position and therefore allocated definitive workload to the project. Because of the definitive workload, the integrator was considered to be the ‘glue’, or the ‘go-to’ person for the rest of the network. By taking carriage of the collaboration of the network, individual network members were better enabled to continue to meet their own commitments and use the network as a support for those commitments instead of an additional task. Through the integrator, the network helped each of its members to review and renew their curricula in relation to the network’s goals for increasing interdisciplinary and climate change teaching.

While the new integrator was employed to take on the role of building group coherence, in practice the newly developed *Making Sense of Climate Change* undergraduate unit (KGA319) quickly emerged as the focal point of the network. This new focus network meant that the coordinator of this unit (Pharo), a network activator, became the glue of the network, coordinating different academics and individuals to come together in the unit and reducing the reliance on the network integrator. Such a shift in network focus only became clear retrospectively, toward the end of 2011 and, as will be discussed in Part 4, proved to be one of the challenges the network faced.

While the team-taught unit itself was a huge success, as can be evidenced by the reflections of the teaching staff and the student feedback below, the class has yet to achieve some of the larger, transformational goals of the network to tackle institutional curriculum silos. The unit did indeed increase the number of interdisciplinary units available for students at UTAS, however little progress was made in breaking down the siloed, disciplinary structures that prevent staff from different Schools from teaching together and from sharing students outside of a competitive budgetary structure. The

fact that the course coordinator of the new interdisciplinary unit became the unofficial integrator meant that the unrecognised nature of her position increased the problems of time stress both to her personally and the network at large.

The challenge of breaking down the siloed disciplinary structures preventing teaching collaboration is still something the network is working to overcome. Based on the lessons learned from the pilot project in 2008, the network now aims to address these challenges head on by sponsoring a trial of collaborative teaching approaches to help inform a discussion paper and policy recommendations on how curriculum, budget and administrative structures need to be changed to better enable interdisciplinary teaching and learning opportunities at UTAS.

3.1.7 Achievements

Over the four years that the network has been operating at UTAS there have been some significant achievements for both individuals and the network itself. Given that these successes are often interwoven, for the purposes of clarity, network achievements and individual achievements are presented here in the one section.

What is striking is the way in which the network has provided a vehicle for exploration of teaching, a sharing of ideas and ultimately the creation of a set of teachers much more confident in their abilities and much more reflective and reflexive in their teaching practices. Comments from network members included the following statements:

"it was inspiring, how you can do things differently and it made me think heaps more about my own discipline."

"If you had asked me at the beginning of last year would I teach into a geography unit, I would have been a bit worried. But it was actually good and broke down boundaries. It was nice to talk with students from outside my own discipline because they were not afraid to ask questions, they were not afraid that I was making an assessment of them and expecting to know journalism terms etc."

3.1.7.1 Achievements 2008/2009

While impossible to directly attribute network membership to increased promotions and opportunities, when looking at the original network members it is worth noting that *all* members found significant opportunities open to them that were at least partially supported by network participation. Examples of these include; the development of the new interdisciplinary class, an appointment as an Education for Sustainability teaching fellow, an ALTC citation, a movement to the office of the Deputy Vice Chancellor, achieving positions in key teaching and learning bodies and committees at UTAS, having a paper accepted in the journal *Teaching in Higher Education*, the development of new teaching activities within existing units, time as Acting Head of School, and various other promotions.

As a result of these individual and group achievements through commitment to innovative teaching and interdisciplinary approaches to climate change, eight classes (reaching potentially 200 students per year) were better able to integrate climate change into their curriculum.

Furthering the success of the 2008 network was the development of individual and group leadership in 2009. Individual leadership took the form of unit coordination and development across the network, while the network itself emerged as a leader in the broader university context with the LNCC model being taken up by the University's Centre for the Advancement of Learning and Teaching (CALT) as the model to support their strategic communities of practice initiative and new teaching fellows program.

3.1.7.2 Achievements 2010/2011

The primary achievements of the UTAS network in 2008/2009 focussed on the development of new classroom activities (see curriculum resource) and the creation of new a new unit. In 2010/2011 the focus of the network shifted to centre around the implementation of a new unit KGA 319 – Making Sense of Climate Change. This unit was developed in conjunction with staff and students and sits within the School of Geography and Environmental Studies.

The development of this new unit proved a huge leadership development success for both staff and students involved. Students were encouraged to play a key role in the evaluation, development and critique of the unit, providing the structure not only for student lead learning, but also provided the space for students to show leadership in curriculum development.

Students who participated in KGA 319 *Making Sense of Climate Change* made the following comments highlighting the value of such an interdisciplinary approach:

"Having previously undertaken physical science units, this was the first time that social science issues had been addressed, giving much needed balance to my understanding."

"This unit have been by far one of the most interesting, informative and REAL subjects I've ever attended. I loved the unorthodox, yet effective, approach to teaching; as it seems the only way necessary to sufficiently deal with a unit as big as 'making sense of climate change'. The use of 3 teachers (each from different geography styled backgrounds) gave an amazingly diverse perspective; and coupled with the array of guest speakers, one could ACTUALLY gain an understanding of the effect of climate change and how climate change has unfortunately come to be viewed as a 'debate'."

As noted above the unit KGA 319 – *Making Sense of Climate Change,* developed to operate as a secondary network with the key course coordinator unofficially stepping into the role of network integrator. In this capacity she drew in staff from within the network, as well as tapping into broader university climate change networks. This unexpected network development proved to be a key exercise in leadership development for the course coordinator.

3.1.8 Development of new network

As outlined in Part 2 of this report, UTAS was the only partner institution in the LNCC project that would participate in Stage 3 and 'Cascade' the LNCC model by seeding a new network within the institution. In 2011 this was done through an academic integration program run out of the Sustainability Office at UTAS as part of Asset Management Services. The original UTAS integrator assisted a new activator from the UTAS Sustainability office to catalyse a network around a project designed to integrate on-campus sustainability initiatives with in-class learning in a number of different disciplines. The new network consisted of lecturers (and students) from the Schools of Architecture and Design, Geography and Environmental Studies and Engineering, as well as staff from Facilities Management, a local business and a local community group.

In the first twelve months of the network, members worked together to collaborate on the design, building and installation of a number of bike shelters around the southernmost UTAS campus in Hobart. The project involved an initial data collection exercise conducted by students from the School of Geography and Environmental Studies, to ascertain the most bike accessible and heavily accessed bike areas on campus. This data was then used to choose sites for the bike shelters, which were then designed, built and installed by students from the School of Architecture and Design. School of Engineering students are now looking at ways in which different energy capture technologies can be located on the bike shelters to maximise the functionality of these

sites. The collaborative effort of staff and students from each of these schools has helped to inform the redevelopment of the UTAS Environmental Management Plan and contributed to measurable on-campus sustainability initiatives being led by the Sustainability Office.

While this new network has helped a number of UTAS teaching academics achieve integrated and collaborative teaching outcomes, other notable outcomes are the transferability of the LNCC model to inspire collaboration around themes other than climate change, and the potential for the LNCC model to draw in collaborators from academic, infrastructure, administrative and broader community units.

3.1.9 Curriculum change

There were a number of changes made to curricula from across the Schools and classes involved in this project over the three years of implementation. In particular, the first stage of the project led to the incorporation of interdisciplinary climate change activities into eight different classes from across the network. Using a problem-relay approach, each network member worked with the integrator to develop a teaching activity around the shared problem of climate change refugees. In many instances, the outcomes from one class activity (i.e. student solutions proposed in a mock international forum in a first year geography class) led to the development of another activity in another class (i.e. second year entrepreneurship students writing business pitches to deliver these solutions).

Network members worked together to share resources, develop and peer review lecture material and appear as guests in one another's classes. Each of the activities also introduced interdisciplinary perspectives into the once defined disciplinary curriculum into which they were taught. The development and implementation of the new interdisciplinary climate change class has been a major achievement for curriculum progression as a result of this project. Network members from each stage of the network have contributed to the design and delivery of this unit.

3.1.10 Climate change teaching in the university context

In considering the importance and relevance of climate change teaching to those within the network it is interesting to reflect on who the people involved in the project were. As indicated above, a broad spectrum of people joined the network for a variety of reasons. It became apparent that the primary reason for participation was not the climate change element, but rather the opportunity to work collaboratively and innovatively in an interdisciplinary context. As members of the group said that they craved an interdisciplinary space and relished the freedom to try new things.

While an interest and concern for climate change was often an initial reason for joining the group, the processes of complex problems and critical thinking is the most important element. One of the members considers himself a climate skeptic, which highlights the genuine nature of this group to be open to all interested in playing with complex ideas and innovative interdisciplinary teaching. While many participants already taught into units with a climate change focus, others, such as those from media studies or entrepreneurship used climate change as a vehicle for exploring other ideas and skills.

3.1.11 Distributed leadership

A distributed leadership model has underpinned the UTAS network from the start of this project. In each stage of the network, individual network members have maintained responsibility for the design and delivery of their own classes and curricula. The network was then used for collegial support and peer review to assist teachers to renew their teaching in light of interdisciplinary goals and the integration of climate change teaching. In each of the three student-led interdisciplinary activities implemented by the UTAS

network, the group worked together to design and support the activities. This was especially important for processes of student recruitment and dissemination of outcomes to the broader UTAS community. With an established network that has now been working together for four years, there is a strong likelihood that the distributed responsibility and collegiality of this network can be maintained.

Despite the distributed nature of leadership across the UTAS network, it cannot be discounted the role that a strong leadership nucleus has played in the initiation and maintenance of the network. The LNCC model of a network activator and dedicated network integrator has been critical to the success of the UTAS network. The time poor nature of the academic profession has meant that distributed leadership still needs initiation and up-keep of collaborative, group-based initiatives. The successes of the UTAS project would not have been achieved without the support of the integrator, which is why this model has been picked up by UTAS central learning and teaching for a variety of collaborative, group-based projects across the university.

Rather than just being a tool for the network to wield, the integrator role is essentially a leadership position. This leadership exists in the form of organising catch up sessions, pushing people to meet deadlines, injecting new connections which are only visible from the non-disciplinary perspective and in being the primary contact who has a sense of the larger picture. The importance of the integrator realising the trust that has been invested in them, and feeling enabled to act on the behalf of the group is a key element of the network success. In some cases, the leadership role was picked up and went unnoticed for some time, as was evidenced in the way in which the course coordinator for *Making Sense of Climate Change* suddenly recognised her integrative role.

3.1.12 Evaluation

The UTAS project was evaluated a number of different ways. Stage 1 (2008) evaluations included the collection of Student Evaluations of Teaching and Learning (SETL) forms from each of the participating classes in this year. Many of these comments can be viewed above in the achievements section. A common set of questions about climate change and interdisciplinarity were asked of students in each of these classes to allow for comparison across the disciplines.

Surveys on student perceptions of climate change as an interdisciplinary problem were conducted before and after unit completion by some of the network members during this first year. The data from these surveys helped network members to consider and, in some cases, to redesign learning activities in subsequent years. The data also helped the network to consider the extent to which students desired more interdisciplinary learning opportunities as part of their degree, the results of which have lent support to the development of the climate change unit emerging from Stage 1 activities. Other evaluations included surveys and focus groups (run by the project's external evaluator) of the first round of students who enrolled in the interdisciplinary climate change class in Stage 2 (2010). The data collected from these sources allowed the network to make a case for continuing to team teach that class the following year, despite large budget cuts and administrative challenges proposed within the School of Geography and Environmental Studies.

A further, less direct evaluation of the UTAS project was the trial of this distributed leadership model in the three participating institutions, and with a new network at UTAS as part of Stage 3 of this project (see Part 3.1.7). As UTAS was the initiator of the LNCC model, the potential for this approach to be successfully disseminated to different institutional contexts has been evaluated throughout this larger inter-institutional effort. The successes and lessons of this evaluation are discussed in the following case studies and the remainder of this report.

3.2 University of New South Wales
Paul Brown and Sarah Terkes

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3.2.1 The institution

UNSW comprises: 52,500 students, 7,700 staff, nine Faculties, 66 Schools, 97 Centres, 11 Institutes, five Teaching Hospitals, eight Residential Colleges, 86 Buildings and five Field Stations. It has three campuses: a 38ha campus in Kensington/Randwick, NSW, a College of Fine Arts at Paddington, NSW, and the Australian Defence Force Academy, ACT. The focus of the university is to teach and conduct leading research in scientific, technological, engineering and medical disciplines ('STEM'), with humanities, law and business as other 'professional' fields. UNSW is distinctive in that it is the only Australian research intensive university established with this STEM focus, comparable with universities such as MIT in the USA, European technical universities, and leading Chinese universities.

The institutional goals of UNSW have been defined as follows: "UNSW's aspiration is to continuously improve our position as a leading research intensive university in the Asia-Pacific region, focusing on contemporary and social issues through defined strengths in professional, scientific and technological fields. UNSW seeks to make a significant contribution to the development of knowledge, to learning and teaching, to our students, and to society."

Staff at UNSW work within a 'research intensive' framework. Learning and Teaching is valued, however research performance remains the key driver, for example when staff seek promotion. Specialist researchers in the Climate Change space are limited in the time they can devote to teaching and to cross-campus networking. Interdisciplinary activity is argued to be advantageous to UNSW, though faculty-based budgeting and management structures ('the silos') are widely acknowledged as an impediment to interdisciplinary teaching. UNSW has recently instituted an analysis of how silos can be broken down.

Environment research and teaching is undertaken in every faculty at UNSW. Science and Engineering have the longest traditions, with specialist degrees, and internationally renowned research teams, most notably in photovoltaics, water engineering and climate change research. More recently developed fields include Environmental Law and Environmental Economics. Community health interests have drawn in the Medical Faculty. The Faculty of Arts and Social Sciences has taught interdisciplinary environmental studies for two decades, and is moving forward with the newly delineated field of 'environmental humanities'. Environment features in design studies at College of Fine Arts, and in security studies at Australian Defence Academy.

Of central importance to the LNCC project is the prior existence of the UNSW Institute of Environmental Studies (IES). This small unit, located in the Faculty of Science, is the hub for networking amongst staff with environmental research and teaching interests. It also hosts a leading postgraduate coursework program – the Masters of Environmental Management, with its interdisciplinary course offerings. In addition, in 2007, UNSW established a world class climate change research centre (CCRC), which is a key provider of research findings at national and international levels, including contributions to the Intergovernmental Panel on Climate Change reports. With research as its primary focus, the CCRC also hosts a small but growing teaching program.

3.2.2 The network

The network activator is Paul Brown, Head of the School of History and Philosophy in the Faculty of Arts and Social Sciences. He convenes the environmental studies program for the Arts faculty, and helps lead the development of interdisciplinary environmental curriculum across UNSW campus. Paul's position assists with negotiations within the university hierarchy. The network integrator is Sarah Terkes, the Research and Communications Coordinator at the Institute of Environmental Studies. Sarah's role includes maintenance and development of environmental networking on campus, so she is ideally positioned to create and manage a climate change network at UNSW.

3.2.3 Network members

In 2010, the network had 22 members, besides Paul and Sarah. In 2011, 23 new members joined the network. The network also maintains an 'outer network' of mentors, who are happy to consult on various projects. These include the Director and the Deputy Director of the Institute of Environmental Studies and the Director of the Learning and Teaching Unit.

Table 1. UNSW Members by Discipline and Role in 2010 and 2011.

Discipline	2010				2011			
	student	PhD student	practitioner	academic	student	PhD student	practitioner	academic
Law				2		1		2
Arts	1			3	2		1	7
Economics				1				2
Science				1	1			7
Engineering	1				1			
Environment		5	2	3	3	9	3	3
Media			2	1			2	1
	2	5	4	11	7	10	6	22
Total	22				45			

3.2.4 The network activator and network integrator

Paul was approached initially by the project leadership team to activate the network on behalf of UNSW. Sarah was recruited by Paul soon afterwards. Paul chose to accept the position because the project is consistent with other cross-campus environmental initiatives, and Sarah chose to accept as it fits in well with her current work duties and

provides an achievable challenge. Paul and Sarah's working relationship before the project was minimal – they only knew one another through Sarah's work coordinating the PhD program in Environmental Policy and Management, to which Paul contributes as Chair of the annual review panel.

Inside the project, their relationship dynamic developed into one where Sarah instigates and coordinates most of the actions, and Paul provides oversight, chairs meetings, and assists where necessary to make the actions come to fruition. Neither makes important decisions without consulting the other, and they work together to advocate for the LNCC within UNSW hierarchy. Tasks are divided according to ability and practicality – in a nutshell, Sarah's strength is in organising meetings and events and in network communication, Paul's strength is facilitation and advocacy.

3.2.5 Network recruitment

What was the process by which the network was recruited and established?

April 22, 2010: We called a meeting of Heads of School and senior academics already teaching climate change / passionate about incorporating climate change into their courses. This meeting introduced all the relevant and influential UNSW 'climate change players' to the project and sought their feedback, steerage, and ultimately their recommendations of early career academics to join the network.

June 11 2010: We ran an introductory "workshop" meeting with a selection of early career academics to introduce them to the project and the concepts of distributed leadership, interdisciplinarity and problem based learning. This workshop served essentially as a meet and greet for network members, to help break down barriers, as well as a brainstorming session for how the network will operate over the course of the year.

What were the motivations of network members for getting involved?

We outlined all possible benefits to network members during the recruitment phase – in essence to 'help you do what you are already doing and through the support of a network integrator to gain teaching support, curriculum design and integration and networking within an interdisciplinary teaching group'. More specifically**,** we presented the LNCC as an opportunity to:

- energise your teaching and reinvigorate your practice;
- improve your interdisciplinary teaching by respond to the real world problem of climate change;
- enhance your scholarship of learning and teaching, help create a model for interdisciplinary teaching in the sector, and possibly to publish beyond your own disciplinary field;
- participate in leadership activities for climate change and gain experience in distributed leadership environments, and be recognised for leading the way in climate change teaching;
- meet and work with colleagues from other disciplines/faculties/institutions, and have fun;
- participate in an inter-institutional ALTC project; and
- contribute to and have access to an interdisciplinary climate change curriculum resource.

3.2.6 Network functioning

Early in the project we defined four main 'working groups'.

1. Teaching and Curriculum
2. Survey and Analysis
3. Communications and filmmaking
4. Public events

We currently hold whole network meetings once a month, with working group meetings in between. The working group meetings are where most of the action takes place, with all the major decisions being made at the main network meetings. The integrator and activator regularly speak and email and meet privately to discuss the network and how it's going, and make necessary decisions. Network members are typically involved with more than one working group.

Action sheets and regular updates are critical to ongoing involvement of members. The integrator has created a 'Climate Educators' website as a clearing house, while a separate climate change area accessed via UNSW TV provides the 30 or so short films on climate change produced to date.

We have held a number of social events, and routinely made our meetings lunch time gatherings. We have devoted resources to documentation of our process, for example through video coverage of meetings in our first year, and we have expended other resources on research assistance, for example related to the survey and analysis project.

3.2.7 Network aspirations and goals

We had three main goals. To:

- analyse and improve the way climate change is taught on campus;
- create a happy and motivated network of academics, practitioners and students; and
- influence institutional change at UNSW.

These main goals remain intact. However, sub-goals and aspirations evolved as we realised what was feasible, and what wasn't. For example, originally we intended to interest the UNSW Learning and Teaching Unit in becoming the LNCC host; and we also thought we could utilise new networking and database initiatives run by that unit. It now seems more productive to settle LNCC in the Institute of Environmental Studies and for databases to leapfrog to national repositories, for example the Sustainability teaching database now hosted by UTS.

Network members joined for many reasons. Students at both undergraduate and postgraduate levels sought projects related to their program, and this led us to establish forms of academic credit. The student environmental collective and the UNSW Sustainability office saw LNCC as a rallying point for a range of issues and activities. Meanwhile, most of the staff were involved in progressing climate change teaching across the campus and were gaining networking and publication experiences. The aim of tying research and teaching together motivated many participating staff. Initially members found common ground in four broad objectives:

- analyse needs;
- collaboratively design and deliver student-led problem-based learning activities (focusing on climate change);

- collectively write publications; and
- operate via a distributed leadership model.

The first objective has been addressed well via the survey and analysis work, which is a refinement of earlier attempts to understand needs via key informants. The second objective has been addressed though new specific strategies and activities emerged. These include for example the strategy of working with media students and UNSW TV to create animations, as a means of addressing two sub goals simultaneously – to create student led activities and to create a repository of educational material. As the second year of the LNCC project draws to a close, we have also developed two new sub goals – to develop a new teaching module from the store of experience and research around our mock trial project; and to create a hybrid modular course for listing in the new Environment and Development degree now under consideration. The goal of collective publication is the least well served at this point. Time pressure is the most salient factor. Two members of our network have jointly published on related topics, and we remain committed to further outputs. See below regarding the fourth goal.

3.2.8 Network challenges

Explaining the value of the project to potential participants was initially difficult, and although our network is diverse and representative, we know there are key people on campus who should be involved but who have not been convinced of the value. Articulating the 'what's in it for me' is and will always be difficult, when everyone is so time-poor. Maintaining personal energy for the project is an issue, more so for the activator than for the integrator. An important overriding challenge has been the need to define a manageable 'scope of works' that has strategic importance in the longer term. As we now seek to consolidate the network, and to include its operation in relevant university budgets, the challenge of gaining institutional support looms large.

As network projects started developing, the members became more enthused, with specific sub goals and tactics driving the work. Establishing 'academic credit' for students involved in the LNCC has locked in their participation, while key staff members of the network have given service above and beyond the call of duty, driven largely by their commitment to addressing climate change issues. We have not completed the process of involving all the key people who should ideally participate in LNCC, though doing this is an essential part of maintaining and developing the project. We think the scope of our four main projects has been manageable, and we have adjusted to suit resources and interests. For example, the filmmaking project has moved further forward than we ever could have anticipated, while we have scaled back the public events project for now. Our surveys have been administered, achieving meaningful returns and will be analysed by December 2011, with implications for continuing network priorities in 2012 and beyond. Regarding the challenge of giving LNCC a longer life, we have established ongoing resources, in the form of 2012 budget lines for the basic support of network meetings, and for small project funds. We have agreed that the function of the integrator should continue at UNSW, although we are yet to finalize exactly how and at what level this will be funded.

Therefore, the network faced three main challenges.

- finding time to attend meetings;
- lack of resources to achieve our ideas; and
- translating ideas into achievable actions.

To overcome some of these challenges, we broke into working groups that met at different times to network meetings. This enabled members to attend some meetings and not others, but still remain involved in network activities. Some successful ideas for

activities arose out of 'left field', due to luck and circumstance. For example, the animation series idea arose out of one network member's providential discussion with a media lecturer about the network, and the idea for the animation collaboration was born. We see this as distributed leadership in action.

3.2.9 Achievements

We think the main achievement was the creation of a large, open and friendly network of people who now collaborate readily and freely, both within and outside the scope of the project. The network also achieved interdisciplinary teaching and research collaborations, the creation of an institutionally recognised (and therefore committed) 'student committee' and the creation of effective working groups.

Communications and Filmmaking Group Achievements

This group has produced a series of educational videos called "Climate Change Simply Explained", which evolved from linkages between media students, UNSW TV, Institute of Environmental Studies and Climate Change Research Centre. Other key achievements include a short documentary video, a Youtube channel, a website for showcasing network members' achievements, teaching resources and links to climate change information. Via UNSW TV website there is also linkage to related broadcasting, for example the 'Steaming Toad' series. Members of this group produced a publication co-authored by a student and an academic.

Public Events Group Achievements

The involvement of key figures in the Faculties of Arts and Law led to the development of the idea of a mock trial set in the future, focusing on the impact of climate change (particularly, the displacement of people) on the Pacific Islands. We took this to the stage of writing a short treatment for a televised version of the mock trial, which we pitched to the ABC network. The pitch was not successful, though there remain other possibilities which we will pursue in 2012. We are also capitalising on the research and development of the mock trial idea, by new work on a Climate Adaptation Game, which would serve as a teaching module at UNSW, and also be a published resource for use elsewhere. This continues as a project for 2012. In the latter part of 2011, we have developed a new relationship and the agreement of an ongoing collaboration with the UNSW Debating Society, and through a network brainstorming exercise, we have concocted eight crucial debate topics, to be run as a program by the Debating Society in 2012. Members of our network also made presentations for the UN sponsored Refugees conference held in July at UNSW.

Teaching and Curriculum Group Achievements

As already mentioned, offshoot research from our mock trial project on climate adaptation and migration is now directed towards new course modules and a Climate Adaptation Game. There are possibilities for instituting these modules and the game in 2012. Although various plans to develop course proposals are yet to come to fruition, a number of curriculum developments saw new opportunities implemented for interdisciplinary climate change assignments. These include development and completion of two Masters level projects focusing on the impacts of climate change on the Pacific Islands and the development of seven Masters level projects involving collaboration between students in the Institute of Environmental Studies and the Sustainability Office on campus, and the independent commercial organisation ARC on campus.

Survey and Analysis Group Achievements

This strand of our work began with communication with and the involvement of the Director of Learning and Teaching at UNSW. This led to the identification and documentation of key issues, in particular, the lack of an accessible, up to date repository of climate change teaching materials. We formed the survey group to scope this and other issues associated with climate change teaching, and this led to the collaborative writing of two surveys on climate change teaching at UNSW (one for students, one for staff). 2011 saw the transferral of each survey into an online format, ready for email dissemination, then in October the dissemination of each survey with the help of key figures on campus (for instance, the office of the PVC students). We anticipate that the analysis and report from the survey will be available in December 2011.

Examples of the personal achievements and leadership development of network members include:

- publications for non-academics (students and practitioners were given the opportunity to co-author a scholarly publication);
- the Executive Director of UNSWTV became the leader of the communications group in the network, setting up all of the video opportunities for the group;
- a Research Assistant in the Australian School of Business became the leader of a video script writing group;
- a Research Fellow in the Faculty of Law became the leader of an initiative that eventuated in a creative TV show pitch to the ABC; and
- two academics in the Institute of Environmental Studies used their involvement in the network in their applications for promotions.

3.2.10 Climate change teaching in the university context

We came to the LNCC project with the broad idea that climate change teaching could be enhanced through networking designed to foster cross-faculty activity. UNSW is a highly complex organisation, and its curriculum is one dimension of this complexity. A program simplification ('Pro-Sim') process is now underway, with significant adjustment of curricula to commence in 2012. In this context, and because of our own sense of inquiry, LNCC is implementing its survey of climate change teaching needs with a view to making changes in the Pro-Sim scheme. Pro-Sim opens up new opportunities for students to take electives outside core teaching programs, and climate change teaching can enter that cross-disciplinary zone. Also we expect our survey to indicate specific needs of teachers already engaged in environmental teaching.

Everyone in the network is interested in climate change. General teaching practice and academic leadership are other key interests. One network member already taught climate change specifically as a subject, and several had incorporated climate change "examples" or case studies into other interdisciplinary subjects. All network members believe the university has a responsibility to teach climate change. What varies are the perspectives and visions for enhancing programs.

Three particular challenges and opportunities that climate change teaching brings to our university were identified.

1. The size and complexity of the organisation, although with that comes great diversity and range of climate change knowledge.

2. Effective and institutionalised communications procedures are hard to implement. IES has strong institutional support, and can be the ongoing driver of networking on climate change teaching.
3. A general tension between the 'citizen' perspective that sees interdisciplinary climate change teaching as desirable, and the 'managerial' view that drives the structuring of and constraints on teaching programs.

3.2.11 Distributed leadership

Initially we did not push distributed leadership as the cutting edge of this project. Rather we promoted the opportunities to enhance climate change teaching. Leadership in the UNSW context has a number of meanings. It is often thought to mean 'management', and some 'leadership' training at UNSW is really all about managerial compliance, hiring and firing, dealing with staff, etc. 'Academic leadership' is often assumed to be leadership of research programs and projects, and very few academics at UNSW have thought about how their teaching is an act of leadership. Breaking into working groups was effective in allowing for distributed leadership to take place.

In teaching practice, at UNSW we are currently in the throes of a campus wide 'assessment' reform, which is driven from the top and tied to the need to do less assessment because of budget constraint. Such an emphasis is a long way from pedagogical consideration of best practice curriculum design, or problem based learning, or student and staff leadership in teaching. Coming to LNCC off a fairly low base of understanding about leadership, we nonetheless evolved to some explicit discussion of how distributed leadership works and how it can be harnessed. We are yet to explore the implications for our activities in the context of the literature on academic leadership, though we know this is a task worth doing, and could be the subject of a publication.

Reflecting on how distributed leadership has worked in our network, we would first characterise it by saying distributed leadership is in evidence as:

- spontaneous leadership in response to identified challenges;
- leadership where it is needed rather than as dictated by hierarchy or job description;
- leadership shared across a group and therefore arising from collaboration not hierarchy;
- leadership that is just as likely to be 'bottom up' as 'top down';
- leadership that arrives unannounced and with modesty and therefore need recognising, naming and celebrating;
- leadership that comes from students;
- leadership that ebbs and flows amongst the individuals in our working groups;
- leadership by academics at level A,B or C that meets what is expected of professorial staff;
- leadership in the academic realm by professional and technical staff; and
- leadership that is like any other… inspiring, showing by example, directed at problem solving or capacity building, that is enacted though organisational skills, and that is confidence building.

The following are examples of where distributed leadership occurred in our network at UNSW:

t

- the Executive Director of UNSWTV became the leader of the communications group in the network, setting up all of the video opportunities for the group. This happened spontaneously rather than through direction or conventional planning;
- in the same way a Research Assistant in the Australian School of Business became the leader of a video script writing group;
- a Research Fellow in the Faculty of Law became the leader of an initiative that eventuated in a creative TV show pitch to the ABC, with ongoing spin-offs for future curriculum development, now picked up by and led by other network members;
- leaders in the student Environment Collective use LNCC to gain additional leverage on 'Green Campus' initiatives, and the network activities have strengthened their hands as advocates;
- senior students have initiated research projects within their courses and brought these to fruition, while leaving behind the 'template' for future students to follow;
- people engaged to work on the survey project, and on video documentation, took the lead with innovative methodology and practical tasks; and
- our network integrator who is appointed as Professional and Technical Staff has made significant and essential leadership contributions in the academic realm.

3.2.12 Evaluation

Progress was evaluated through regular reporting to the project leadership team, network discussions on the project, and through surveys of member reflections. Key lessons include that the network would not be able to operate effectively without a dedicated coordinator and that it is important to have goals that are achievable for time-poor, unpaid members.

3.3 University of Wollongong
Helen McGregor and Pamela Abuodha

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3.3.1 The institution

UOW is a research intensive university situated in the Illawarra region of New South Wales. The University consists of four campuses: Wollongong campus as the home base; the Shoalhaven Campus, Nowra; the Innovation Campus (iC), North Wollongong; and is has a strong presence overseas via UOWD in Dubai. The university has nine key faculties (Arts, Commerce, Creative Arts, Education, Engineering, Health and Behavioural Sciences, Informatics, Law and Science), and has two graduate schools: Sydney Business School and Graduate School of Medicine. Postgraduate students represent 8,929 enrolments and there are 18,008 undergraduate students, with total enrolments, including non-course awards, of 29,031 (UOW 2010 annual report, p. 2).

UOW maintains 20 research strengths across five research themes: Environmental Sustainability; Innovative Materials and Manufacturing; Health and Medical Research; Information and Mathematical Sciences and Society, Policy and Culture (UOW 2010 annual report, p. 2). In 2010, the University was once again placed in the top 2% of research universities in the world in the highly respected *Academic Ranking of World Universities* (compiled by the Shanghai Rating Consultancy, formerly by Shanghai Jiao Tong University) and the *Times Higher Education – QS World University Rankings.* The University was among the top ten universities for ARC grant income (relative to size) and it was awarded five out of five stars in the *2010 Good Universities Guide* for 'research intensity' (UOW 2010 annual report, p. 15).

UOW strives to be "an international University recognised for originality and enterprise in exploring, communicating and applying knowledge to enrich individuals, their communities and the environment" (UOW 2010 annual report, p. 2). The University has a strong focus on teaching and aims to see "graduates equipped to learn, engage and lead in society and the global workplace" (UOW Strategic Plan 2010, p15). Objectives of the UOW Student Learning and Teaching Plan devised to achieve this aim include:

"1. Graduates who embody the University's Graduate Qualities
Achieved through:

- a strong integration between the Graduate Qualities, the curriculum and assessment;
- development of international perspectives and experience;
- experience of work-integrated learning;
- a demonstrable Learning-Research nexus with a strong alignment of teaching programs with areas of research strength; and
- embedded principles of Academic Integrity.

2. Student access and quality transition support for the student learning journey
Achieved through:

- a UOW Social Inclusion Strategy that attracts prospective students from a diversity of backgrounds and supports their success;
- the capacity of Wollongong College Australia (WCA) to provide pathway opportunities for students, including low socio-economic status backgrounds (SES) and at new locations such as UOW Southern Sydney;
- a UOW Learning Strategy that addresses transition, delivery and learning support for all cohorts and across sites;
- an engaging UOW student experience that encourages active membership of an inclusive community and supports the development of global citizens; and
- a continuing and interactive relationship with Alumni.

3. Quality programs relevant to the evolving needs of students and the community
Achieved through:

- quality e-learning practices and standards in course design for multi-location delivery, on and off-shore;
- strategic course development with reference to national priorities, academic standards and stakeholders in the community, government and industry;
- flagship courses, distinctive for their strong alignment with disciplinary research as well as pedagogical theory; and
- planned development of programs at regional sites and the facilities, technologies and services to deliver them.

4. High quality teaching
Achieved through:

- attraction and retention of high quality teaching staff;
- development programs to refresh and engage full-time and sessional teachers;
- commitment to distinctive, reflective and innovative teaching culture;
- integrated systems for analysis of student feedback;
- peer review and recognition, including promotion frameworks for excellent educational practice; and
- continuing enhancement of a strong policy and governance framework."

(UOW Strategic Plan, 2010, p15)

UOW is subject to similar pressures as other higher education institutes in Australia and operates within the context of Australia's demand-driven higher education sector. The university faces challenges in terms of responding to federal government calls to increase bachelor degree-holding 25-34 year olds to 40%, and new frameworks for performance targets and assessing university quality and standards. Further, the university faces specific issues in attracting international students in an increasingly competitive global higher education market place.

3.3.2 The network

The UOW network was initiated in early 2010 as part of this ALTC project. Dr Helen McGregor, Australian Institute of Nuclear Science and Engineering (AINSE) Research Fellow, had contributed to the original project grant proposal, and took up the role of network activator at the commencement of the project. Dr Pamela Abuodha was chosen to take up the role of integrator based on her 2009 experience coordinating the newly developed UOW Faculty of Science subject SCIE103 Climate Change, taught across the Earth Sciences, Biology and Chemistry Schools within the Faculty.

Both McGregor and Abuodha are located in the School of Earth and Environmental Sciences (SEES), Faculty of Science. McGregor's AINSE Fellowship is a unique scheme within Australia in that it is designed to 'ease' early to mid-career scientists into permanent teaching-research positions at their respective universities. The Fellowship is for five years, with the first three years focused on research with some teaching responsibilities, and following satisfactory review, the final two years equivalent to a full teaching-research lectureship position. McGregor is currently within the first phase of the Fellowship with teaching and co-coordination in the first year SCIE103 Climate Change subject, Faculty of Science, and teaching in the Masters level ENVI922 The Scientific Basis of Ecosystem Management, SEES. McGregor's research is in tropical climatology, past climate and climate models, and is currently lead CI and co-CI on two Australian Research Council grants.

In addition to her role as integrator, Abuodha is subject coordinator of third year ACCCY304 Social and Environmental Accounting, Faculties of Commerce, and co-coordinator of SCIE103 Climate Change, Faculty of Science. Abuodha also guest lectures at the School of Accounting and Finance (this collaboration resulting from LNCC network activity) and in the SEES. Abuodha is a project leader on a social inclusion project with the Academic Division Services and a project leader on intercultural awareness among engineers, Faculty of Engineering. Abuodha has research experience in climate change impacts, vulnerability and coastal zone management.

UOW network members were drawn from the Faculties of Science, Law, Commerce, Education, and Arts, The School of Business Studies, and the Academic Services Division. In addition, one network member was from the University of San Diego, USA. There were ten active members, participating in UOW network meetings and activities, two support members, providing advice and input to the network, though not necessarily teaching at the time, and sixteen affiliate members, interested in receiving updates on network progress.

3.3.3 Network functioning

Network activator McGregor and network integrator Abuodha formed a solid working relationship, with both motivated to get the job done to a high standard. The activator/integrator relationship at UOW was characterised by clear and open communication, trust and initiative. Major decisions were always made via negotiation and discussion, and the trusting nature of the relationship was such that subsequent minor decisions were taken individually with only periodic updates on resulting progress. The relationship was supportive and positive, with the integrator and activator often using each other as the catalyst and sounding board for UOW network activity and direction. The integrator and activator were able to step into each other's roles where necessary when one or other was absent.

McGregor and Abuodha had different, though complementary roles. The activator and integrator roles at UOW were partially established based on the UTAS model though those roles evolved over the course of the project as a result good communication,

understanding, and common goals for the project, between McGregor and Abuodha. Initially McGregor played a major role in establishing the UOW network. Once the UOW network was formed, Abuodha's role was crucial in keeping the members networked and McGregor continued to provide strategic direction for the network. Abuodha handled much the logistics of implementing UOW network activity and managed the Ethics approval process. Both McGregor and Abuodha acted as brainstorming/facilitator role with network members, being the catalyst to trigger network members to devise activities, and with McGregor active in keeping a climate change focus to the student activity. McGregor's and Abuodha's confidence in getting members to develop activities increased with experience through the course of project.

Recruitment of UOW network members commenced in earnest in March 2010 and culminated with the first network meeting in late April 2010. Prior to 2010 neither Abuodha nor McGregor had been too involved in teaching and did not know who at UOW were teaching climate change-related material and therefore who to target as possible members. To address this challenge Abuodha compiled a database of academics and subjects with climate change-related teaching. In parallel, Abuodha and McGregor used the small networks they did have, as well as senior members of UOW staff (DVC International, Deans), to ask for personal recommendations of people likely to be interested in joining the UOW network. From there, an email invitation was sent out to possible network members, with the email tailored to individuals if they had been recommended to the activator/integrator, or a generic email if the person had been identified via the database search. The emails contained an invitation to attend the first UOW network meeting and if they were unable to attend an offer to arrange an individual meeting. Out of this process members self-selected to be involved with the network as active members. Staff were motivated to join the UOW network to improve their teaching, were interested in trying new and innovative teaching methods, and wanted better teach climate change. A number of other staff members were keen to be involved but either did not have the time, were not teaching at the time and elected to be affiliate members, kept up to date via newsletters and emails of network activity.

The UOW network was positive about developing teaching activity around climate change, though were faced with challenges in terms of finding the time to attend network meetings and accommodating the additional time required to devise and implement new cross-disciplinary activity.

In general whole-of-network meetings were held once per semester to report on completed activities and to plan for the next activities involving students, and were generally scheduled towards the end of the semester. Online tools such as www.agreeadate.com were used to streamline the process of identifying common times to meet when the highest numbers of members were available; however, there was no meeting where all members were able to attend. Typically this process led to 50-75% of members able to attend. Meetings were usually run at lunchtime, although our most recent meeting was a breakfast (following the success of breakfast meetings at Murdoch). Those who could not attend meetings were kept informed via emails attaching minutes of the meetings or most of the times via one-on-one interaction between the integrator and individual members.

Once semester activities were chosen by members at the whole-of-network meeting, smaller meetings between the activator, integrator and those members directly involved with activities were conducted to refine the details of the activity. Learning designers and developers also attended to further ensure the effectiveness of the activity. Once devised, the activity was introduced to the students and the integrator took on a lead role in implementing the activity in consultation with specific network members. All UOW network members and affiliates were invited to attend the activity, where possible, and a number of network members accepted the invitation.

3.3.4 Network aspirations and goals

The UOW activator and integrator goals were to build a coherent team of UOW staff with an interest in improving teaching around the subject of climate change, in order to fulfill the broader ALTC project aims. These goals remained the same throughout the project, with the only change being that once the UOW was established and over the course of the project the activator and integrator became more experienced in working with the UOW network members to devise and implement student-led teaching activity.

Goals for the UOW network as a whole were developed during the initial April 2010 UOW network meeting. These goals, outlined below, were essentially the goals of the broader ALTC project:

- identify and undertake student-led activities within the various units that the members coordinate and teach across campus;
- help individual members improve on their teaching through enjoyable student-led activities;
- gain more leadership and managerial skills and actively participate in distributed leadership; and
- form lasting bonds and possibly friendship and give support to one another in teaching climate change.

Many network members were keen to see each other give guest lectures in their respective subjects.

3.3.4.1 Network activator aspirations

At the time the project proposal was being drafted McGregor had just commenced her AINSE Fellowship and was adding teaching to her portfolio of skills. The opportunity presented itself to be a part of this project and McGregor was interested in participating, as it seemed a way for McGregor to mesh her interest in climate change with a 'bigger picture' view of teaching, gain experience in the teaching-research sphere, and to do something innovative in terms of educating students.

3.3.4.2 Network integrator aspirations

Abuodha chose to accept the position because the project is cross-disciplinary and was going to give her the opportunity to meet and work with new people not only at the UOW but also at UTAS, UNSW and MU. The position represented a great opportunity for Abuodha to learn new things and to travel, as well as being good for her CV and financial situation.

3.3.5 Network challenges

3.3.5.1 Teaching versus research, and workload challenges

By far and away the biggest barrier to developing and implementing student-led teaching activity, albeit innovative and worthwhile in terms of student outcomes, was the investment of time required, and that that took already busy staff away from more 'valuable' research. UOW activator, integrator and network members found that it takes much effort and time to work across disciplines and across faculties, to appreciate and work with discipline paradigms.

McGregor, the activator, had to balance the network and teaching activity against her role, primarily as a research academic on a fixed-term contract. Abuodha, the integrator, found this a challenge to work with the busy schedules of network members (and activator) to find the time to meet and develop the student-led activity. A number of potential members did not join the UOW network citing time pressure, and that the network activities would take them away from their research.

The challenge of balancing teaching, research and workloads was only partially met. In activating the network McGregor found that she had to invest the time in contacting people but did set a real deadline for the first network meeting – the network had to be formed one month prior to McGregor being off campus for several weeks to undertake research. The month between the first network meeting and McGregor's departure was to allow for additional one-on-one meetings and to start developing in more detail the joint teaching activity. The process of setting up the network was also streamlined by changing the initial April 2010 meeting from an information session only to providing information for potential members and then moved on to actually brainstorm activities and subjects in which to run them.

In year 2 of the project McGregor had to focus on her other research projects; fortunately the experience from year one of the project meant McGregor, Abuodha and the other network members had a much better sense of what was involved in developing student-led activity and could tailor activities closer to the time staff had available. Abuodha's role as integrator was key to ensuring members stayed in contact both in the case where staff couldn't attend the initial UOW network meeting and in maintaining ongoing contact. The website www.agreeadate.com was a very useful tool in streamlining when meetings should be scheduled and keeping meeting to a tight agenda and timeframe was also useful.

3.3.5.2 Network setup

Initiating the UOW network proved challenging for the activator and integrator. There were some initial hurdles in understanding what the network was about and how the network would use a distributed leadership model. Many of these questions were addressed in the activator and integrator workshops, however it would have been better that these workshops had been run simultaneously rather than one month apart.

McGregor and Abuodha had initially thought that Faculty of Science SCIE103 Climate Change subject would in some way be a core part of the network activity. However, some of the key lecturers involved in this subject were unable to participate in the network making the initial idea unrealistic. Despite this, a number of cross-disciplinary activities did run involving students from SCIE103, and at the end of the ALTC project the subject has become very multidisciplinary with academics from nine different Schools (UOW and elsewhere) contributing, up from four in 2009 when the subject was first offered.

An additional challenge felt by Abuodha was in bring together network members from different disciplines, with such a wealth of experience, and in senior positions into one network and then guide them towards distributed leadership model of interaction.

3.3.5.3 Discipline barriers

Developing cross-disciplinary, student-led teaching activity meant bringing people from different disciplinary area together. In order to develop the activities, network members, including the activator and integrator, had to learn something of the other discipline's view of the world, the discipline-specific learning outcomes required for the students of that discipline, and how they could work this in with their own course requirements. This challenge was met through the open-mindedness of teachers involved in the network who were good communicators and interested in learning new skills and in improving the

teaching of climate change. The specific nature and role of Academic Services Division at UOW is to support academic staff in developing sound teaching resources that can be assessed. This helps to explain some of the relative ease of access and progress with 'new' learning tasks and cross-disciplinary connections that we had to undertake within this project. Also it is important to note here that the ASD staff who are members of the network already have extensive experience in working across disciplines, which gives them the confidence to contribute to network initiatives.

3.3.6 Achievements

Despite the challenges a number of innovative, student-led, cross-disciplinary activities were implemented over the life of the project. These activities represent major achievements by the UOW network:

1. In 2010 a joint activity was devised involving first year students from the Faculty of Science SCIE103 Climate Change subject and third year students from the Faculty of Law, LAW334 Environmental Law subject. The students, worked in lawyer/expert scientists' teams, and were given a fictitious for or against scenario involving issues of coastal development, climate change, and endangered species law. Each team developed their case and presented it in a mock trial situation. The standard of legal argument from the law students was excellent and the high quality of research from the science students was impressive. Beyond learning about climate change, the students developed broader research, teamwork and presentation skills, as well as a deeper understanding of the approach of other disciplines. This activity is being rolled out again in the 2011 SCIE103 subject, modified to be a debate, as the Environmental Law class was not running in 2011.
2. In 2010 McGregor and Dr Beth O'Shea (Geology Dept) University of San Diego (USD), USA, devised a survey on attitudes and perceptions of climate change, which was completed by UOW SCIE103 Climate Change students and to USD first year Earth Science students. The students then conducted a video conference to discuss the survey results and compare climate change attitudes in different cultures. In 2011 the survey was rolled out to additional classes at UOW. The differences between the student cohorts are currently being explored by Abuodha.
3. In 2011 two network members took part in a joint multidisciplinary poster activity. The network members were Associate Professor Mary Kaidonis from the Faculty of Commerce, School of Finance, with her 3rd year students undertaking ACCY304 Social and Environmental Accounting and Dr Michael Adams from the Faculty of Education, Woolyungah Indigenous Centre, with his 2nd year students undertaking INDS201 Redefining Eden: Indigenous Peoples and the Environment.

Feedback from students on these activities was extremely positive. The majority of them appreciated the authenticity of the activities and the opportunity to 'think outside the square'. They benefitted from working across disciplines and in teams.

Additional achievements by the UOW network include:

- a heightened awareness of the breadth of climate-change teaching activity across campus;
- a sense that it will be possible to create an undergraduate major in climate change;
- a knowledge of how to design cross-disciplinary teaching activity;
- a broader knowledge of university-level pedagogy; and
- dissemination of network activities across the university and beyond (e.g., McGregor and Abuodha showcased the UOW network's teaching activity at the 2011 UOW 'First Year Experience' workshop, and in 2011 McGregor presented the network's teaching innovations to the Federal Government's Climate Change Commission).

Involvement in the UOW network led to a number of personal achievements and opportunities for development. McGregor, network activator, became more aware of the breadth of climate-change teaching activity across campus. She developed skills in how to design cross-disciplinary teaching activity, and a broader knowledge of university-level pedagogy. McGregor gained confidence in approaching/cold calling academics outside of one's discipline area, and realised that she has a bountiful supply of ideas related to teaching and teaching activity.

For Abuodha, the integrator, her networking role has opened other doors at the university and she is currently working with Faculty of Commerce, Engineering and CEDIR (Centre for Educational Development and Interactive Resources), in addition to her work with Faculty of Science. Abuodha's teaching confidence has improved and she has learned many teaching tips through involvement with other UOW network members. Abuodha has expanded her personal network and now knows personally at least one individual in each school/department on the Wollongong campus. This has strengthened Abuodha's motivation and given her several ideas and approaches to further networking and problem solving.

3.3.7 Curriculum change

Being involved in the network has greatly changed the curriculum development and what is taught in a number of subjects. For example, the SCIE103 *Climate Change* subject now incorporates a 15% assessment task on interdisciplinary student-led activity as a result of this project. Both lecturers and students liked this incorporation and now it is expected that the network will design an activity for students within the climate change subject. In addition, many UOW network members are contributing to subjects outside their disciplines, bringing their different expertise and experience of climate change into new subjects.

3.3.8 Climate change teaching in the university context

A concern regarding the issues of climate change was a very important motivation of those joining the network and many members believed it a responsibility of a university to teach climate change. When initially setting up the UOW network those already teaching some climate change-related components were targeted.

UOW already had a climate change subject at the commencement of the project and activator, integrator and two members of the network were already teaching in the climate change subject. Climate change was a major focus of the Faculty of Arts, School of Literature and Philosophy, STS 116 Environment in Crisis. Apart from these two subjects climate change was taught as a minor component of a range of different subjects (e.g. Environmental Law, Social and Environmental Accounting). The challenge for UOW is to integrate climate change teaching across subjects and faculties rather than seeing it as an ad hoc add on.

3.3.9 Distributed leadership

Distributed leadership was encouraged by the activator and integrator but was not discussed explicitly at the initial April 2010 UOW network meeting. However, designing and implementing student-led activities were the most important for fostering distributed leadership among the members. In small groups and in one to one interaction with members tasks were shared out using a distributed leadership model.

Examples of where the distributed leadership model was used include:

1. McGregor took the initiative to develop collaboration between UOW and Beth O'Shea, San Diego University, giving the project a global perspective. But the design of the activity was extremely distributed with McGregor and O'Shea creating the

survey using a shared document on Google Docs and editing the document 'live' via Skype.

2. In designing the mock trial Abuodha, Carrington (UOW network support member) and Dr Andrew Kelly (UOW network Member and Environmental Law lecturer) brainstormed the initial idea to create and activity around climate change, the endangered green and goldern bell frog, and local tourism development. From there, McGregor, Abuodha and Kelly sat together and discuss how the activity could accommodate the different discipline perspective and ensure meaningful learning outcomes for the students. This was achieved through discussion and being open to new ideas, with neither one of the three of us actually taking the lead.
3. A similar approach was taken with the poster activity. McGregor, Associate Professor Mary Kaidonis (UOW network member and Commerce lecturer), Dr Michael Adams (UOW network member and Indigenous studies lecturer), Dr Emily Purser (UOW network member and Academic Services Division (ASD) staff), and Chris Brewer (UOW support member and teaching support staff member) met to devise an activity for semester one, 2011. The tasks were brainstormed, and often the lead was taken by ASD staff, so that their role is not to be underestimated at key moments in the genesis and progression of ideas, like the debating and poster tasks. Without the prior experience and confident encouragement of such voices especially to the integrator, Abuodha, things may have turned out very differently! So, not only do ASD staff support curriculum development and professional development of staff, but also the development of students' academic literacy, which is why we have committed ASD staff on board in this project. The ASD staff identify and create opportunities like this all the time, because this is how they understand their job at UOW and there is much thought that goes behind the student activities. Ms Purser's involvement as a literacy specialist was and is serious and engaged, and this and other cases in Science have become the subject of several publications in the field of Academic Language and Learning development (Purser, 2011). McGregor knew nothing about either of the subjects but knew that there potentially were issues that related to both disciplines/subjects. McGregor stepped into the integrator role and got everyone talking and kept the meeting focused on a climate change joint activity, but it was Kardonis, Adams, and Purser who worked out what they could do and how it could work: Adams designed the marking scheme; Purser designed the poster template; Kardonis organised the venue. Abuodha coordinated the team and organised additional logistics.
4. The interaction between the lecturers led to a number of 'expert' guest lectures being given across a range of subjects.

Although a distributed leadership model was used at the small group, activity design level, the activator and integrator still had to take the lead in bringing the network together and pushing for network members to come together and design activity.

3.3.10 Evaluation

The LNCC project in the UOW context was evaluated at a number of different levels. The effectiveness of the UOW network's teaching activities was gauged through written student reflections, staff observations, surveys of the students' awareness of and attitudes towards climate change, and anonymous surveys on student satisfaction with the learning strategies. Feedback from the mock trial in 2010 meant it was implemented again in 2011.

Written reflections were a feature of the activator's evaluation of the project. Oral discussions between the activator and integrator were an important step in assessing the progress and direction of the UOW network, and discussions and feedback from network members was also vital in this regard. Network-wide discussions were minuted and distributed to all members.

Finally, at a much broader level, the input from the critical friend was highly valued in terms of an 'outsiders' perspective on the effectiveness of the UOW network. In addition, feedback from the UTAS project management team and the other network's NIs and NAs was key to evaluating the UOW network in terms of the Australian university context, issues in the higher education sector, and national and international research into latest thinking in pedagogy. Lessons learned from these evaluations are discussed in the UOW network case study above.

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3.4 Murdoch University
Davina Boyd and Peter Devereux

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3.4.1 The institution

MU in Perth, Western Australia (WA) was constituted in 1973 and opened its doors to 510 foundation students in 1974. At that time, there was one campus, the South Street Campus. Today, Murdoch has three campuses in Western Australia (South Street, Rockingham and Peel) and international centres in Singapore, Malaysia, United Arab Emirates and Japan. In 2010, there were close to 19,000 students enrolled at Murdoch University, almost half of which (9277) were enrolled externally. The university has four faculties: 1) Arts, Education and Creative Media; 2) Health Sciences; 3) Law, Business and Information Technology; and, 4) Science and Engineering.

MU's vision is to "be an innovative and enterprising University leading discovery for a better future" (Murdoch University, 2010a p.1). Sustainability, student-centred teaching and multidisciplinary/interdisciplinary course offerings have been identified as some of the important elements for achieving this vision. These elements are pertinent to a discussion about MU's Climate Change Teaching Network as they provide insights into the institutional context within which this network has functioned.

3.4.1.1 Sustainability

Sustainability is one of the four values that provide a context for all activities at MU, along with equity, global responsibility, innovation and entrepreneurship (Murdoch University, 2010). This value is reflected in:

Graduate attributes: social justice, global perspective and interdisciplinarity are attributes identified as important capabilities and qualities for Murdoch graduates.

Course offerings: undergraduate and postgraduate courses are offered in Sustainable Energy Management, Sustainable Development, Climate Change Management, Business Sustainability and Environmental Science. In 2011 two new degrees will be offered, a Bachelor of Sustainability and a Bachelor of Sustainability Science.

Environment Sustainability Program: this program has been established to enable the university to respond to carbon targets and mandatory reporting.

Greening initiatives: this includes the use of GreenPower and renewable energy with solar panels generating around 130 kWh of energy every day, the provision of recycling bins on campus, development of greener buildings and infrastructure and participation in programs such as the TravelSmart Workplace Program and Days of Change Program.

*Dedicated environmental and sustainability staff***:** two staff members are employed full time in the areas of environment and sustainability, an environmental program manager and sustainability officer who is a former MU sustainable development graduate.

These actions and initiatives suggest that to some extent there is institutional support for teaching, research and practice that relates to sustainability including climate change.

However, at the same time as establishing new course offerings, setting up the Environmental Sustainability Program and recruiting a sustainability officer, the School of Sustainability was closed. This took place in the first year of the LNCC project and for sustainability staff (five of whom were network members including the activator and integrator/activator-integrator) this raised questions about the actual level of support for new initiatives.

3.4.1.2 Multidisciplinarity / Interdisciplinarity

MU sees its "student-centred teaching and its multidisciplinary/multi competency approach to course offerings" as distinguishing features (Murdoch University, 2010b p.3). As part of maintaining and improving the academic profile of the university the Strategic Plan 2010 – 2015 identifies "Ensuring Student Engagement and Success" as a core goal with a focus on developing teaching and learning environments that have a "stronger focus on internationalisation and cross-cultural competencies, work integrated learning opportunities and interdisciplinarity and flexible learning environments" (Murdoch University, 2010b p5). The foundation units, flexible degree structure and design of a number of units are indicative of this approach.

All students are required to take a foundation in the first semester of study. While these units focus on developing generic learning skills they also encourage students to develop an understanding of "the value of different disciplines for addressing themes, problems or issues, and demonstrating the integration of knowledge from more than one discipline" and "the global implications of themes, issues or problems in the unit" (Murdoch University, 2010c). In addition to the content, multidisciplinarity and interdisciplinarity are further encouraged in the way the units are taught and the student enrolments. Staff members from at least two schools typically teach into these units and students can enrol in any of the eight foundation units.

The course structure further encourages multidisciplinarity and interdisciplinarity. MU tries to ensure that the number of prescribed units for any course is kept to a minimum to enable double majors and actively encourage students to take units from other areas. As a result, many students are enrolled in double degrees and double majors with as many as half the students taking double majors in some areas. It is also common for students to take minors with 97 minors on offer.

An interdisciplinary approach to course design and unit design is not uncommon with many courses and units structured in a way that an issue is explored from different perspectives. Examples of courses taught in this way are: Bachelor of Arts in Sustainable Development, Bachelor of Science in Sustainable Development and Bachelor of Business Sustainability. Examples of units taught in that way are: Sustainable Tourism, Indigenous Sustainability; Environmental History; Environmental Politics; Sustainability Ethics; and, Economics for Sustainability. Interdisciplinarity is achieved through unit design and through guest lectures from different schools.

MU's approach to multidisciplinarity and interdisciplinarity suggest that the university is a supportive environment for a network that aims to promote interdisciplinary approaches to teaching. MU is also potentially a unique environment for the network to operate within given the high degree of collaboration, sustainability and climate change teaching, interdisciplinary and multidisciplinary approaches already in place.

3.4.2 The network

The network members have changed over the course of the two years, but at project end there were 14 members, including the network activator-integrator. Their roles and positions at MU are summarised in Table 2. The network members are predominantly lecturers in Arts, Education and Creative Media or Science and Engineering with a mix of early career academics and more senior academics. The network also includes a postdoctoral researcher working with the Centre for Excellence in Climate Change, Woodlands and Forest Health and a postgraduate researcher working on an Australian Research Council (ARC) Linkage Grant on Decarbonsing Cities and Regions.

In year one of the project there was a activator and a integrator; both lecturers in the School of Sustainability. The activator had been employed as a lecturer at MU for three years and was responsible for coordinating units on Overseas Aid and International Development and Global and Regional Sustainability. The activator was a newly appointed lecturer and was mostly involved in co-coordination of units and tutoring. Both the activator and integrator were part-time (0.8 FTE and 0.4 FTE respectively).

In the second year there was one person performing the role of activator and integrator; this role is distinct to the Murdoch network. The original activator left MU at the end of 2010 and it was decided that the integrator would take on both roles. This was considered appropriate for two reasons: 1) the network was already established; and, 2) there were difficulties identifying either a suitable activator or integrator. The activator-integrator was employed part-time in the second year of the project (0.5 FTE) and was responsible for unit coordination of two units, Overseas Aid and International Development and Approaches to Sustainability.

3.4.3 Network functioning

3.4.3.1 The network activator and network integrator

The integrator was recruited by the activator and accepted this position for several reasons:

- a passion for teaching and learning about, and improving, teaching;
- an opportunity to establish a network at Murdoch;
- further opportunity to work with the activator (at the time the activator and integrator were working together teaching); and
- an interest in climate change and sustainability teaching generally, especially in terms of how that leads to action.

During the first year of the project the roles of activator and integrator were blurred in a sense as both members shared the role(s) equally, this included generating ideas for events/activities, management of the network and decision-making. This ‘way of working’, which was collaborative and team based, stemmed from prior work together where the activator was a unit coordinator in a unit that the integrator tutored in. This was also one of the ways the activator and integrator translated the concept of distributed leadership into practice.

Table 2: The Murdoch Network

	Faculty	School	Area	Level/Position	Teaching
1	Arts, Education and Creative Media	Social Sciences and Humanities	Politics and International Studies	Senior Lecturer	FDN110 Australia in Asia; POL161 Asia Pacific in the Global System; POL299/699 Politics of Globalisation; POL313613 Gender and Development
2	Arts, Education and Creative Media	Social Sciences and Humanities	Asian Studies	Associate Professor	AST250 Society, Culture and Ecology in Asia AST212 Anthropology and Its Others; AST258 Women in Asian Societies
3	Arts, Education and Creative Media	Social Sciences and Humanities	Politics and International Studies	Senior Lecturer	POL135 Australian Government; POL285/585 Environmental Politics POL297/697 Democracy in the 21st Century POL322/522 Parliamentary and Public Sector Internship HIS225 European Union
4	Arts, Education and Creative Media	Social Sciences and Humanities	Sustainability	Lecturer	STP303/603 Social Justice and Sustainability – Non Profit Sector STP332/632 Sustainable Development Internship/Project
5	Science and Engineering	Biological Sciences and Biotechnology	Climate Change, Woodlands and Forest Health	Post-doctoral Fellow	None
6	Science and Engineering	Environmental Science	Environmental Technology Centre	PhD Candidate and Tutor	ENV210 Environmental Technology for Sustainable Development
7	Science and Engineering	Energy and Engineering	Energy	Lecturer	PEC332/632 Greenhouse Science and Policy PEC370/670 Energy Efficient Buildings PEC287/587 Renewable Energy and Sustainable Development PEC620 Case Studies on Renewable Energy
8	Science and Engineering	Environmental Science	Education for Sustainability	Lecturer	EDU450 Environmental Education for Sustainability
9	Science and Engineering	Energy and Engineering	Physics	Senior Lecturer	PEC430 Advanced Topics in Physics: Theoretical FDN109 Tomorrow, Yesterday, Today; PEC152 Principles of Physics PEC231 Modern Physics
10	Science and Engineering	Environmental Science	Marine	Lecturer	ENV102 Introduction to Environmental Science ENV282 Oceanography and Marine Pollution
11	Arts, Education and Creative Media	Social Sciences and Humanities	Asian Studies	PhD Candidate	None
12	Arts, Education and Creative Media	Social Sciences and Humanities	Sustainability	Lecturer	SSH301 Workshop in Aid and Development STP110 Introduction to Climate Change Studies STP333/633Disasters and Risk Management ENV212/612 Global and Regional Sustainability
13	Arts, Education and Creative Media	Social Sciences and Humanities	Sustainability	Lecturer	STP212/612 Sustainability, Ecology and Communities STP211/611 Resilient Regions: People and Practice
14	Arts, Education and Creative Media	Social Sciences and Humanities	Sustainability	Lecturer	STP204/604 Overseas Aid and International Development STP109 Approaches to Sustainability

In terms of specific roles, there weren't any clear divisions. The integrator often took care of logistics (e.g., room hire, invitations and catering) and preparing materials for network events. But, there were lots of exceptions to this with the activator also completing these tasks. The activator and integrator also shared the facilitation of events

3.4.3.2 The network

An initial meeting was used to promote, identify and recruit members for the network. There were several methods used to invite people to this meeting:

- targeted email or phone-call to people that the activator or integrator knew and thought might be interested in being involved;
- general email to people who were identified through a) a recommendations from colleagues; and, b) from searching unit offerings and staff profiles in different schools;
- general announcement via Murdoch University 'Coming Events' email and website; and
- general email to the Network Enhancing the Scholarship of Teaching (NEST) members.

At this meeting 18 people attended and had the opportunity to join the network. Eleven people joined the network at that time, eight of whom are still involved, although two only minimally. Since this initial meeting, new network members have been recommended by network members or directly made a request to be involved. Network members have expressed a number of motivations for joining the network that centre on their interests in climate change, teaching, multidisciplinarity and networking.

There were a number of individuals who joined the network due to their "passion for climate change" and belief that "it is paramount that we educate people to think about climate change". The network was also a potential avenue for generating action on climate change as it provided a way of "finding likeminded people also concerned about that issue and trying to see collectively if we could do more than I could do as an individual – the network model was attractive" and for "advancing the cause of climate change". For others, although there was a "base level of passion and interest in climate change" there were also additional motivations.

The network was seen as valuable for providing people with the opportunity to establish connections and potentially collaborate with people from different disciplines. For example, one network member saw this as an opportunity "to find out what you [social scientists] were doing… and maybe collaborate as a physical scientist with social scientists", another felt that "getting a multidisciplinary approach to climate change and understanding who else and in what areas are incorporating climate into their teaching was exciting" and for another it was an opportunity to "see things from different perspectives."

The network members also saw the network as a mechanism for improving and sharing ideas about climate change teaching commenting:

"I always want to learn more, [this was an opportunity to] learn from others so that I can incorporate it into my teaching whether it be a topic, skill or way of teaching"

"Professional development of teaching, really interested in any positive approaches to dealing with climate change, this way of looking at climate change in teaching just appealed as a positive approach"

"Particularly interested in how to teach climate change especially for students with different [disciplinary] backgrounds"

Networking for networking sake was also identified as important as some members were relatively new to MU.

The network has met five times per year. These have been a mixture of lunchtime and breakfast meetings with one afternoon session ending in a sundowner. In between meetings email has been used as the central communication method along with phone-calls when necessary. One-on-one face-to-face interaction between the activator-integrator/activator/integrator and members has been based on need. For example the activator-integrator and individual network members have met to discuss curriculum development and/or other ideas. In addition, members regularly interact in non-network related ways via seminars, guest lectures and informal interaction.

3.4.4 Network aspirations and goals

3.4.4.1 Network activator and network integrator

As an early career academic the activator-integrator was unsure what the network could achieve institutionally or structurally, but saw the network as an opportunity to build and be part of a network of people interested in learning about and improving climate change and sustainability teaching. Other goals included: to create a university wide network; to create something that was sustainable and had a life and purpose of its own beyond the project; and, to work with network members to encourage collaboration.

These goals and aspirations did not change during the project, but there was a shift in thinking in terms of having more realistic expectations of what people could contribute to the network and the extent of collaboration that was possible. There was also a growing realisation about the network in the MU context and what a network could/should look like and contribute in an institutional context where many of the project goals were either addressed or well supported. These reflections are elaborated on in the section on network challenges below.

3.4.4.2 Network members

Network members had a range of aspirations and goals for the network that related to their motivations for joining the network; these are captured in the following quotations:

"To invigorate my teaching about this topic"

"To think about new ways to present it [climate change]"

"To learn how to teach climate change in a user-friendly way so that everyone could learn or understand the concept"

"To pick up experience and knowledge from other people"

"The possibility to connect students across units and disciplines"

"To spread the word in an interdisciplinary way"

"To create [and be part of] some momentum behind the importance of climate change within tertiary education"

"To write papers/publish"

"To incorporate climate change into my teaching"

"To collaborate on something"

These were consistent with the goals established at the initial network meeting which where to “share ideas and provide mutual support”, “facilitate and interdisciplinary approach to climate change teaching” and to “develop new teaching materials, interdisciplinary case studies, resources and research papers” related to achieving these goals. The network was also identified as a vehicle for action on climate change “to support a paradigm shift to a more sustainable ways”, to “encourage students to raise the profile of issues” and to “build momentum for a carbon neutral future”.

These aspirations did not necessarily change over the course of the project, but for some people “they got a bit smaller”. Overwhelmingly, a lack of time was cited as the main factor influencing the network members’ shift in expectations around what could be achieved by the network with comments such as “we are all busy and it is very difficult to make time for any other work” resonating throughout the network. As one network reflected “I realised I didn’t have the time, I enjoyed it, but it’s easier to do the same old thing”. The lack of time impacted on the way the network functioned with many outcomes from the network coming from individual action and/or interaction between small groups of members. This inability to work on one project meant that for one member the network wasn’t as “cohesive or collegiate” as they expected and this impacted on their involvement.

3.4.5 Network challenges

The reflections of the activator, integrator, activator-integrator and the network on the challenges that were faced by the network are presented in Table 3. From the range of responses four challenges that provide opportunities for learning about and improving the network are discussed

3.4.5.1 Time and institutional constraints

As described above and reported on throughout the project a lack of time was the main barrier to network members participating more fully in the network activities. This challenge is indicative of the increasing workloads of academics and dilemmas they face when making decisions about spending time on activities not accounted for in workload management systems. The following quotations highlight this:

“The academic university would like to spend time on it, but the financial university says there’s no time, which leaves the option to do it on our own time, but the financial university has stolen that time so we don’t have discretionary time”.

“If I was to collaborate with someone else, I would have to give up something else and it would have to have been of equal value and it would have had to be accountable (e.g., in the workload)”.

Throughout the project different strategies have been employed to address time constraints, these have included holding breakfast and/or lunchtime meetings to minimise interruptions to existing schedules. The network has also co-opted the sustainability seminar series rather than set-up a new seminar or workshop program as the latter may have created further time pressures for individuals wanting to attend both events. Halfway through the second year of the project a research assistant was employed to help coordinate and organise the network events.

There is some indication that these strategies have worked; in spite of being time poor members have stayed engaged throughout the project with good attendance at network meetings. When asked to reflect on this people said they saw value in the project and continued to stay engaged for the following reasons: “we commit to this network and I feel obligated to do something”, “lunchtime meetings – if I can’t stop for lunch sometimes then what can I do”, “interesting speaker”, “seeing people thinking the same or along the same lines makes it easier to carry on doing what you’re doing”, “you get reinvigorated about stuff”, “it’s good to share with other teachers across the university, we don’t do it enough as teachers”.

Table 3: Network Challenges

Role	Reflections
Network Integrator	● Trying to understand what the project could look like at Murdoch that would be useful for the Murdoch network. ● Moving from ideas to action, the network has had and continues to have a lot of ideas, but collective action has been more difficult to achieve. ● Trying to convince the network members that they were part of a network for which they had collective responsibility rather than directing ideas/messages via the activator/integrator for distribution or action. ● Working to develop activator and integrator roles that would encourage the development of a sustainable network. This at times seemed at odds with the project goals and structure. ● Grappling with the concept of distributed leadership and how this fitted into the network and project levels of operation. ● Maintaining a two-tiered network of a core and broader group, which was our initial intent, but not well executed. ● Ensuring that the meetings provided space for networking as well as tasks while not having meetings that ran for more than one and half hours.
Network Activator-Integrator	● Having a workload that meant I could completely empathise with the network members, but left little space for doing network things. The integrator role had inadvertently been excluded from my workload. ● Continuing the process of trying to build ownership and sustainability of the network. ● Questioning whether I had the social capital or seniority to really galvanise the network. ● Reflecting on whether having more than two people as part of the 'management' team whether or not they are called activator or integrator or play those roles in the project sense was essential for driving the project (in particular for self-motivation) and how this relates to the sustainability of the network.
Network Members	● A lack of time to commit to network actions – "it is one of those things that is important, but not urgent" ● The closure of the School of Sustainability – "going through such an upheaval it was hard to get to thinking about the network" ● "Not being secure in our jobs" (the contracts of all networks from sustainability were on fixed contracts until the end of 2011) ● "Network participation not being part of workloads" ● "A lack of leadership and recognition of the value of network activities" ● "A lack of Murdoch endorsement" ● "We don't know what the other groups from the [national] project are doing" ● "A lack of online presence that might have enabled me to have a sense of ongoing connection and way to dip in and out of things"

What has not been addressed during the project is the underlying issue of a lack of formal institutional support for the project. An endorsement or formal recognition of the network activities from the university may have enabled network members to spend more time on the project. This was discussed early in the project, but the activator and integrator did not feel that this would be forthcoming given the closure of the School of Sustainability in year one of the project. A network member has suggested that applying for MU strategic funding for 2012 could help sustain the network and secure institutional support.

3.4.5.2 Contextualisation

The LNCC project design was based on the UTAS experience and context. A challenge for the Murdoch network was understanding the MU context and how it differed from other universities participating in the project. The bigger challenging was taking that knowledge and rethinking the project design in a way that delivered the project aims and outcomes while also creating something meaningful and useful for network members. The following two aspects of the MU context were potentially unique and were taken into account during this process.

1. MU is supportive of multidisciplinary and interdisciplinary teaching (see above) and for network members teaching in multidisciplinary and interdisciplinary ways was not new.
2. An interest in climate change was a strong motivating factor for individuals joining the factor. This is not a challenge that has been overcome, but rather it has been a challenge and opportunity throughout the project. It has resulted in: more individual action in terms of rethinking existing climate change curriculum including assessments; the network focusing on activities designed to encourage action on climate change and engage students in action (e.g., bike to work challenge and Climate Q&A); and, connecting with researchers and teaching staff working in the area of climate change (e.g., through the Climate Change Teaching and Research Nexus Workshop).

3.4.5.3 Network sustainability

From the outset the activator, integrator/activator-integrator were committed to developing a network that would be sustainable beyond the life of the project. This commitment led the activator and integrator/activator-integrator to consider how best to support the network in a way that fostered ownership and collective action rather than a reliance on the activator and activator/activator-integrator for action. On the one hand the activator and integrator/activator-integrator recognised the challenge of fostering ownership and encouraging people to take action given the time constraints described above. On the other hand, there was a strong feeling that unless the network members were drivers of the network this the network would cease to function at the end of the project.

This has been a constant challenge and in the first year the activator and integrator/activator-integrator initiated meetings and encouraged action through those meetings and follow up emails and meetings, but did not implement the ideas of the network without a commitment from one or more network members. In the second year of the project, the activator-integrator took on more of management role and a research assistant was employed to support the activator-integrator and network. This enabled the network to deliver outcomes such as Climate Talk and the Big Ideas Seminar Series. It remains to be seen whether this impacted on the sustainability of the network.

Another strategy used to support the development of a sustainable network was integrating ideas into existing structures i.e., the idea of having a regular workshop or space for networking was incorporated in the existing sustainability seminar program. At the project end network members also had an opportunity to talk about the future of the network and provided the following suggestions about how to sustain the network and network purpose and function in 2012:

- set up a blog using some of the content from Climate Talk;
- set up a web platform as a resource attached to the library that provides content and resources related to the different facets of climate change;
- set up a monthly/bimonthly lecture series that explores climate change from different perspectives;
- apply for strategic funding as a way to obtain institutional support;

- write a paper about climate change teaching experiences at Murdoch for the teaching and learning forum to be held at Murdoch in 2012;
- try to integrate the ideas of the network into research students projects;
- continue to explore ways of getting students doing projects and connecting up; and
- hold Climate Talk annually.

3.4.5.4 Network management

To some extent a further challenge was that the integrator/activator-integrator lacked network management expertise and experience. There were some obvious tools not utilised by the integrator/activator-integrator, for example an online presence (such as a blog) or email subscription list. These could have helped the network stay more connected. The integrator/activator-integrator also lacked understanding about what a network was and what was needed to support network activity. In a presentation to the Network Enhancing the Scholarship of Teaching (NEST) about the project the activator-integrator was questioned about whether this was a network or a group. Upon reflection it appeared that the network was more of a group. In the first year, based on the UTAS experience it was decided to recruit six to twelve people for the network. A broader network was also established, but not maintained likely due to the poor network management described here. One way that networking could have been promoted was by having one network that was open to any number of new members. The network would undoubtedly have active and passive members, but all members would have remained connected and had the opportunity to engage when something was of interest. In the second year of the project a flexible approach was taken to new members joining the network. An online presence in the form of a blog will be developed for 2012.

3.4.6 Achievements

In the two years of the project the MU Climate Change Teaching Network has achieved many things. In particular it has created conversations, connections and curriculum.

1. *Conversations***:** the network has provided a space for individuals to share ideas and discuss teaching, climate change, climate change teaching and interdisciplinarity and transdisciplinarity. The meetings are well attended and individuals bring to these meetings ideas, dilemmas and questions that are discussed in a collegial environment. The network has provided a source of motivation for individuals to rethink and improve their teaching.
2. *Connections***:** the network has helped individuals connect with colleagues from other disciplines. The network has focused not only on connecting people teaching about climate change, but also connecting researchers with teaching staff. This was seen to be particularly beneficial for supporting postgraduate students.
3. *Curriculum*: as described below the network members have made a number of changes to their curriculum with a particular focus on developing climate change related assessments.

The network has also organised or contributed to three events focused on connecting academics, students and the wider public in conversations and action related to climate change: 1) Bike to Work Challenge; 2) Tackling Climate Change Student Creative Exhibition; and, 3) Climate Talk.

3.4.6.1 Bike to work challenge

In 2010, several network members, the university Environment Officer, other volunteer staff members and one dedicated student worked collaboratively during September/October to promote cycling at MU. This involved setting up a stall each Thursday as part of market day to actively promote cycling and the ‘bike to work in spring challenge.’ This culminated in a

breakfast to celebrate the efforts of those people who had joined up to cycle to work in spring. This activity provided an interesting contrast to the direct network activities as people readily volunteered their time and energy to setting up and 'manning' the stall, promoting the stall, sourcing prizes etc. This raised the question of what elements were present here that encouraged or enabled the same busy/time poor people to participate. Unfortunately, we didn't come up with any answers, but reflected that having a clear focus and event to work towards may have been an enabling factor.

3.4.6.2 Tackling Climate Change Creative Exhibition

The Tackling Climate Change Exhibition was held in years one and two of the project. As part of an assessment, students from the 'Global and Regional Sustainability' unit were actively involved in undertaking a creative artwork or activity that engages them in tackling climate change. Each student was involved in exploring the nature of the climate change issue, developing approaches to its resolution, and reflecting on both their own personal and practical contribution to climate change and its resolution. The outcome of this process was an exhibition held in the MU library.

3.4.6.3 Climate Talk

Climate Talk was a half-day event designed to engage students, staff and the wider community in conversations about climate change. The program included two main activities.

1. *Climate change teaching and research nexus workshop*: this workshop provided academics and postgraduates across campus with an opportunity to: explore the teaching research nexus; showcase teaching and research and network with people interested and working the areas of climate change and sustainability. Participants prepared a poster for this event and engaged in networking activities on the day.
2. *Climate Q&A*: this event brought together practitioners, impassioned people, researchers, teachers and students to discuss burning questions and dilemmas relating to climate change identified by students as important. Mayor of Fremantle and MU lecturer Dr Brad Pettitt hosted the panel which was made up of: Alannah MacTiernan – Former state minister for planning and infrastructure; Piers Verstegen – Director, Conservation Council Western Australia; Peg Davies – Waste Education Officer, Mindarie Regional Council; Simon Cherriman – Environmental Consultant and Filmmaker, iNSiGHT Ornithology and AG Young Conservationist of the Year 2010; and, Basha Stasak – Perth Coordinator, Australian Youth Climate Coalition (AYCC).

In addition to these activities, Murdoch's Moody Theatre presented Dystopia a play about climate change in Western Australia and the Tackling Climate Change Creative Exhibition was also run concurrently.

For individual network members there have also been personal achievements. These have related mostly to changes that they made to their assessments as a result of: conversations with the network; motivation from being part of the network; and, validation from the network about the changes being made. These curriculum changes are described in detail below.

3.4.7 Curriculum change

There have been a number of changes to curriculum that have been supported by the network. The focus has mostly been on emphasising climate change in the content and assessments. There have also been attempts to make the assessments more problem-based. The changes to curriculum made by network members are summarised here.

1. *FDN110 Australia in Asia:* this unit has two weeks that focus on climate change (Week 12: Climate Change: The Science and Week 13: Climate Change: Global Responsibilities). The oral presentations made and tutorial activities in Week 13 were

modified. For the oral presentation students were asked to present two-minute responses to questions about climate change. The external students were asked to submit video clips of their presentations. In the climate change mock negotiations activity, students were asked to negotiate an agreed position on the following question: What obligations, if any, does Australia have to climate change refugees?

2. *FDN109 Tomorrow, Yesterday and Today:* 'Requiem for a Species: why we resist the truth about climate change' (Hamilton, 2010) has been adopted as the text for this unit.
3. *STP109 Approaches to Sustainability:* a new assessment has been added to this unit that asks students to blog about climate change. Students are asked to post questions about how they feel about climate change and what dilemmas they experience in taking action.
4. *STP212 Sustainability, Ecology and Communities*: this unit focuses on systems thinking and the main written assessment was modified to ask students to think about climate change using systems thinking.
5. *STP303/603 Social Justice and Sustainability – Non Profit Sector***:** the group assignment and presentation has been modified so that students are asked to develop a non profit organisation/social enterprise or social entrepreneurial venture that considers the implications of adapting to climate change and addressing the need to deliver social justice for all. In the second year of the project the introductory lectures were also modified so that social justice was discussed in relation to climate change and sustainability.
6. *ENV212 Global and Regional Sustainability*: the Creative Exhibition assessment has been modified so that students focus on ways of tackling climate change through the production of an art piece.
7. *PEC332/632 Greenhouse Science and Policy: the* content for this unit was modified so that emphasis was given to adaptation and mitigation. The pre-requisite requirement for this unit has been removed in order to attract students from different disciplinary backgrounds.

3.4.8 Climate change teaching in the university context

As described above, the network members had different motivations for joining the network, but for all except one of the newer network members interviewed, a concern for issues of climate was central to their decision to be involved. The majority of network members were already active in this area personally, professionally and in their teaching. For example, one network member is also the president of the Conservation Council of Western Australia and another a board member of Oxfam Australia. A number of the network members lifestyles could also be described as sustainable lifestyles with actions taken to reduce footprints (ecological and carbon) through the use of public transport, renewable energy, rainwater, greywater and locally produced or home grown food. Several network members also actively contribute articles or comment to the public debate via websites or blogs. In terms of teaching, all network members taught about climate in an indirect or direct way prior to the establishment of the network.

Given this passion for tackling climate change it is not surprising that network members felt strongly that it was the responsibility of universities to teach about climate change as reflected in the following comments:

"It comes down to the definition of a university, for a university of academics it is a moral imperative, if you have knowledge about this you've got to do this. The mortar and bricks university teaches about what makes money".

"Climate Change is a huge issue facing us now and into the future. If we can't use big institutions for the big issues I don't know what we are doing".

"Quite a significant responsibility given our toxic public debate, it seems to be difficult to get much understanding of climate change from public debates and media, of feels like the

government are participating in this toxic debate… there seem to be very few avenues for credible information. I think the universities play a huge role in that. The way we can see our students thinking quite superficially about climate change and policy, we do have an important role to dig a little deeper and think critically because clearly they are just as influenced by the toxic media debate".

"I think it's very important because we are teaching the future leaders and if we are not teaching about it who is, where they learning, where are they getting an opportunity to get different sides of the story, think critically about whether they need to worry about it".

"University is a good platform to teach students to build a nation for the future. We need to train our future generation about how they can live, how they can adapt and the university is the place to explore these ideas".

The network did not identify any institutional challenges to teaching about climate change, but throughout the project network members have reflected on how they teach about climate change and challenges associated with this. The network has had many conversations about how to teach about climate change in a way that students feel empowered rather than disempowered due to the presentation of gloomy facts and forecasts. The Climate Q&A was an attempt to engage students in dialogue that helps them think about ways to engage in a positive way. Another area that the network has grappled with is whether their teaching is having an impact on behaviour. The network has been interested in conducting research about behaviour change across a semester and using an ecological footprint tool to explore impact. These are activities that the network is still interested in pursuing beyond the life of the ALTC project.

3.4.9 Distributed leadership

The MU network encouraged and modelled distributed leadership in a range of ways. Notably, the network motivated and inspired members to reflect on their teaching and show leadership in their own unit(s). As discussed in the section on curriculum, many network members modified their units to focus on climate change and the network provided a space to think about and reinvigorate teaching.

Distributed leadership was also demonstrated through the two main events that network members coordinated. In the first year of the project, network members worked together on the bike to work challenge advocacy and breakfast. Although this was not a formal network activity, several network members actively participated in and organised these activities. This is perhaps a good example of distributed leadership occurring without external activation or integration; one network member initiated this activity and others were quick to respond and participate.

Climate Talk took place in year two, and in contrast with the bike to work challenge this event was born out of the networks ideas and shaped by their experiences of teaching climate change. The activator-integrator and support staff initially drove these activities, particularly in terms of organisation, coordination and logistics. However, in the weeks prior to the event, network members actively supported the process and were involved in script writing for the Q&A, provision of materials, preparation of posters for the teaching and research nexus workshop and promotion of the event. As was the case with the bike to work challenge, once there was a clear goal and focus network members mobilised and showed leadership.

These experiences suggest that for the MU network, distribution of leadership came about once someone initiated action. The activator-integrator and support staff provided a vital role in providing the initial impetus and logistical and administrative support. However, the role of integration was distributed amongst network members especially once an activity was initiated. In a seminar presentation about the network, a researcher, who's area of expertise is personality type, suggested that many academics are ideas people, but less of them a doers and so in developing a network it is important that some doers are in the mix.

3.4.10 Evaluation

There has been no formal evaluation of the network, but there have been three attempts to obtain feedback and reflect on the networks ideas and actions.

In the first year of the project Survey Monkey an online survey tool was used to pose three questions: 1) How do you feel our climate change network is going? 2) Where can you see it going from here? And, 3) How will you help it get there? This yielded one response. Phone-calls and emails were used as an alternative, but it was difficult to reach network members with two members on leave; three working on their PhD's concurrently with academic workloads; and, others busy teaching. In the end three network members provided responses.

In the second year of the project face-to-face interviews were conducted with seven network members to complete this case study. The interview questions largely focused on what had happened during the two years of the project in terms of achievements and challenges. However, it also provided an opportunity for network members to reflect on what they would like to see happen once the project finished and how the project could be sustained.

Throughout the project reflective practice is another way that the project has been 'evaluated'. This practice has been encouraged through semi-regular dialogue between the activator, integrator and designated critical friend.

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3.5 The LNCC Project Team

Aidan Davison, Emma Pharo and Kristin Warr

The primary aim of the LNCC project was to develop the capacity of interdisciplinary teaching networks within a university to demonstrate distributed leadership and thereby affect positive change within their institutions in relation to student learning on the topic of climate change. The previous institutional case studies outline the successes achieved and challenges encountered in domesticating the LNCC model in three recipient institutions and in further elaborating the model at its originating institution (UTAS). This section of the report outlines how the activators and integrators at all four partner institutions worked together in an overarching project team, or 'network of networks', to share practice, develop relationships and achieve shared ownership of the project, so that common threads and differences could be identified and project deliverables met.

3.5.1 The LNCC leadership team

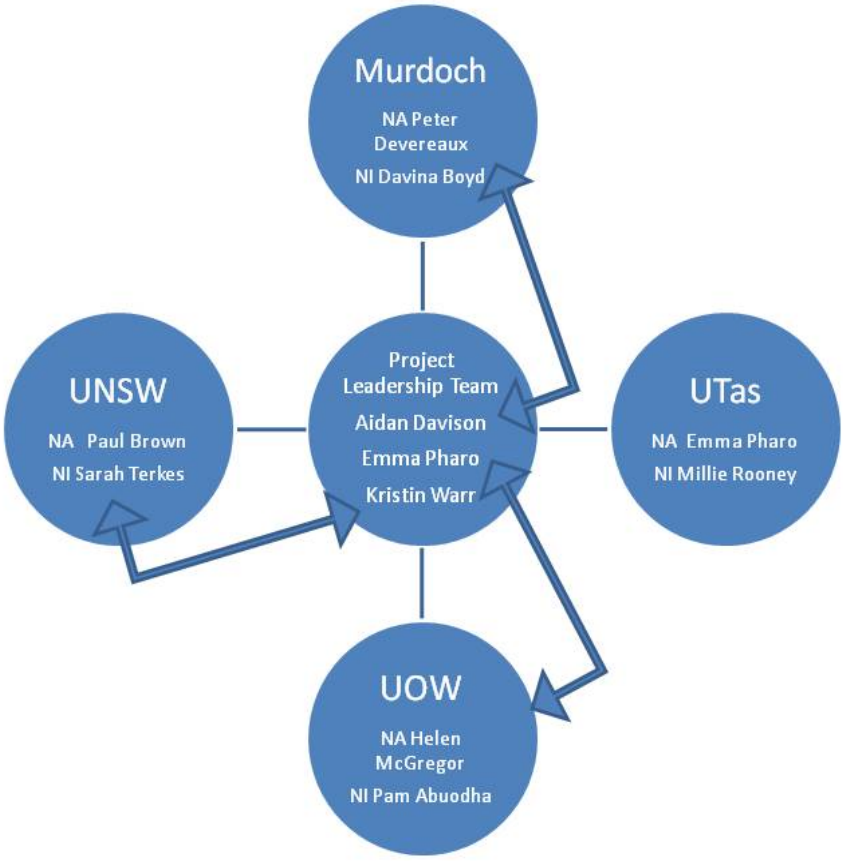
Within the LNCC project team, the UTAS members provided administrative leadership related to the grant and were responsible for day-to-day project management, financial management and reporting requirements, as well for preparation of the original grant proposal, recruitment of partner institutions and initial dissemination of the LNCC model into the three partner institutions. The LNCC leadership team existed as an entity only for the life of the funded project, with the major outcomes and deliverables of the project being the responsibility of the institution-based collaborative teaching networks.

The LNCC leadership team emerged out of the UTAS pilot project and consisted of the activators (Pharo and Davison) and the integrator (Warr) from the original 2008 UTAS network. The leadership team sought to model distributed leadership by working collaboratively with each other and with other members of the project team (Figure 2). The capacity to share these roles and make decisions collectively about the design and delivery of the project was supported through the negotiation of a shared understanding about the project that allowed room for individual autonomy, and a commitment to ensure reciprocity through the sharing of responsibilities and rewards. Mutual trust and respect continued to develop over the course of the project, allowing the project to withstand a number of changes to project team membership without having any adverse impact on the functioning of the project.

3.5.2 Reference group and external evaluator

In addition to mentoring other members of the project team, the leadership team was in turn mentored throughout the project by the external evaluator and an external reference group. The external evaluator played a key role in helping the leadership team guide the project by attending all of the project team's face-to-face workshops and web-based meetings. The evaluator was willing to assist the leadership team to develop workshop and meeting agendas and offer guidance to the team in shaping and maintaining the direction of the project. The reference group met with the project leadership team three times throughout the life of the project to give feedback on the planning of the project, outcomes of the first year and the scoping of lessons learned from the project for the purposes of writing the report. The reference group offered valuable feedback on the various themes of the project, as they were drawn from fields and areas of expertise that included interdisciplinary teaching, distributed leadership and environmental education. The also collectively had expert knowledge of leading ALTC projects, institutional structures, and provided an international context for thinking through the relevance of climate change curricula in the tertiary sector. In addition, three reference group members were situated in three of the participating institutions and were able to directly assist their local collaborative teaching network. This enabled the reference group to contribute to the project both at the leadership team level and within particular institutional contexts, which will assist with the sustainability and dissemination of project outcomes.

Figure 2: The LNCC Project Team. The arrows indicate critical friend (peer mentoring) relationships between members of the UTAS leadership team and the three institutions new to the project in 2010. UNSW = University of New South Wales, UOW = University of Wollongong, Murdoch = Murdoch University, NA = Network Activator, NI = Network Integrator.



3.5.3 Project management roles

In addition to their critical friend roles, indicated in Figure 1 and explained below, Aidan Davison was responsible for liaison with the ALTC, the external evaluator and project reference group. Kristin Warr was the contact person for the integrators, having been the integrator for UTAS from 2008 through 2010. Sarah Terkes, from UNSW, had web development expertise and designed, created and managed the web resources.

A series of project officers were employed with funds from the grant to support the leadership team in managing the day-to-day administration of the project. Administration involved organising four project team meetings each year; collecting and collating data for reporting and communication about the project to stakeholders through quarterly newsletters; and organising four whole of project team workshops held in Hobart at the start, mid-point and wrap-up of the project. The project officers worked collaboratively with the leadership team and contributed substantially to the conceptual framework and intellectual output of the project.

3.5.4 Critical friends

In order to support ongoing collaboration within the project team, each member of the leadership team established a peer mentoring relationship with one of the partner networks, which for the purposes of this project we called a 'critical friend' relationship. 'Critical friends' provided each partner institution with a point of contact with the project leadership team, from whom they could seek feedback, rely on for dissemination of project information, support the establishment and embedding of the LNCC model in each context, and establish a partnership throughout the life of the project.

Each critical friend visited their partner institution at least once during the first year of the project to meet members of the local network and to reflect on progress with the integrator and activator. These visits enabled the leadership team to gain more insight into the structure and activities of their partner network than could be gained from written reports and web-based meetings. The visits also assisted the activators and integrators in validating to network members the role their work was playing in the overall LNCC project. The developing relationships between the activators, integrators and their critical friends have been a great success of this project.

3.5.5 Face-to-face meetings

To establish and maintain collaboration, three scheduled face-to-face workshops for members of the project team were scheduled at the start and mid-way through the project. Following the mid-project workshop, the team proposed a final workshop at the end of the project to follow-up on post-project activities such as collaborative preparation of scholarly papers and identification of strategies for supporting the ongoing sustainability of the project in each of the institutions. Face-to-face meetings were further supported by three annual web-based meetings. During these meetings, ongoing outcomes and activities were shared between the institutions so that lessons learned from different methods of implementation could be shared and feedback could be provided to each partner institution from a wide range of perspectives.

3.5.6 Network activator and network integrator workshops

A two-day introductory workshop was held in February 2010 in Hobart for network activators. Activities included roundtable discussions sharing perceptions and experiences of distributed leadership, interdisciplinary learning and climate change teaching. A second workshop then hosted network integrators from each institution in a two-day workshop in Hobart in March 2010. Materials for the integrators workshop were developed out of the Green Report (Lefoe et al. 2008) and the ALTC Project Manager's workshop and included vignettes and lessons from the 2008 experience of the UTAS integrator.

Key outcomes from these initial workshops included:

- developing relationships;
- explaining the LNCC model;
- sharing lessons from the UTAS pilot project;
- reflecting on and sharing lessons from each other's previous experiences with interdisciplinary collaboration, teaching and climate change;
- discussing ideas for climate change curriculum development;
- outlining the requirements and timelines of the grant;
- planning and sharing expectations for the project;
- identifying and discussing distributed leadership as a methodology; and
- evaluating possible leadership development tools that could assist network establishment and maintenance.

The leadership team evaluated the workshops by seeking post-session feedback from participants in the form of written questionnaires that included both broad questions about strengths and weaknesses as well as opportunity for open comments. Lessons from this feedback assisted in the development of the mid-year workshop, and also helped each of the partner institutions consider the approaches they would take to running their own initial network meetings upon return to their home institutions.

3.5.7 Mid-project workshop

At the conclusion of the first year of the project, the project team attended a two-day workshop in Hobart in November 2010. The main purpose of this workshop was for each of the partner institutions to share the outcomes of their networks to date. By doing this in a collaborative environment, the project team was able to provide detailed feedback and support to each of the networks, whilst taking lessons from each of the shared experiences. Additional outcomes of the mid-year workshop included the scoping out of three collaborative working papers on themes identified to be developing out of the project, the planning of network activities at each institution for the second year of the project, and the development of a framework for building a collaborative curriculum resource of climate change activities from across the institutions.

Whilst all of these were expected outcomes based on deliverables identified in the project grant, there were also a number of notable unexpected outcomes that surfaced at this face-to-face meeting. It was highly apparent at the mid-project workshop that strong and collegial relationships were developing between the project team, and in particular between critical friend groups. These relationships allowed for open and frank discussions to emerge about the nature of distributed leadership, the use and challenges of this concept as a project methodology and the role that individual leadership outcomes play in authenticating this model as a framework for leadership development. For instance, newly appointed middle-level academic Helen McGregor from UOW was being considered for a tenure-track position and was due to give a seminar immediately following the retreat. In addition to being able to use her role in the project to demonstrate her professional development as a teacher, she was able to do a run-through of her presentation with the group and draw on the experience of the group in seeking feedback.

Another junior member of the team later used one of the more senior members of the team (from another institution) as a referee on a job application, based on the work they had done together as critical friends in this project. A final notable outcome of this mid-project workshop was the overwhelming desire of the whole project team to have one further, unscheduled, face-to-face meeting in order to pursue scholarly outcomes from the project, decommission the project thoughtfully, and consider ways of maximising the ongoing legacy of the project. This end-of-project writing workshop is planned for shortly after this report is due for submission and will take place in Hobart.

4. Reflections and Evaluation

Aidan Davison, Emma Pharo and Kristin Warr

4.1 Formative evaluation

As outlined in the grant application, the project team was committed to on-going reflection and evaluation during the course of the project. This process of formative inquiry focused on the following:

- assessing progress towards achieving project deliverables;
- opportunities for learning and adaptation of the project model, especially in relation to the aims of distributed leadership development and interdisciplinary teaching collaboration;
- evaluation of network and project-team functioning; and
- identification and analysis of commonalities and differences between the four networks.

Methods of reflection and evaluation adopted by the project team included journaling, semi-structured interviews, roundtable discussions, critical friend discussions, formative feedback from the external evaluator, reference group meetings, newsletters, ALTC reporting, conference presentations and preparation of journal articles. Continuous participative feedback from the external evaluator in the form of roundtable discussions and critical friend relationships has been particularly important in embedding on-going learning, adaptation and evaluation in the project team. This has enabled team members to be aware of the progress of all networks, compare notes with one another and to engage in analytical discussion of specific challenges as they arose. A measure of the success of these roundtable discussions was that a third, unscheduled workshop has been organised by the UTAS project leadership team to be held in Hobart in early December 2011 at the request of project team members from partner institutions. This final, voluntary workshop will be solely focused on the preparation of academic journal papers by the project team that will report and analyse data collected as part of the reflection and evaluation methods outlined above.

This section of the report draws upon reflection and evaluation processes embedded within the project to analyse achievements and challenges in regards to the project aims. We pay particular attention to the degree to which the achievements of the project are sustainable at each institution. In what follows, each of the aims stipulated in the grant application are restated and then analysed in light of progress over the course of the project.

4.2 Project Aim 1

Extend the outcomes of the distributed leadership approach piloted at UTAS in 2008 to develop distributed leadership within meaningful and durable cross-disciplinary teaching collaborations in three other Australian universities.

All four teaching networks were successful in providing opportunities for the activator and integrator to develop and exhibit their leadership capacity. This leadership was expressed in the initiative, vision, strategy and advocacy of activators and integrators as individuals. It was also expressed through the ability of the activator and integrator to establish and consolidate vibrant and dynamic collaboration in which network members were empowered to develop leadership capacity through their teaching practice. Empowerment manifested in individual achievements but also in the development and exercise of initiative, vision, strategy and advocacy by the group as a whole. This development of individual and group-based leadership capacity through collaborative means is the defining characteristic of distributed leadership development (Bennet et al., 2003; Lefoe et al. 2008).

The model of distributed leadership development employed in this project involved creating close-knit teams of teachers - networks, in the terminology of the project - drawn from across disciplinary and administrative boundaries at each of the four institutions. The founding aim of these networks was to advance interdisciplinary teaching practice and student learning related to the topic of climate change through peer-supported innovation within existing curriculum structures and teaching workloads. As a result of being able to mesh teaching development and existing workload, opportunities for distributed leadership development were embedded within 'business as usual' activities of group members.

As evident in Part 3, the approach of embedding network activities within existing structures and workload commitments - in contrast to the imposition of a predetermined agenda - ensured diversity in the structure, function and outcomes of each network. Flexibility in the application of the UTAS pilot model was deliberate and important to maximize opportunities for distributed leadership development. This approach was based on the innovative teaching experience of the UTAS project leadership team and informed their aim of striking a balance between central management and giving project participants freedom to lead the development of the project in their local setting (Pharo and de Salas 2009).

The autonomy of networks combined with the facilitative structure provided by the activator and integrator and the resources provided through ALTC funding ensured an effective synthesis of external support and internal self-determination. Initial workshops run by the UTAS project leadership team for activators in February 2010 and integrators in March 2010 were important for giving the three partner institutions the opportunity to be fully informed about the design, intent and process of the project. Partners were able to clarify the requirements of networks in order to meet the project outcomes and deliverables laid out in the application to the ALTC. Beyond this they were encouraged to innovate and adapt the model to best suit their circumstances and the emergent aspirations of their networks.

Each network activator agreed to undertake three generic tasks.

1. To establish a cross-disciplinary teaching network with a minimum of six to eight members.
2. To employ a network integrator in accordance with the budget detailed in the grant application.
3. To ensure that the network created and implemented an interdisciplinary learning activity for students on the topic of climate change.

Leadership was required from both activators and integrators in deciding the most appropriate form, style and process for their network so that they could best respond to their own institutional setting and to the aspirations of their particular group of participating teachers.

The establishment of the network at the UOW was shaped by the fact that both the activator and integrator were relatively junior early career academics, on fixed-term contracts, with strong track records in research but limited teaching experience. For these staff, the most feasible way of establishing the network was to build it around their existing teaching in a multidisciplinary and multischool unit on the physical science of climate change. However, the decision to explore opportunities for interdisciplinary teaching and for involving teachers from additional schools had the consequence of raising the concern of some senior academics with managerial responsibility for the unit, worried that the project may be detrimental to their school's interests. In this context, the activator and integrator benefitted from external support provided by their critical friend in the UTAS leadership team and from senior staff in learning and teaching support at UOW, one of whom is a member of the project reference group. At UOW, then, collaborative development of the teaching leadership capacity of the activator and integrator has been a major outcome of the network. The operation of the network relied heavily on the facilitation provided by both the activator and integrator, who worked closely together with overlapping responsibilities. The future viability of the network is likely to depend on the continuation of both of these roles.

In contrast, the establishment of the network at UNSW, the largest university participating in this project, was shaped by the seniority and existing leadership responsibilities of the network activator, a Head of School. As a consequence the UNSW network was designed to align with university-wide strategic objectives, structures and agendas. It was therefore more dispersed and multifocal than any of the other institutions. This university-wide context was in turn shaped by significant investment in climate change research and institutional commitment to promoting interdisciplinary learning. While interdisciplinary teaching of climate change was not well-developed at UNSW at the start of this project, there was widespread interest in and opportunity for network activities. This included the active support of senior managers, including the UNSW Director of Learning and Teaching. Shaped by its formal leadership context, the resulting network is large, comprising of over 40 highly diverse members, including postgraduate and undergraduate students, organised into distinct working groups. The devolved structure of working groups with a specific point of focus has facilitated many opportunities for network members to lead the creation of new initiatives, such as production of educational documentaries. The activator has shown considerable individual leadership in defining strategic objectives of the network most likely to ensure the long-term relevance and survival of the network. The integrator has been responsible for cultivating the collegial relationships of trust and shared purpose on which the network is based. The vital importance of the integrator has seen the network explore opportunities for the continued funding of this position after the life of this project.

Like those at UOW, the activator and integrator at Murdoch were relatively junior early career, fixed-term staff. However, the historical legacy of the founding of this university in 1975 with the explicit aim of promoting interdisciplinary teaching, and the location of the activator and integrator within a small interdisciplinary school, led to the establishment of a network in which many members were already engaged in interdisciplinary teaching. Given the familiarity of the group with interdisciplinary teaching, the focus of the network instead developed largely around the topic of climate change itself. The network demonstrated group leadership at Murdoch in expanding the climate change curriculum in a number of programs; in tackling the isolation of climate change research and climate change teaching in the institution by including researchers in the network and through organising a university-wide seminar on this topic; in exploring innovative teaching methods by which to enable students to integrate formal learning about climate change with issues of personal change and responsibility; and in leading transdisciplinary initiatives that engaged the public in network activities. The activator and integrator deliberately sought to apply a highly-facilitative approach to the operation of the network which emphasised opportunities for other members to lead decisions and initiatives. This was done to develop a network that was as sustainable as possible and not reliant on future funding for the integrator in order to maintain the collaboration.

The network activators at UTAS held permanent but relatively junior teaching positions when starting the initial network in 2008, while the integrator was at that time employed at UTAS on a short-term administrative staff contract. The resultant network was highly collaborative in operation, but depended on the relationship-building effort of the integrator to compensate for the time and workload pressures faced by network members. All network members volunteered to take the lead on specific tasks and showed initiative without being directed. Despite workload pressures, network members contributed to collaboration as it became clear that together the group could achieve what would have been difficult on our own. While all members of the group were encouraged to take the network in new directions (depending on teaching, funding and publishing opportunities), the group remained focused on the goal of contributing to responses to climate change through higher education. Over the past four years all members of the network have advanced in their academic careers partly as a result of demonstrated leadership capacity as teachers, in which their involvement in network activities has been a contributing factor. While the role of the network activators is no longer vital to the operation of the network, the role of the integrator remains essential in the highly siloed context of UTAS in which barriers to cross-discipline collaboration remain substantial.

4.3 Project Aim 2

Build the capacity of academics to better lead teaching relevant to the real-world complexity of climate change through participation in cross-disciplinary teaching networks.

All four networks enabled academic teachers to enhance the real-world relevance of their teaching about climate change through supportive, cross-disciplinary peer collaborations. Over the course of the project more than fifty teaching staff -the majority of which were unit coordinators- have been encouraged to collaborate with teachers from other disciplines, administrative staff, researchers and postgraduate students with the aim of promoting student and public understanding of climate change complexity. Again, the specific ways in which networks went about this were related to their institutional context and specifically to the strength and rigidity of disciplinary boundaries. UTAS and UOW appear to have the most discipline-based structures and culture of the participating universities. UNSW has discipline-based departments or schools, but also has overarching structures, such as media units and climate change institutes, that provided opportunities for formal cross-disciplinary collaboration. Murdoch, while much more disciplinary in its organisation today than when it was founded, has the most well-developed formal structures for interdisciplinary learning. This includes a compulsory foundation unit, chosen from a small group of options, for all first year undergraduate students that provides generic learning skills training as well as interdisciplinary curriculum content related to broad issues of real-world relevance. While some of the initiatives at UTAS might have been of little consequence in the Murdoch context, they were often ambitious in the context of the disciplinary segmentation and competition characteristic of UTAS. Thus, the achievements of each network need to be assessed against the specific challenges posed by their local institutional setting.

All networks designed and implemented interdisciplinary student learning activities on the topic of climate change that shared two elements. First, these activities enabled students to appreciate the unique contribution that many disciplines offer in promoting learning about climate change. Second, these activities encouraged students to value interdisciplinary skills of knowledge synthesis, translation and contextualisation. This enabled them to assimilate the contributions of different disciplines, thereby increasing the sophistication of their understanding climate change complexity. Several networks employed these interdisciplinary student learning activities as opportunities to also promote public understanding of climate change issues. Thus, the MU network incorporated an assignment based on artistic expression of climate change issues as part of a social science unit on international development, and then exhibited these student art projects to the public. The UTAS network recruited students from several different disciplines to form a panel of public speakers at the Tasmanian *Sustainable Living* Expo. Each speaker was asked to briefly articulate the value of their chosen discipline/profession in responding to climate change and then to engage in a cross-disciplinary dialogue with each other and members of the public on climate change issues. Two of the working groups of the UNSW network are also expressly concerned with the role of academic teaching and learning in wider public understanding about climate change, with one focused on communication strategies, such as the concept design for a televised mock trial, and the other focused on public events. While the UOW network has not directly linked student learning and public engagement, one of their interdisciplinary student learning activities involved collaboration between UOW students and those at the University of San Diego, a collaboration that proved a valuable opportunity for cross-cultural learning about understandings of climate change. The UOW activator and integrator have both engaged in various media opportunities around climate change science and teaching climate change.

Capacity building for interdisciplinary teaching on climate change was constrained at all institutions by the competing and excessive demands on the time of network members. Finding time for professional development and scholarship related to teaching remains difficult while formal recognition and rewards associated with these activities continue to be dwarfed by those associated with research (Boyer 1990; Greenbank 2006). This difficulty is only increased when the focus of this professional development and scholarship is

interdisciplinary. While many disciplines provide considerable support for the scholarship of teaching and learning through professional associations, journals and conferences, little support of this kind is directed at interdisciplinary teaching and learning. An additional stress is that funding for teaching scholarship is presently being reduced and fragmented, a situation likely to worsen in the short-term in Australia with the demise of the ALTC (Chalmers 2011; Macfarlane 2011). In keeping with these impediments, all networks reported that participants would have liked to contribute more freely to network activities but that they were constrained by workloads that were already full. There is no denying the problem of overwork, nor the present pressure on teachers to respond to diminishing resources and growing staff:student ratios. The fact that this project has been broadly successful is due in large part to the effort to incorporate project initiatives within existing workloads. To maintain and increase this participation in the future it is necessary for senior managers to address structural issues of overwork and declining incentives for professional development in academic teaching. Expectations of success for academics have become increasingly incompatible with a healthy work-life balance, creating high levels of stress among those working long hours (Jacobs 2004).

In the context of the structural impediments outlined above, members of all four networks stressed the importance of the network integrator in keeping the network together, both in pragmatic tasks such as organising venues and aligning diaries, but more importantly in the substantive role of fostering collaborative relationships between network members. In all four networks, the role of the facilitator was thus more than logistical support and was important in motivating the network (e.g. Johnson 2001). With the end of ALTC funding for this project, some of the networks will struggle to maintain an active membership, which leads to key recommendations in Part 5 below about the need for institutions to support the LNCC networks through resourcing and recognising the value of the integrator role. It is also important to recognise that the motivation of activators and integrators was at least partially different from that of other network members due to their participation in the project team of this ALTC project and thus their role in administering funding and decision-making related to the project.

The exact nature of the role of integrators varied at each institution. In three of the four networks (Murdoch, UOW, UTAS), the integrator and activator roles were blurred to varying degrees. In 2011 these roles were fully combined at Murdoch, with the integrator taking on the role of activator as well because the activator left Australia for an overseas appointment. At UNSW, the roles of integrator and activator were clearly defined and discrete, with the activator taking on a formal advocacy and planning role and the integrator taking on a facilitating role. Overall, despite the blurring of the two roles, all networks reported the benefits of having two people share responsibility for establishing and consolidating networks, and for reporting back within the larger project. The activator and integrator at UOW, for example, relied heavily on the mutual support they provided for each other in coping with sometimes adversarial reactions to the project by some colleagues. The integrator at Murdoch reported that while it seemed feasible for them to take on the activator role in year two of the project, after the departure of the original network activator from the university, in practice the lack of collegial support previously provided by the activator, made doing both jobs much more difficult than anticipated.

4.4 Project Aim 3

Create opportunities for academics to develop their teaching leadership, and in turn inspire interdisciplinary leadership development in students entering diverse professional fields, through cross-disciplinary peer mentoring, dialogue and reciprocal exchange around a common problem.

The focus of this project was on academic leadership development and our evaluation has to this point correspondingly focused on changes in the capacity of our network members to implement innovative and relevant forms of interdisciplinary teaching on climate change.

The teaching innovation within existing units and additional interdisciplinary student activities at all four networks has meant that many thousands of students have been exposed to cross-disciplinary dialogue around the complex issue of climate change over the course of the project. In addition, this project has fostered creative forms of public engagement on interdisciplinary issues of climate change. In the case of UNSW, both undergraduate and postgraduate students were network members, thus exposing them directly to opportunities for networking and development. This open membership model was successful in maintaining energy in a network, even with a membership that will inevitably flux over time. Over the four years of the UTAS network, the retirement of key network members (as they left the university or moved to an administrative position, for example) had an effect on the momentum of the whole group. Bolstering membership with key personnel in the sustainability office and student membership is a key model outcome that the other networks are considering.

4.5 Project Aim 4

Establish the interpersonal, intra-institutional and inter-institutional bonds that enhance distributed leadership through meaningful and durable cross-disciplinary teaching collaborations.

Each network has created opportunity for the development of interpersonal relationships between colleagues in different disciplines with no or little prior opportunity for interaction. Each network has also created opportunity for existing relationships to be strengthened and redefined, as for example in the case of the UOW activator and a research colleague in the United States, who brought their students together in an interdisciplinary student learning exercise after the project created opportunity for them to share with each other their interest in teaching. Intra-institutional relationships have been established through many network initiatives, such as the role of the UNSW network in bringing together the Institute for Environmental Studies, UNSW TV and Climate Change Research Centre on campus in the task of preparing a series of educational videos entitled ‘Climate Change Simply Explained’.

Inter-institutional bonds were cultivated through the project team: the network of networks. The chief mechanisms for building these relationships were the critical friend partnerships established between the activator and integrator at each partner institution and one member of the UTAS project leadership team and face-to-face workshops of the project team in Hobart. Critical friend relationships were maintained by regular email, phone and Skype contact, as well as through the site visits of critical friends to their partner institution in 2010, and were an important part of the leadership development of the project. Critical friend relationships enabled the three UTAS leaders to pass on their learning from the pilot project and to contribute to evaluation of their critical friend networks. Equally, these relationships provided project team members at partner institutions with an opportunity to reflect upon their experience and to pass their learning back to the UTAS leaders and through them to the rest of the project team. Each UTAS representative got the chance to better understand one of the other institutions, clarify what that network was hoping to achieve and become an advocate for their success (Costa and Kallick 1993). The experience of visiting critical friend institutions and meeting network members was important in enabling the UTAS project leadership team to better understand the evolution of the UTAS pilot model as it moved into new contexts. It would have been difficult for the project leadership team to have had meaningful input into the networks at partner institutions without this level of knowledge.

Another important contributing factor to the interpersonal trust and reciprocity created through the project was the presence of two members of the project team at each institution, with the exception of 2011 at Murdoch. These pairs provided vital mutual support and feedback and enabled the modeling of peer collaboration to other network members. The critical friend partnerships, the pairing of activators and integrators, and peer relationships established within networks offered ‘just-in-time’ professional development conducive to development of distributed leadership (Garet et al. 2001; Pharo and de Salas 2009; Redding

and Camm 2009). The participants at Murdoch found themselves in a particularly difficult position with respect to their institution in 2010 because the school that housed the two key participants and some of the other network members was dismantled as part of a wider university restructure. The activator left the university at the end of 2010, leaving one person to fulfill two roles. The upheaval and uncertainty associated with these major disruptions created stress that was unique compared with the other institutions. This underlined the importance of having a pair of teachers at each institution for emotional, logistical and intellectual support.

As with all efforts to build collegial bonds based on trust and reciprocity, the previous experience, knowledge, skills, interests and personalities of individual participants were an important factor in shaping the project. At Murdoch, the community development background of both the activator and integrator were key in the way they perceived distributed leadership and consequently in the way that they established and ran their network. While context was an important factor, roundtable discussions of the project team support the conclusion that network outcomes would have been very different at each institution had different people taken up the activator role, in particular. Each activator's position within the university, their experience and their particular skill set strongly influenced the nature of the collaboration at each institution, as did their role in choosing the integrator.

4.6 Project Aim 5

Identify a sector-wide model for the proliferation of problem-based teaching networks.

This project has demonstrated the institutional flexibility of the LNCC model of developing leadership in interdisciplinary teaching through collaborative cross-disciplinary networks. As is discussed more fully in Section 5, this flexibility is evidence of the sector-wide applicability of the model. This flexibility is not limited to institutional arrangements, but extends to the problem-based focus. The outcomes of the project support the conclusion that a strong problem-based 'anchor' can contribute to successful and sustained collaboration by providing the group with shared language and purpose (Barab and Landa 1997; Dale and Newman 2005). While the topic of climate change was extremely effective in drawing together diverse and passionate teams of teaching around a shared purpose, it is far from being the only topic suited to this model. Any one of a number of complex, or wicked (Brown et al. 2010), problems that demand multiple analytical perspectives and multiple, context-dependent responses, is likely to promote effective interdisciplinary teaching collaboration. Finally, as described in the original application, the UTAS network has demonstrated the ability of the networks created through this model to self-seed new networks within their institution. This third stage of network development was only undertaken by the UTAS, in 2011, due to the fact that this network completed Stage 1 in 2008 and Stage 2 in 2010.

5. Outcomes: The Value of the LNCC Model

Emma Pharo, Aidan Davison, Kristin Warr and Anna Egan

5.1 Disseminating the LNCC model

Dissemination of the LNCC model has occurred throughout the course of the project. The project has a presence on the ALTC Exchange and was presented at the ALTC Leadership Project Leaders Meetings in February 2010 and February 2011. Other activities have included intra-institutional awareness-raising by all four networks as well as national and international activities undertaken by the UTAS project leaders and the project team.

5.1.1 Dissemination activities: LNCC project team

In implementing the UTAS pilot model at three other institutions, the LNCC project is in itself an exercise in national dissemination. The emphasis in the project on sharing learning between universities has convinced the project team of the wide relevance and applicability of the model, as well as the need for its local domestication. The main dissemination outcomes of the project team are this report, the LNCC Curriculum Resource, and scholarly presentations and publications. The first scholarly paper relating to the UTAS pilot model has been accepted by a leading international journal in higher education (Pharo et al. in press). The project team has begun drafting two further papers based on material in this report and relating to the project as a whole. It is expected that one of these papers will be completed at the December 2011 writing workshop of the project team in Hobart, with the second paper substantially advanced and a third begun at this gathering. These papers will address the literature on distributed leadership, interdisciplinary pedagogy, teaching collaboration and climate change teaching for an international audience.

5.1.2 Dissemination activities: LNCC leadership team

In addition to visiting partner institutions as part of the critical friend relationships described earlier, the UTAS project leaders have undertaken the following dissemination activities:

- presentation of a poster about the project at the February 2010 ALTC Leadership Project Leaders Meeting in Melbourne;
- ALTC Paper presented to the 2010 HERDSA conference in Melbourne: Warr, K., Davison, A., Pharo, E., Nursey-Bray, N., Jones, C. and Wapstra, E. 2010. *A climate of interdisciplinarity: a teaching collaboration for enhancing interdisciplinary student learning about climate change*;
- visit by Kristin Warr to Deakin University in June 2010;
- interviews conducted with US academics about interdisciplinarity by Kristin Warr, 18-20 May, 2010;
- paper presented at the interdisciplinary Understanding Sustainability Conference, Portland, USA.: Warr, K., Davison, A., Pharo, E., Nursey-Bray, N., Jones, C. and Wapstra, E. 2010. *Understanding Sustainability Through Interdisciplinary Practice: Developing Integrative Curricula Through Problem-based Learning*;
- Kristin Warr's participation in the American Association for Sustainability in Higher Education (AASHE): USA Workshop for teachers in Higher Education, 3-4 June, 2010 San Diego;
- Emma Pharo's collaborative activities at ANU while on study leave, January to June, 2011;
- presentation of a poster about the project at the February 2011 ALTC Leadership Project Leaders Meeting in Adelaide;

- roundtable presentation at the 2011 HERDSA conference, July, Gold Coast, Queensland: Coady, C. Davison, A., Matthews, K.E., Pharo, E. and Warr, K. 2011. *The interdisciplinary edge: transforming academic practice and enhancing student learning via interdisciplinary curricula*; and
- paper accepted by the highly ranked international journal *Teaching in Higher Education*. Pharo, E., Davison, A., Warr, K., Nursey-Bray, M., Beswick, K., Wapstra, E., Jones, C. (in press). 'Can teacher collaboration overcome barriers to interdisciplinary learning in a disciplinary university? A case study using climate change'.

5.1.3 Dissemination activities: Institutional networks

Each of the four networks has undertaken intra-institutional dissemination activities in order to embed and upscale their activities. A website has been created to share reflections on the process of Stage 1: Network Establishment and Stage 2: Network Consolidation. This website will also be used to disseminate climate change curriculum resources and other outputs that will be made publicly available. Newsletters have been produced and circulated amongst a broad sector of people at each participating university and to others within the sector who express interest. Students from each institution have been involved in public forums, either indirectly with project learning activities being represented in local media or through having creative work related to their learning exhibited in a public venue, or by directly speaking at public forums as.

In addition there are also some examples of inter-institutional dissemination, such as MU's contact with a University of Western Australia network and the collaboration between UOW and University of San Diego in the United States. All four networks have been proactive in documenting both planned and unplanned outcomes from their activities. There have been some exciting synergies with existing networks, such with the communication and television people at UNSW, that were not anticipated at the start of the project.

Below are some of the dissemination activities undertaken by each of the four networks.

5.1.3.1 University of Tasmania

The UTAS network has maintained a high-profile within the university since late 2008, when the findings of the pilot project were presented at the annual Teaching Matters Conference in Launceston. On the basis of this presentation the network activators and integrator were invited to make a similar presentation to the committee of Associate Deans (Learning and Teaching). Presentations were also given to the annual School of Geography and Environmental Studies Conference (2008) and as part of the Australian Maritime College seminar series on teaching and learning (2008).

The UTAS network has a good relationship with senior leadership in the university, as reflected in: an invitation to the project leadership team to present to University Council (2010); the enthusiastic support of the acting PVC (Students and Education); and support from the in-coming DVC (Students and Education).

Dissemination of project activities within the institution has been progressed through:

- a quarterly newsletter;
- an article in the on-campus magazine;
- a survey of climate change teaching circulated to all academic staff, resulting in around 50 staff indicating interest in being kept informed about the project;
- the establishment of an opportunity for informal networking for staff interested in climate change teaching; and
- discussions with relevant managers about opportunities to embed activities of the network in operational sustainability programs on campus.

The community and professional profile of the project has been enhanced through an invited presentation to a community forum on climate change in Tasmania and through student presentations to the public at the Hobart Sustainable Living Expo (see 4.3) regarding the role their particular professions can play in understanding climate change.

5.1.3.2 University of New South Wales

Dissemination of the project has been particularly effective at UNSW both because of the large size of the institution and its many existing affiliations, and also for the involvement of media and communication experts. UNSW TV has been involved in creating a series of public outputs, available through their web page or the specially created YouTube channel (http://www.youtube.com/user/climatechangeleaders). These resources were used by other institutions and have received extremely positive feedback. Students from UTAS commented on how much they enjoyed both the UNSW products and the fact that they had been produced by a group of mainland peers.

A range of publications have emerged from UNSW staff and students who remain committed to further output as a result of LNCC activities. There have been a series of public events including the proposal for a mock trial – pitched to the ABC as a possible television event - and various presentations both within and external to the university.

Senior staff at UNSW have been informed of and involved with LNCC activities. The wider UNSW community has been exposed to the project in many ways, including meetings, surveys, discussion papers, and through the actual teaching of climate change and its interdisciplinary aspects.

5.1.3.3 University of Wollongong

The LNCC project has been showcased at UOW's 'First Year Experience' workshop, and at the 2011 Federal Government's Climate Change Commission as part of teaching innovations. Both the UOW activator and integrator have been featured in university and local news, discussing the project and its outcomes. The model was extended to include a colleague and her class in the United States, which proved a useful comparison for cultural discussion. In addition, many local lecturers were exposed to the wider context of climate change teaching through contact with network members. This included a range of discussions and presentation opportunities, such as workshops and poster sessions.

5.1.3.4 Murdoch University

The network at Murdoch has engaged with students, staff and the wider community through diverse and varied media. They have been particularly active in promoting personal activism and utilising opportunities for public outreach. This has been accomplished through a series of workshops, challenges, exhibits and events. In the second year of the project, the Murdoch network ran a successful half-day event combining a teaching/research workshop with a public question-and-answer session. The workshop connected academics and postgraduates, teachers and researchers. The forum, jointly hosted by a university lecturer and the Mayor of Fremantle, was successful in reaching a wide target audience from both within and outside of the university context.

The Murdoch network has put in place processes that encourage the maintenance of connections formed during the project. At present members are planning to retain an online presence in the form of a blog during 2012. Their achievements are all the more admirable for having occurred against a backdrop of internal upheaval and structural change within the institution. The network's successful dissemination of the project is a demonstration of the resilience of both the participants and the robust LNCC model.

5.1.4 Impact

Evidence of project impact has come from those involved in the student-led activities and the enthusiastic reception of the project model by senior management and educational developers at several institutions. At UTAS, in addition to frequent contact and outstanding support from the Pro-Vice Chancellor (Teaching and learning) 2008, Pro-Vice Chancellor (Students and Education) 2009-2010 and the new Deputy Vice-Chancellor (Students and education) in 2011, the project was well received by University Council and the Centre for the Advancement of Learning and Teaching (CALT). CALT is interested in adopting our model in 2011 to help establish communities of practice at the university, with CALT staff acting in the role of network integrator. A focus group ran by the external evaluator with students involved in the UTAS interdisciplinary climate change subject resulted in high praise for the unit and the innovation and quality of the teaching involved. This was reflected in student nomination of the teaching team for a UTAS Teaching Merit Certificate. This certificate was subsequently awarded by the university.

Presentation of the project to the 2010 and 2011 ALTC Project Leaders Meetings resulted in connections with other universities interested in becoming part of such a network or learning from this one. As a result of these contacts, a senior colleague from RMIT observed the April Activators workshop and a member of the project leadership team was invited to visit colleagues at Deakin University engaged in a complementary collaborative teaching initiative. Project members at UTAS and UOW have had contact with academics in the U.S. as part of network activities and through conference presentations.

5.2 The LNCC Curriculum Resource

This project offers important insights into the challenges of developing quality higher education curriculum outside of disciplinary boundaries. The rise of interdisciplinary programs and whole-of-university initiatives has increased worldwide in the area of environmental education and, more recently, under the rubric of education for sustainability (McMillan and Dyball 2009). As the Sappora Sustainability Declaration of the 2008 G8 Universities Summit notes:

Sustainability is a broad area that embraces a complex diversity of interrelated factors ranging from the natural environment to socioeconomic systems…. Universities have a critical role to play in educating future generations, disseminating information about sustainability, and particularly by training leaders with the skills to solve regional and local problems from a global and interdisciplinary perspective.

However, recognition of the need to support holistic and integrative student learning in the name of sustainability has been accompanied by concern regarding the learning outcomes and graduate attributes associated with interdisciplinary programs. There is a common perception that curriculum in these programs is often poorly designed and coordinated and thus that they lack rigour (Vincent and Focht, 2010; Sherren 2008). As Sherren observes, “sustainability attempts to balance concepts of social justice, environmental citizenship, cultural diversity and economic viability with a scientifically informed view of the natural world.” In the context of the disciplinary academy, education for sustainability can therefore appear to be “about nothing and everything all at once” and “at odds with the idea of core knowledge” (2008: 6). Ensuring graduates emerge with substantive skill, knowledge, confidence and abilities from an interdisciplinary university experience therefore requires that interdisciplinary learning and teaching be founded on explicit pedagogical discipline. Providing curriculum that allows students to have a ‘disciplined’ mind outside of a discipline is essential if new ideas and ways of thinking, especially regarding ‘wicked’ problems such as climate change, are to emerge.

One outcome of this project is a collection of online curriculum resources which aim to provide insight into interdisciplinary pedagogy on climate change that is more than simply an extension of disciplinary approaches (available at www.lnccexchange.org). Rather than focusing on curriculum content related to climate change, of which considerable volumes already exist, the LNCC curriculum resource is concerned with the experience of interdisciplinary learning from both a student and a teacher perspective. A challenge for the successful design of interdisciplinary curricula, aside from institutional structural barriers, is the challenge it poses for teachers. Most teaching academics do not have a background in pedagogical theory (Sterling and Scott 2008), despite the fact that creative, reflective and pedagogically aware teaching is essential to providing an interdisciplinary curriculum that is rigorous and that results in measurable graduate attributes.

Studies have found that interdisciplinary student learning in the areas of sustainability or environmental studies are most successful when the curriculum and teaching methods result in graduates with highly developed critical thinking, problem solving, communication, planning and management skills (Thomas et al, 2007; Vincent and Focht, 2010). The curriculum resources resulting from this project are examples of how different teachers worked to provide students with opportunities to develop these skills. This offers valuable insight into the challenges of creating and delivering successful interdisciplinary curriculum. Teaching practices included in the resource include surveys, poster sessions, mock trials, discussion groups, and special events such as Q and A discussion, along the lines of the successful ABC Q&A show. For example, students from a second year indigenous studies unit and a third year accounting unit collaborated around the production of posters that addressed sea level rise impacts on vulnerable coastal communities. The students met to design the poster and both staff and students participated in the poster session. In this way, students developed a range of skills involving research, communication, and thinking about different perspectives.

Key to the examples housed in the project's curriculum resource collection are discussions of the process involved in delivering such interdisciplinary skills. This includes describing the processes surrounding the conception of a subject, collaboration with colleagues from other disciplines to deliver it, the design of different delivery methods and most importantly reflections on the results of these processes and methods in the classroom. This focus on the *experience* of teaching (conception, collaboration, implementation and reflection), rather than just offering teaching material or content, aims to share the details of what it means at a classroom level to teach beyond the bounds of a particular discipline. Such descriptions of teaching practice assist to fill a void noted to exist in research on interdisciplinarity in higher education; that it tends to be "largely silent on the matter of what the particular characteristics of such classroom interactions might be" (Woods, 2007). Descriptions of this detail also highlight various ways in which students can be offered the opportunity to develop the more abstract - but no less vital skills, so highly valued in graduates of successfully designed interdisciplinary programs. A commitment to 'student-led activities' and to 'team or group work', is illustrated and prioritises these as methods for ensuring quality graduate attributes.

Our project links closely with other ALTC projects and in particular with others in the leadership program. We drew heavily on 'The Green Report*:* The Development of Leadership Capacity in Higher Education' in the design of our project and consulted the lead author at regular intervals during the project (Lefoe et al. 2008). We used lessons from the Higgins' report about the ways in which communities of practice can function to widen the net of leaders and foster leadership abilities (Higgins 2008). We communicated by phone, email and in person with these and other ALTC funded researchers to share ideas, advice and resources. Lefoe was a member of our reference group and commented on interim reports and newsletters, as well as helping her local network at UOW.

5.3 Lessons for the Higher Education Sector

The LNCC model demonstrates the capacity for development of distributed leadership through communities of practice based on teaching collaboration. Through this approach, we have responded to two systemic challenges faced by the higher education sector in Australia. First, we responded to the need for universities to translate long-standing recognition of the value of interdisciplinary teaching into institutional practice. In this way, the project contributes to the capacity of universities to lead professional, public and policy responses to the wide range of social and environmental problems that are interdisciplinary in nature, such as climate change. Second, we responded to the need for universities to develop more supple institutional structures capable of adapting to an increasingly dynamic context created by changing student cohorts and expectations, diversified and mutable career structures, higher education policy reform and new international opportunities and challenges. The model complements existing forms of concentrated, top-down leadership with forms of distributed, collaborative leadership that support participatory governance within tertiary institutions.

The successful implementation of the LNCC project at four diverse institutions demonstrates the sector-wide applicability of the model. This relevance stems from the flexibility, pragmatism and problem-based focus evident in Parts 3 and 4. Each of these three attributes is discussed here in turn.

The flexibility of the LNCC model, which enables it to be shaped to very different institutional contexts, results from the distributed leadership methodology described in Part 2. While all networks shared generic features, each was autonomous in deciding how best to promote interdisciplinary climate change teaching in their institution. This autonomy extended to the way in which the activator and integrator went about establishing networks, as well as to the ability of subsequent network members to influence the goals, processes and tasks undertaken by the network. Emphasis on voluntary participation, informal relationship building and consensus decision-making within networks provided ample opportunity for all network members to show initiative and take responsibility for network outcomes, in keeping with the literature on communities of practice (Cox 2001; Sherer et al 2003). Leadership was shared or distributed between members of the group, depending on the nature of the specific task being undertaken, the competencies of members of the group and the constraints and opportunities encountered by members at any given time. In some circumstances, leadership was exhibited by individuals. In others, sub-groups of network members or the whole network itself acted collaboratively to engage, inspire and influence students, other teachers, senior managers and the public. In addition, emphasis on collaboration and peer-mentoring within the project team allowed the four networks opportunities to lead each other through acts of shared learning, inspiration and initiative.

The second characteristic of the LNCC model that makes it widely applicable across the sector is its pragmatic approach to structural impediments to interdisciplinary teaching. This pragmatism is evident in the way in which the model enables the identification of opportunities and efficiencies for teaching leadership within existing administrative units, curricula, degree programs, and staff workloads. This approach does not seek to create new administrative structures, such as small interdisciplinary teaching units that effectively add a further internally isolated silo to those created through disciplinary divisions. Rather the model seeks to strengthen and create teaching collaboration across these divisions, in effect creating collegial relationships that enable institutional culture change within existing institutional structures (Roxa et al. 2011). The LNCC model thus recognises the vital role disciplines can play in embedding interdisciplinary learning as a core generic competency that will enhance the professional lives of all graduates, and, arguably, that will enhance the quality of public discussion, citizenship and democratic governance more generally. A key barrier to the implementation of interdisciplinary curricula in Australian universities has been an unfortunate perception that disciplinary and interdisciplinary approaches are clearly distinct and, in some cases, antithetical. The LNCC model, in contrast, is built on understanding that disciplinary and interdisciplinary approaches exist within a continuum of

pedagogical approaches, that also includes multidisciplinary and transdisciplinary approaches (Davies and Devlin, 2007). In addition to being often overlapping, the LNCC model takes advantage of the fact that disciplinary teaching and interdisciplinary teaching can be complementary. While some LNCC network members were not trained in any one discipline—for example, within the field of environmental studies—and taught within interdisciplinary programs, the majority identified with conventional disciplines and sought to integrate interdisciplinary learning within predominantly disciplinary teaching programs.

The third characteristic of the LNCC model that makes it widely relevant across the sector is that it applies a problem-based pedagogy to the facilitation of both student learning and teacher collaboration. As discussed in Part 4, this pedagogy is applicable to a wide variety of problems of such complexity and social significance that each is also likely to be addressed by most if not all higher education institutions, as is the case for climate change. Thus, the specific climate change teaching outcomes of the LNCC project, which are reported through the online LNCC Curriculum Resource, are likely to be relevant to teachers throughout the sector. Rather than concentrating on curriculum content, we focused the resource on teacher innovation and teacher experience in using a problem-based pedagogy to promote interdisciplinary student learning that is relevant to real-world contexts. As the external evaluator notes in her report (see Appendix), this innovative approach to disseminating outcomes of the project recognises that while there is a wealth of available curriculum content on climate change, there are relatively few pedagogical resources explicitly directed to the process of promoting interdisciplinary student learning on this topic. The problem-based pedagogy of the LNCC model does not just apply to student learning, however. It applies also to the ability of the model to facilitate institutional learning and academic development of teachers. The problem-based design of the network provides an independent logic for the recruitment of network members and a source of on-going motivation and group cohesion as it attracts participants who seek to integrate their aspirations to develop their teaching practice and their institutional leadership capacity with a real-world problem in which they have substantive interest.

As reported in Part 4, the principal problem faced by networks was the time-poverty of teaching academics, with the related issue of the relatively low status given to teaching in general, and to professional development related to teaching in particular, being also significant for some networks. The barrier of time-poverty was partly addressed through the role of network integrator. A clear finding from the project is that the continuation of networks beyond the life of this project rests upon the continuation of this role. The UOW and UNSW networks have indicated they will seek funding to continue to employ the integrator. At UTAS this is likely to be achieved through staff in the Centre for the Advancement of Learning and Teaching taking up this role as part of an institution-wide initiative to resource communities of practice. At MU the intention was to create a network that was not dependent on the integrator and there are no plans to continue to this role in 2012. The effect this may have on the network is difficult to predict, although network members are talking about activities for implementation in 2012.

The issue of the relatively low status accorded to teaching in Australian higher education institutions was addressed in several ways, of which two are especially noteworthy. First, the model involves self-nomination of staff who were already interested in developing their teaching practice and/or who were concerned about the issue of climate change and who saw a need for improved teaching on this topic. This ensured that there was considerable intrinsic motivation within the group to advance teaching practice. Second, the group was able to raise the profile of the teaching innovation of the network through the status of being part of a national ALTC project, through the promotional efforts of the integrator and through encompassing staff from a wide diversity of schools and departments who were able to promote the work of the group to their colleagues and to highlight the relevance of network activities to a wide variety of disciplines.

The strong outcomes of the teaching networks in this project recommend this model to other institutions interested in low-cost and easy-to-implement methods of capacity building for interdisciplinary teaching within existing structures. This model also fits well with complimentary efforts to build communities of practice in other areas of university endeavour, such as research, administration, and community engagement. It is important to recognise that while the role of the LNCC integrator encompasses conventional understandings of group facilitation it extends well beyond this to include a substantive role in pedagogical practice through helping network members to develop common language and common purpose in teaching collaboratively across disciplinary languages, sub-cultures and classroom habits. As the project's external evaluator observes (see Appendix), the role of the integrator is itself a major outcome of the project that deserves wide dissemination and that is a valuable exemplar of a new and emerging role for is traditions for academic developers more generally (Carew et al. 2008).

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External Evaluation Report by Professor Gail Hart

October 2011

My role as evaluator

The pilot for the ALTC funded project was developed and funded by the University of Tasmania (UTAS) while I was employed as the Pro Vice Chancellor (Teaching and Learning). After I resigned from the University I was invited to contribute to the proposed ALTC project by providing an evaluation of the process and outcomes of the project. I had the opportunity to comment on the draft application to ALTC and I have participated in regular workshops, teleconferences and meetings with the project team at UTAS, the wider project members from the partner Universities of New South Wales (UNSW), Wollongong (UOW) and Murdoch (MU) and the project advisory group. In this sense the evaluative process has been one of continuous feedback, iteration and reflection rather than an objective, formal evaluation limited to a point in time. I have viewed my role as a critical friend - offering a 'sounding board' and independent view on issues that arose over the two years of the project implementation. It was my role to listen, ask provocative questions, offer critique and act as an advocate for the success of the project (Costa and Kallick, 1993). Gordon (2006) notes the potential of the critical friend concept to reduce or even remove blind spots, when project participants become immersed in the detailed implementation. For me, this included reframing some of the challenges and highlighting the project achievements.

The scope of the project.

The project is complex and multi-layered dealing with a range of scholarly issues including:

- climate change;
- distributive leadership
- interdisciplinary collaboration in teaching;
- team teaching;
- communities of teaching practice;
- student led learning activities;
- transferable curriculum resources;
- cross institutional collaboration; and
- organisational change

Over the implementation period the project team has survived many personal challenges and disruptions (changing academic roles, resignation, study leave, marriage, maternity leave and birth) as well as organisational change (new senior executive team, dissolution of school structure and budget cuts). Apart from the commitment and tenacity of the team members, the structure of the project - particularly the division of labour in the two roles of activator and integrator - has served the project well. In addition, cross-institutional collaboration has been sustained by the informal mentoring role between the UTAS project leaders and the project team at the partner universities. These factors may be some of the most important and transferable aspects of the project and will be addressed in greater detail within this report.

Project aims

The case studies provide a succinct snapshot of the implementation of the project at four different institutions. They are evidence that ***project aim one*** (extend the strategic approach piloted at UTAS to developing distributed leadership) was achieved. Spillane (2005) conceives of distributed leadership as a system

comprised of the interactions of leaders, followers and situation which can only be understood together, as more than the sum of component parts. The case studies highlight the importance of adapting implementation to the culture of the institution and the role and sphere of influence of the project leaders. For example, Paul Brown, the activator at UNSW, has found that his role as Head of School has facilitated his communication with senior university staff in regard to the project and in attracting both academics and post graduate students to participate in the project network. Roxa et al (2011, p.102) agree that the mandate associated with such a formal role may "empower an individual to become a hub" for positive interest and investment in teaching innovations.

There are numerous examples of teaching innovation and collaboration across the four institutions. Students value the relevance of study in the area of climate change and teaching staff are convinced of its value in the curriculum. A wide diversity of academic staff have contributed to the project at each of the institutions. Apart from a commitment to climate change, a shared passion for innovative teaching has attracted and maintained members in the network. The professional expectations and leadership ambitions of the participants have differed and there is a variety of creative ways in which they have been achieved. The case studies outline the achievement of ***project aim two*** (builds the capacity of junior and middle-level academics to show leadership in their everyday teaching responsibilities). For example, Helen McGregor, activator at UOW and a newly appointed middle level academic, initiated an international collaboration between UOW and the University of San Diego to survey student attitudes and perceptions of climate change.

The curriculum resource focuses on the experience of teaching practice. It is not a collection of teaching objects - it includes real stories of academics testing innovative teaching and learning strategies to address current and real world problems. It is intended to be inspirational rather than an instructive 'recipe' for good teaching and learning. These stories document the opportunities for academics to develop leadership skills in course and unit coordination and curriculum design and innovation (***project aim three***). At UTAS the experience of team teaching about climate changes has modeled a different approach to teaching practice that has incorporated opportunities for learning and reflection on practice. The teaching team created an interdisciplinary unit that is now open to all later year students without a pre-requisite. A focus group evaluation confirmed that students enrolled in the unit with high expectations. They hoped it would integrate their personal experience and help them formulate career options. They wanted opportunities to apply and verify their learning. They were not concerned that the content might be overwhelming or depressing; they just wanted it to be 'real'. Overall, they thought the unit was the "most enjoyable ever" and all three lecturers were good teachers. The format of the unit facilitated a 'student voice' with all three staff willing to listen to feedback and showing respect for student views.

The achievements of the problem based networks were showcased (***project aim four)*** in a range of innovative ways. At UNSW a series of simple educational videos about climate change were developed. At UTAS a 'problem relay' approach was used around the issue of climate change refugees. The outcomes from one class activity led to the development of a further activity in another class in a different discipline. At UOW a well publicised mock trial on the subject of climate change generated media attention for the network. And finally, at MU a half day event entitled 'Climate Talk' was designed to engage students, staff and the wider community in conversations about climate change. Details of all of these 'outcomes' are evident within the final project report, the case studies and the curriculum resource.

A model for the future

The two final aims of the project: to establish new interdisciplinary links (***project aim five***) and identify a sector-wide model (***project aim six***) will be addressed in greater detail through a discussion of distributed leadership and the role of academic staff development.

The pilot project at UTAS, which began with a shared passion for climate change and novel learning experiences, soon became weighed down in the unfamiliar language of grant applications. At the same time the grant application created a way of communicating a process and a means of documenting, and potentially sustaining, a novel approach to teaching. At the introductory workshop the UTAS team was a little further along the 'path' and able to provide a sense of direction and confidence to the other network members while taking care not to be prescriptive or limit a creative response to a different context. In this sense they attempted to model distributed leadership within and across the project team. A significant contribution to the success of the workshop was the creative activities designed to explore distributed leadership and the role of activator. These activities created a safe place for participants to take risks and share some aspects of their work and personal lives. This was expressed through drawings, pantomimes and poetry. Everyone was able to share experience that demonstrated an understanding of distributed leadership (preparing a Thanksgiving dinner or playing a game of netball). The advantage of such an inclusive model (distributed leadership) for dealing with complex and 'messy' problems such as climate change was agreed. Despite this, they readily acknowledged that such an approach ran counter to the disciplinary silos and administrative fragmentation that characterized most universities.

The team members and the institutional contexts in which they worked represented considerable diversity. They came with different disciplinary backgrounds and held different loyalties. They were at different stages in their careers and they had differing commitments to research. The team workshops created a legitimacy and relevance for each member of the network. This in turn fostered a network dialogue that was at once challenging and affirming, expanding individual perspectives but also developing trust between members. The process by which the project team formed and communicated modeled a means of developing interdisciplinary networks within the partner institutions (***project aim 5***).

Within the individual institutions the work of creating, facilitating and sustaining the interdisciplinary workshops was divided into two roles: activator and integrator. While the role of activator might roughly equate to the inspirational role of project leader; the role of integrator was more novel. It was at concerned with coordination and administration but also provided a friendly and welcoming 'face' to the project. It was the only position that was paid for from the project funds. It was both facilitative and sustaining in regard to the networks. It was enacted in diverse ways in each of the institutions according to the experience and expertise of the incumbent integrator. Nevertheless, it was viewed by most of the project team members as the key energising factor in the success of the interdisciplinary networks. Some described the role as the 'glue' that sustained the momentum of the project and fostered commitment. While it might be tempting to compare it to a research assistant role, it was much more 'outward looking' and people focused. It was strategic in terms contacting identified academics, assessing their interest and capabilities and tailoring their network involvement to a manageable commitment. It is this role that holds the most promise for a sector-wide model ***(project aim 6***).

The role of integrator suggests an undervalued and under-utilised role for academic staff developers. Academic development staff have often joined a central unit with an identified expertise in an aspect of teaching and learning: for example - assessment, the development of generic capabilities or online learning. Once within

the academic development unit, without the opportunity for direct involvement in teaching and learning, their area of expertise becomes less relevant to the practice challenges of teaching academics. Rather than seek to help as an 'expert' in a specialised area of teaching practice, academic developers can promote themselves as expert facilitators of communities of practice or networks of academics united through a shared passion for a complex issue or an challenging aspect of learning and teaching. The identification, matching and linking of academics who may never meet given the confines of discipline and constraints of workload is an important catalyst for teaching innovation. The value of 'weak links' - connections between individuals who may not have strong, shared discipline backgrounds and expertise - has been recognised as a key factor in innovation and change (Roxa et al, 2011). The role of integrator/catalyst/facilitator is a novel but not entirely new opportunity for academic developers. Carew et al (2008) acknowledge the potential conflict faced by academic developers in addressing both the goals of university management (reporting, achievement of strategic goals) and the immediate and functional concerns of discipline-based academic teachers. They describe the concept of 'elastic practice' as the "tailoring of specific instances of Academic Development activity (approaches) from the wide array of possible actions (practice) in response to context" (p.65). Academic developers, rather than relying on personal expertise for academic credibility, promote the diverse expertise of colleagues and support a network that has the potential to achieve and extend the level of change and innovation envisioned by university management.

Summary

In summary, the project was innovative, successful and held the exciting promise of a future model of interdisciplinary collaboration and innovative learning and teaching. There was a deep integrity to the project. The pilot project had tested the methodology within one institution. The project was managed with the same principles of distributed leadership that it was attempting to promote. The project team generously accepted the continuous monitoring and critique of a critical friend.

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