Getting it together. Interdisciplinarity and Sustainability in the Higher Education Institution
Joanna Blake, Stephen Sterling and Fumiyo Kagawa

PedRIO paper 4
http://hdl.handle.net/10293/1124
www plymouth ac uk research pedrio
EXECUTIVE SUMMARY

Purpose

This paper seeks to clarify the relationship between sustainability and interdisciplinarity as a contribution to furthering policy and practice towards sustainability oriented interdisciplinarity in teaching and learning in higher education.

Background

The paper is one in a series of Occasional Papers produced by the Centre for Sustainable Futures at the University of Plymouth which examine aspects of the transition towards ‘the sustainable university’. This paper is the result of a research exercise undertaken between late 2008 and spring 2009.

Key Findings:

- There appears to be rising demand for interdisciplinary understanding in relation to sustainability issues characterised by complexity and uncertainty, and this is likely to exert pressures on traditional disciplinary modes of organisation in higher education.

- There is a difference between the level of interest in interdisciplinarity and sustainability at the level of discourse and rhetoric, and manifestations in practice as regards policy and programmes.

- There is a gap between the level of interest in interdisciplinarity and sustainability in research, and their manifestation in teaching and learning.

- Programmes which are promoting an interdisciplinary approach to sustainability are often recognised as innovative by their host institution, yet common problems persist around the uneasy fit between their cross-boundary integrative approaches and participatory pedagogies on the one hand, and discipline based university structures and methods on the other.

- Innovation in this area often requires one or more people with energy and enterprise to make it happen, but the survival and flourishing of interdisciplinary programmes requires support from senior management.

- Sustainability theorists and practitioners widely recognise the importance of interdisciplinary approaches to understanding sustainability issues. However, theorists and practitioners interested in interdisciplinarity are not necessarily interested in sustainability.
• The outlook for interdisciplinary programmes is made more positive by rising interest and growing initiatives in HEIs in response to the sustainability agenda: however change in teaching and learning policies and practice in terms of embracing interdisciplinary approaches is slow to take effect.

• One way forward for interdisciplinary sustainability programmes is to link more overtly to the skills debate and employers’ calls for graduates to possess ‘real world’ and ‘soft’ skills of flexibility, adaptability, creativity etc.

• Achieving transdisciplinarity in sustainability programmes in mainstream institutions is particularly difficult, and may be largely the province of educational establishments outside the mainstream who can work across boundaries more easily.
# TABLE OF CONTENTS

1.0 Introduction .................................................................................................................. 1

2.0 Methodology ................................................................................................................ 1

3.0 Commentary and literature review .............................................................................. 3

4.0 Case studies .................................................................................................................. 18
   4.1 Case study 1 - University of Strathclyde ................................................................. 18
   4.2 Case study 2 - Royal Melbourne Institute of Technology (RMIT) ......................... 23
   4.3 Case study 3 - Centre for Human Ecology (University of Strathclyde) ................. 27
   4.4 Case study 4 - St. Andrews University ..................................................................... 33
   4.5 Case study 5 - University of the Western Cape ...................................................... 38

5.0 Interdisciplinarity at Plymouth .................................................................................... 43

6.0 Analysis ....................................................................................................................... 47

7.0 Recommendations – General .................................................................................... 50

8.0 Recommendations – University of Plymouth ............................................................ 50

References ....................................................................................................................... 52

Acknowledgments & About the authors ......................................................................... 57

Appendices
   Appendix 1 - Questionnaire sent to JISK Lists ............................................................. 58
   Appendix 2 - Data from initial questionnaire responses ............................................... 59
   Appendix 3 - SSI Questions for key developers .............................................................. 61
   Appendix 4 - Questionnaire completed by senior personnel ........................................ 64
   Appendix 5 - Questionnaire completed by Plymouth Personnel ................................. 66
   Appendix 6 - CSF Common Module Document .............................................................. 67
   Appendix 7 - Detailed findings ....................................................................................... 70
1.0 Introduction

Ultimately, interdisciplinarity raises the most fundamental question of all. What is the purpose of education? In its highest form, interdisciplinarity is not a finite set of skills, a simple add-on, or an adjustment in the schedule. The ultimate goal is to reconstruct what is taught and how it is taught (Klein 2006, 16).

This research paper is one in a series of Occasional Papers developed by the Centre for Sustainable Futures (CSF) which examine aspects of the transition towards ‘the sustainable university’. This paper seeks to clarify the relationship between sustainability and interdisciplinarity as a contribution to furthering policy and practice towards sustainability oriented interdisciplinarity in teaching and learning in higher education. It does not cover interdisciplinary research: while such research may often encourage interdisciplinary teaching, it opens up areas beyond the scope of this paper.

After a literature review, five case studies are presented, representing different manifestations of and approaches to interdisciplinarity. This is followed by a review of practice at the University of Plymouth, and recommendations are made for the sector, and for University of Plymouth in particular.

2.0 Methodology

A literature review was undertaken to map the background to sustainability-focused interdisciplinary initiatives in higher education institutions in the UK and English-speaking world, as well as explore thinking about the nature of interdisciplinarity. As detailed in Section 3.0 below, interdisciplinarity in higher education is a diffuse and multi-interpreted approach to teaching and learning. Therefore, providing a comprehensive overview of the literature was not a straightforward endeavour. An academic literature search was undertaken and was followed by the collection and analysis of the selected literature. Four related aspects of interdisciplinarity were kept in mind in the selection of literature - philosophical, definitional, motivational, and operational – and as regards to the epistemological, normative, ontological, and methodological dimensions of the relationship between sustainability and interdisciplinarity.

The academic literature search involved exploring the major library databases in the field (British Education Index, Australian Education Index, ERIC and Web of Knowledge) and using Google Scholar by combining keywords: ‘sustainability’, ‘interdisciplinarity’ and ‘interdisciplinary’, and ‘higher education’. There were no results from a search of the combination of keywords from the British Education Index,
Australian Education Index or ERIC. Web of Knowledge produced 11 results from the combination of keywords. However, Google Scholar located 15,600 entries in which the four terms were combined. As anticipated, searching for the keyword ‘interdisciplinary’ alone, within the databases, proved more fruitful. The British Education Index, Australian Education Index, and ERIC yielded many more results (3,133 in total) than a search that combined the terms ‘interdisciplinarity’ with ‘sustainability’.

The second stage of data collection involved a search of UK and English-speaking universities to identify those embracing both an interdisciplinarity and sustainability agenda. To do this, an overview of the research aims and objectives accompanied by an invitation to participate in the research was distributed via Education for Sustainability networks: the Environmental Association for Universities and Colleges (EAUC) JISC List and the Higher Education Academy Education for Sustainable Development (HEA ESD) Project JISC lists. Forty people responded to the call for interest and were sent a short questionnaire designed to capture key details about the sustainability-focused, interdisciplinary initiative (see Appendix 1). Thirteen people responded to the questionnaire from which initiatives were selected for further, in-depth research employing a case study method (see Appendix 2). The methodology employed to select five case studies to pursue in-depth from the thirteen returned initial questionnaires adhered to the following criteria:

1. Inclusion of two international cases
2. Diversity with respect to level of initiative under discussion: postgraduate, undergraduate, module, whole-programme etc.
3. Diversity with respect to the disciplines encompassed by the initiative (where initiative does not potentially encompass all subjects)
4. The initiative had been running for a minimum of 3 years
5. Inclusion of one case ‘from the margins’ i.e. slightly apart from mainstream higher education institution (HEI) culture

The last criterion relates to alternative, civil society colleges that are small-scale, unique, non-statutory, and imbued with an explicit ethos. Colleges with an explicit sustainability and environmental ethos include the Centre for Human Ecology, (CHE) (see Case 3 below), Schumacher College, the Centre for Alternative Technology, Emerson College and Hawkwood College in the UK; the Centre for Ecoliteracy, ESALEN College and Hollyhock College in North America. The research in hand was keen to learn whether or not a college that espoused an explicit sustainability ethos, and adopted a non-mainstream approach to education might work more readily and successfully with innovative approaches to interdisciplinary. If this were the case, the research was interested in whether there were any lessons that mainstream HEIs might benefit from.
As regards the case studies, key developers from the five selected initiatives were invited to participate in the research in the form of a semi-structured interview. During the interview, they were requested to nominate a senior member of the institution who might be able to provide an overview of the initiative, possibly alongside other interdisciplinary initiatives taking place at the institution. Three senior individuals from the five institutions elected to participate in the research. At the same time, research was also conducted into interdisciplinarity at the University of Plymouth. Sixteen senior personnel from the University of Plymouth were contacted and invited to participate in the research.

Three separate sets of questions were designed for the key developers (see Appendix 3), senior personnel members (see Appendix 4) and Plymouth personnel (see Appendix 5). Furthermore, where available, literature relating to the initiatives was gathered and included policies, handbooks, course guides, journal articles and information from the institution’s website. The data from each institution were then systematically analysed. Participants were asked whether they would prefer to be anonymised. All opted to be named. A staff development session at the University of Plymouth entitled ‘Interdisciplinarity and Sustainability at the University of Plymouth’ was held on 2 February 2009 and notes from the session, in particular issues raised relating to interdisciplinary initiatives at Plymouth, were used to further inform the subsequent research.

The research intention was to interview senior individuals responsible for overseeing pedagogic developments at each of the case study institutions, in order to compare and contrast the data with that gained from the initiative’s key developer. However, our research discovered that one person in such a role, in most instances, did not exist - which is perhaps significant in itself. Therefore, the voice of the key developers is not triangulated with that of students or other key stakeholders, supportive or otherwise of the interdisciplinary initiative under review, and this might be considered a limitation of the research.

N.B. It should be noted that the ‘Reflections’ subsection at the end of each case study, reflects the views of the authors, and not necessarily those of the key developers from the subject institutions.

3.0 Commentary and literature review

Over half a century ago, an editorial in an academic journal suggested that a specialist ended up ‘knowing more and more about less and less’ (Editorial, 1949). By contrast, and in the context of a now highly interconnected and uncertain world, the notion of
interdisciplinarity suggests the possibility of learning 'more about more' than such specialisation allows. A growing shared concern about the multiple and multifaceted economic, social and ecological issues facing society is giving rise to a debate about the purposes and appropriate responses of higher education (HE). In the UK, the Department for Innovation, Universities and Skills (DIUS) has endorsed sustainable development as a necessary part of HE, both through its Sustainable Development Action Plan, and its programme for implementing the Leitch review of skills stating:

Sustainable development – meeting the needs of present without compromising the ability of future generations to meet their own needs – is a defining challenge of the twenty-first century……it is imperative that everyone in this country develops the skills of sustainable living and working. That means placing sustainable development at the heart of skills provision, ensuring that it is a fundamental goal of our economic and social progress. (DIUS 2007, 4)

Against the background of pressing sustainability issues, there is evidence of increasing interest in more integrative understanding and holistic management of problems in policy making, echoed by more interest in interdisciplinary research, teaching and learning in universities. Yet as Schmidt argues (2008), interdisciplinarity seems to be ‘everywhere and nowhere’ (54): it is ‘in vogue in science, society and economy’, but the term ‘is quite misty, foggy and shadowy’ (56). Similarly, Klein (one of the leading theorists in the field) says ‘interdisciplinarity is a concept of wide appeal (but) is also one of wide confusion’ (1990, 11). Reviewing the literature, it is clear that the notion and practice of interdisciplinarity has a number of interrelated dimensions. These can be summarised as philosophical, definitional, motivational, and operational, and these aspects are reviewed below.

**Linking sustainable development and interdisciplinarity**

A key objective of the paper is to explore the relationship between interdisciplinarity and sustainability. Whilst this is complex enough, the issue is made further complicated by looking at the implications of this relationship for education, presenting something that might be termed ‘interdisciplinary education for sustainability’. As sustainability issues rise further on the national and international agendas - reflected in media reports almost every day - the links between (say) energy consumption, climate change, loss of biodiversity, and poverty become more evident and the need for multifaceted perspectives and integrative approaches to issues become more accepted – reflected in the common parlance (if not the practice) of 'joined up thinking' and 'joined up policy'.
Yet typically, educational structures and practices are widely characterised by disciplinary compartmentalisation (Godemann 2008).

Leaving aside detailed arguments regarding the nature of sustainability, we can say that it represents a condition, or set of conditions, whereby human and natural systems can continue indefinitely in a state of mutual wellbeing, security and survival. In other words, it has primarily ontological and normative dimensions. Interdisciplinarity on the other hand, is an approach to knowledge and inquiry, and has both epistemological and methodological qualities. In sum, sustainability presents an overarching and complex socio-economic-ecological context wherein interdisciplinarity - as a putative holistic mode of understanding, organisation of knowledge and inquiry - seems appropriate. The relationship might thus been seen as follows (*Fig 1*):

*Fig 1 Suggested relationship between interdisciplinarity and sustainability*

The logic of interdisciplinary approaches to sustainability issues derives from a broad consensus that such issues cannot be sufficiently understood in isolation. This was...
perhaps most notably reflected in the Brundtland Report of 1987 which launched the notion of ‘sustainable development’ onto the international stage. Hence, it stated:

Until recently, the planet was a large world in which human activities and their effects were neatly compartmentalised within nations, within sectors (energy, agriculture, trade), and within broad areas of concern (environmental, social). These compartments have begun to dissolve. This applies in particular to the various global “crises” that have seized public concern...These are not separate crises: an environmental crisis, a development crisis, an energy crisis. They are all one (WCED 1987, 4).

On the next page we read that ‘ecology and economy are becoming ever more interwoven - locally, regionally, nationally, and globally - into a seamless net of causes and effects’ (WCED 1987, 5). Particularly since the Brundtland Report, the interrelationship between issues thematically, spatially and temporally - has gained increasing attention. For example, Clayton and Radcliffe (1996,11) state that ‘environmental questions are inextricably interlinked with social, economic and cultural values’, while Gunderson and Holling (2002, 21) state that ‘the expanding influence of human activity intensifies coupling between people and systems of nature so that neither can be understood in isolation’. The key issue then is the adequacy of the match between the real world and the ways through which it is understood. The catch here, perhaps, is that while human and natural systems can be and are studied in isolation, from a sustainability point of view, setting conceptual boundaries around such systems reduces or impedes what might be termed a more holistic understanding and perspective. Significantly then, sustainability challenges the tradition of reductionist epistemology which is reflected in the disciplinary basis of many higher education structures, policies and practices. As Schmidt suggests (2008, 58):

Disciplinary reduction is undercomplex and hence cannot cope with real-world problems because such problems are too new, complex, wicked, hybrid, or too risky (for instance environmental/global change problems).

Similarly, Becker, Jahn, Stiess and Wehling (1997, 37) suggest that ‘the different (social, economic, political, cultural etc) dimensions of sustainability (and their relationship to the environment), sets up the task of overcoming the limitations imposed by the fragmentation and segmentation of social scientific knowledge’. Dale and Newman (2005, 352) echo a body of literature in stating that ‘human societies and ecological systems are so interconnected that they are co-adaptive, reacting to each other and to previous interactions and reactions in a network of feedbacks’ and therefore approaches to sustainable development education, ‘must be complex, transdisciplinary and broad’.
Against this background, there have been calls for more interdisciplinarity in higher education. A recent report from the New Economics Foundation argues that the problems we face at local and global scales require HE to equip its learners ‘with the knowledge, skills and understanding to pioneer innovative and creative responses to achieving wider economic, social and environmental well-being’ (Steuer and Marks 2008, 12). Internationally, the G8 University Summit held in Japan in 2008 issued a Sapporo Sustainability Summit Declaration which states:

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. (G8 University Summit, 2008)

In the USA, there is a strong tradition of interdisciplinarity evidenced by the liberal arts movement. Much of the recent research and scholarship around the topic is therefore US based. In the UK, the position is less positive with evidence of a gap between rhetoric in favour of interdisciplinarity and actual practice. A research paper on the status of sustainable development in HE in England, commissioned by the Higher Education Funding Council for England (HEFCE) as a ‘strategic review,’ noted that ‘it is quite clear that the whole question of interdisciplinary working, its opportunities and its difficulties, looms large in the minds of those who wish to promote sustainable development’ (Policy Studies Institute et al 2008, 30) whilst the same review recommended to HEFCE that ‘Detailed consideration should be given to measures to facilitate interdisciplinarity in course design and teaching’ (35). According to Chettiparamb (2007, 1) ‘the drive for interdisciplinarity is encouraged both through the Higher Education Academy and the Research Councils’, and HEFCE’s recent sustainable development policy paper (HEFCE 2009, 25) notes the need to encourage further interdisciplinary research ‘of relevance to major world challenges’. However, whilst interest in interdisciplinarity is common in sustainability discourse, the reverse is not necessarily true: many of those advocating interdisciplinarity do so in response to the limits of what they see as overspecialisation, and may have no particular interest in the broader context of sustainability.

**Disciplinarity and multi-, inter- and trans-disciplinarity**

Whilst the term ‘interdisciplinarity’ is often used loosely to mean any approach that goes beyond a single discipline, many writers distinguish between different states of interdisciplinarity. It is perhaps helpful to first look at disciplinarity itself.
The term discipline derives from the Latin *disciplina* (instruction) from the root *discere* (to learn). According to Arum (2004), ‘discipline’ has been used since the Middle Ages to represent a way of ordering knowledge for teaching and learning. Arum sees disciplines as ‘thought domains’ which are ‘quasi stable, partially integrated, semi-autonomous intellectual conveniences consisting of problems, theories, and methods of investigation’ (Arum 2004, 380). They are quasi stable, he suggests, because of constant revision, they are partially integrated because they are characterized by core and peripheral fields as well as highly specialized sub-fields, and semi-autonomous through ‘ambiguous boundaries’. Chettiparamb, in an extensive literature review, notes that disciplines are not static but variable ‘by virtue of enterprise and fragmentation and recombination in time’, yet they ‘still possess and retain characteristics that make them identifiable as disciplines’ (2007, 7).

Disciplines form the ‘organising framework’ in higher education (Selby 2006, 57), as reflected in the structures of faculties and schools. The survival and continuing strength of disciplines as the dominant *modus operandi* might be explained by looking at the arguments in favour of disciplines. Chettiparamb’s review points to such arguments as the role of disciplines in the production of knowledge, the maintenance of rigour and thoroughness, the development of skills and knowledge necessary for society and the labour market, as well as their ‘internal role’ in providing academics with a framework for their professional engagement, advancement and identity. A further factor relating to the resilience of disciplines may be - interpreted in Kuhnian terms - the strength and maintenance of disciplinary intellectual paradigms.

At the same time, disciplinarity is subject to critique and debate. Chettiparamb’s review points to a number of such arguments:

- Disciplines tend to restrict what is perceived as relevant and therefore can draw their boundaries too narrowly
- The desire for and practice of continuity can restrict innovation and creativity
- Deep engagement within a discipline can limit reflexivity
- Lack of engagement with real world problems
- Lack of engagement with other disciplines
- ‘Heresy’ and critical questioning of norms - which might be the source of innovation - may be suppressed

The emergence of interdisciplinarity may be seen as a response to the perceived shortcomings of disciplinarity. Philosophically, according to Schmidt, interdisciplinarity
is an ‘integration instrument’ whose basic goal is to ‘obtain a synthesis and restore what is thought be lost’. It is ‘a means to regain a presupposed unity from the (obvious) plurality of disciplines’ (2008, 56). As Klein (1990, 11) claims, ‘All interdisciplinarity activities are rooted in the ideas of unity and synthesis, evoking a common epistemology of convergence’. This urge is not new: Klein (2004, 2) notes that, ‘the underlying concepts of interdisciplinarity – breadth and general knowledge, integration and synthesis – are ancient’, whilst elsewhere she states that ‘the modern system of disciplinarity is little more than a century old’ (Klein 2006, 10). Also with an eye to historic precedence, biologist E.O.Wilson (1999, 5) advocates what he calls ‘consilience’ or the unity of knowledge, claiming that, ‘the greatest enterprise of the mind has always been and always will be the attempted linkage of the sciences and humanities’.

However, further to this desire for greater unity, Schmidt discerns a second driver motivating interdisciplinarity which is as a means to address complex problems of society. A deeper - and essentially epistemological - argument arises from the idea that bounded, distinct and non-relating bodies of knowledge as reflected in disciplinary structures are no longer appropriate for a world characterised by complexity and rapid change. Wilson (1999, 6) maintains that, ‘The ongoing fragmentation of knowledge and resulting chaos in philosophy are not reflections of the real world but artefacts of scholarship’. Some go further and argue that reductive understanding informing policy and actions in the real world contributes to problems (Bawden 2005, Meadows 1982, Chapman 2002). For example, Bohm (1980, 16) states:

…it is not an accident that our fragmentary form of thought is leading to such a wide range of crises, social, political, economic, psychological, etc. in the individual and in society as a whole.

Bawden suggests that ‘disciplinary successes” have involved high levels of abstraction resulting in deductive conclusions, which are generalized to the real world with little awareness of the dangerous consequences of doing so’ (2005, 121). More optimistically, Klein (2006, 11) detects an historical shift taking place from a position characterised by stability, consistent realities, boundary formation, and compartmentalisation, towards a more dynamic picture:

Images of boundary crossing and cross-fertilisation are superseding images of disciplinary depth and compartmentalization. Isolated modes of work are being supplanted by affiliations, coalitions and alliances. And older values of control, mastery and expertise are being reformulated as dialogue, interaction and negotiation (author’s italics) (Klein 2004, 3).
This argument, which resonates with the ideas of post normal science (Funtowicz and Ravetz, 2008), has radical implications, according to Klein, for ‘the nature of knowledge, the structure of the university, the character of problem solving, the dialogue between science and humanities, and the theoretical relationship of complexity and interdisciplinarity (2004, 2). Yet not all perceptions and practices of interdisciplinarity either spring from or manifest such a radical view. Klein and Newell (1998, 3) define interdisciplinarity as ‘a process of answering a question, solving a problem, or addressing a topic that is too broad or complex to be dealt with adequately by a single discipline or profession’. Whilst this definition might be broadly accepted, it is clear from the literature that interdisciplinarity is widely interpreted, reflecting, in Salter and Hearn’s words, differing levels of ‘challenge to the limitations or premises of the prevailing organization of knowledge or its representation in an institutionally recognized form’ (1996, 43).

These differing levels are reflected in a number of typologies that seek to make sense of the proliferation both of terms and practices relating to interdisciplinarity. For example, Lattuca’s (2001) research with academics gives rise to a classification of four types of interdisciplinarity: informed (where a discipline is by intention informed by other disciplines say in relation to teaching a particular course), synthetic (a linking of disciplines, for example theories and concepts, through courses or research, yet where the integrity of the contributing disciplines remains), transdisciplinary (where courses or research questions cross disciplines and theories and concepts are tested across disciplines) and conceptual (areas which have no disciplinary basis and are new intellectual territory). Building on this model, Rhoten, Mansilla, Chun and Klein (2006, 3) suggest ‘interdisciplinary education’ is:

    a mode of curriculum design and instruction in which individual faculty or teams identify, evaluate, and integrate information, data, techniques, tools, perspectives, concepts, and or theories from two or more disciplines or bodies of knowledge to advance students’ capacity to understand issues, address problems, appraise explanations, and create new approaches and solutions that extend beyond the scope of a single discipline or area of instruction.

The literature largely recognises multidisciplinarity as being the least integrated form of interdisciplinarity, whereby disciplines might work together cooperatively but without sharing ideas, assumptions and methodologies and without being influenced or changed by the other. As Klein (1990, 56) states, ‘it is essentially additive, not integrative’ (author’s italics). A less common term, pluridisciplinarity, refers to the juxtaposition of disciplines that have some linkage (for example, different languages in language studies) whereas a multidisciplinarity approach brings together apparently unrelated disciplines (OECD 1972). Interdisciplinarity is normally understood to indicate
disciplines working collaboratively, sharing their insights and methods in an attempt go beyond their own boundaries to address whatever issue or question that concerns them (which perhaps conforms more to Lattuca’s ‘trandisciplinary’ category). In university settings, Klein (2006, 14) opines that transdisciplinary approaches are reflected in ‘new comprehensive frameworks that transcend the narrow scope of disciplinary worldviews through an overarching synthesis, such as general systems, policy sciences, feminism, cultural critique, and ecology and sustainability’ (which echoes Lattuca’s ‘conceptual’ category).

The notion of interdisciplinarity has wide appeal. However, Klein relates research which indicates that too often, so-called interdisciplinary projects are developed that are poorly thought through. Fazenda (in Klein 2006, 12) is quoted as saying that: ‘In the name of interdisciplinarity, established routines are condemned and abandoned, and slogans, nicknames, and working hypotheses are created which many times are improvised and ill-considered’. Meaning in the field is complicated by people using terms differently and/or interchangeably, or claiming interdisciplinarity for practices that others might deem not deserving the appellation. Hence Klein (1990, 56) notes that ‘Most purportedly interdisciplinary activities are multidisciplinary or pluridisciplinary’. Clearly, the use of the term ‘interdisciplinarity’ in an initiative is no guarantee of innovation and quality, although both might be claimed.

**Sustainability, interdisciplinarity and pedagogy**

As outlined in the introduction above, a major driver for more interdisciplinary approaches to teaching and learning is the sustainability agenda. It is argued that the complex nature of sustainability-related issues require commensurate approaches to knowledge, research, teaching and learning. As Klein (2004, 4) states:

> Arising from environments characterized by turbulence and uncertainty, complex problems are typically value-laden, open-ended, multidimensional, ambiguous, and unstable. Labelled ‘wicked’ and ‘messy’, they resist being tamed, bounded or managed by classical problem-solving approaches.

Funtowicz and Ravetz, (2008) add:

> These new problems are characteristic of ‘complex systems’. These are not necessarily complicated; they involve interrelated subsystems at a variety of scale levels and of a variety of kinds. Thus we now know that every technology is embedded in its societal and natural contexts, and that ‘nature’ itself is shaped by its
interactions with humanity. In such complex systems, there can be no single privileged point of view for measurement, analysis and evaluation.

In this context, Becker, Jahn, Stiess and Wehling (1997, 37) argue that ‘attempts to cope with the complexity of issues raised by sustainability cannot simply aim at adding some new pieces to an already existing knowledge base’. Rather, they argue for a ‘paradigm shift towards a new knowledge base’ characterised by ‘practices of integration’. Whilst this might sound radical to some, Klein argues that the convergence of interdisciplinarity and complexity should be seen as part of the larger cultural shift of postmodernism whereby national, political and cultural boundaries have become more permeable. This includes ‘a reversal of the differentiating, classificatory dynamic of modernity and increasing hybridization of cultural categories, identities, and previous certainties’. All have undergone ‘de-differentiation, de-insulation, and hybridization. All boundaries are at risk’ (Klein 2004, 8).

This kind of argument implies that approaches to knowledge have no choice but to engage with such shifts. Leitch (2005, quoted in Chettiparamb, 14) notes a trend in recent decades from ‘modernist formalism’ towards a ‘open-ended postmodern assemblage’ as a response to changing social and cultural conditions, giving rise to the emergence of ‘interdisciplines’ such as ‘black studies, women’s studies, media studies, cultural studies, postcolonial studies’ and so on. Similarly, Sloep (1994) notes that the rise of sustainability as a prime focus of attention has changed environmental science from being a multidisciplinary field consisting of a number of subfields towards an interdisciplinary field, or interdiscipline. However, sustainability both touches on and requires attention from a wide range of perspectives, (in addition to the clearly relevant science-based orientations). Education for sustainable development (ESD) embraces ‘aesthetic, cultural, ecological, economic, environmental, ethical, philosophical, political, scientific, social, spiritual, and technological’ dimensions (Selby 2006, 57). Godemann (2008, 626) suggests that ESD in HE requires not only the acquisition and generation of knowledge, but the ability to reflect on the effects and complexity of behaviour and decisions in a future-oriented and global framework of responsibility. ‘This new knowledge’, she writes, ‘is structured in a fundamentally different way necessitating academic curricula and academic cultures which cross disciplinary boundaries’ (Godemann 2008, 626).

This raises deep questions about the relationship between disciplines and interdisciplinarity. Whilst some see interdisciplinarity as a necessary and desirable alternative to disciplinarity – implying a kind of epistemological evolutionary step - others see interdisciplinarity as necessarily relying on disciplinarity, that is, as a foundation through which a complementary interdisciplinarity can be achieved. According to the literature, the kinds of interdisciplinarity that emerge in practice partly depend on the
kind of problem at issue and on how the problem is perceived. Hence, Kelly (1996) makes a distinction between the narrow integration of disciplines as when focusing on specific problems, and wide interdisciplinarity sharing epistemological/metaphysical positions across disciplines when faced with value laden issues. One might argue that sustainability requires both kinds of interdisciplinarity given the range of issues that it encompasses, but that wide interdisciplinarity is often most appropriate to the multifaceted and value-laden nature of many sustainability issues.

Apart from the apparent necessity and relevance of interdisciplinarity to a changing and complex real world, there appear to be a number of practical factors which favour this approach. A major cross-national study of interdisciplinarity in HE carried out by the Organisation for Economic Co-operation and Development (OECD) in 1972 (OECD 1972) included a review of motives behind engagement with interdisciplinarity. For students, these included enhancing their ability to: adjust to shifting job markets, develop new career paths, sense the relevance of their subjects, and develop more flexible skills. For teachers, motives for engagement included finding solutions to problems of growing specialisation, working towards common goals, opening up new fields of knowledge and breaking down divisions between university and society.

However, interdisciplinarity raises significant challenges to established norms, not least with regard to pedagogy. According to Klein (2006, 15) whilst integration is the primary goal of an interdisciplinary approach to teaching (referring to schools, although there are parallels with HE), ‘there is no unique interdisciplinary pedagogy’. However, research indicates that teachers seeking to advance interdisciplinarity tend towards ‘innovative approaches that promote dialogue and community, problem posing and problem solving, and critical thinking’. Klein (2006, 15) states that these approaches, strategies and activities are often reported:

- Team teaching and team planning; collaborative learning and learning communities; clustered and linked courses; core seminars; theme or problem focus in courses; proactive attention to integration and synthesis; models of interdisciplinary and integrative process; theories and methods from interdisciplinary fields; projects and case studies; dyads, triads and small groups for discussion; game and role playing; inquiry and discovery based learning; learning portfolios; experiential and service learning, internships and fieldwork; residential living-learning experiences.

The literature shows that interdisciplinarity is often inevitably associated with a constructivist pedagogy. As an integrative approach to knowledge making is intended, students are engaged in meaning making, not least through weaving different modes of thinking from two or more disciplines. At the same time, the focus inevitably swings towards a more student centred model of teaching and learning. Interdisciplinarity does
not just imply a change of method then, but also of methodology and philosophy which challenge the pedagogic norms of disciplinarity. Hence, Klein (2006, 16) notes a ‘philosophical’ shift from ‘transmitting prior notions of a unified view of commonly held knowledge and relationships between existing fields to the creation of new integrative concepts, pedagogy, models, structures, systems and principles, as well as the learner’s capacity to perceive new relationships’. This is borne out in practice. For example, commenting on the experience of a team-taught undergraduate unit in Sustainable Development at the University of Bristol, the team states:

When different contributors presented together, listening to each other and responding, there was a tangible benefit for contributors and students compared with the normal teaching mode where one person produces a multidisciplinary overview with all the wrinkles apparently ‘ironed out’ (Hoare et al 2008, 479).

**Issues of implementation**

It is clear both from the literature and from the research carried out for this paper that putting interdisciplinarity into operation and practice presents a range of significant challenges. The 2008 HEFCE Strategic Review of Sustainable Development in Higher Education in England which surveyed practice across the sector gave this analysis regarding obstacles to interdisciplinary teaching:

- The focus upon cost centres for purposes of financial administration
- The continuing disciplinary basis of Research Council (RC) funding
- Research Assessment Exercise (RAE) categories tend to create difficulties for interdisciplinary research, and so HEIs may prefer to appoint staff with a single-discipline focus. This then has consequences for what is taught
- There are particular issues around integrating the social aspects of sustainability into natural science-based courses
- Much interdisciplinary work is reported in ‘grey literature’ or in relatively low-status journals. This is in part because interdisciplinary journals tend to have lower status. Hence academics may prefer to focus elsewhere. (Policy Studies Institute et al 2008, 31)

Further, the review states:

The achievement of interdisciplinarity in teaching presents serious challenges, although examples of innovative good practice do exist. Barriers extend well beyond issues of conservatism among disciplinary practitioners and touch upon much wider matters of management and governance in the sector (Policy Studies Institute et al 2008, 35).
These points might be summarised as relating to issues of governance, structures, finance/resources, status, and ‘culture clash’ between disciplinary fields. The cross-national OECD study (1972) reports on the difficulties of interdisciplinary teaching under the headings of rigidity of institutional structures, rigidity of people and disciplines, and lack of facilities. Of these, the personal aspects appear particularly operative, the report suggesting that:

Interdisciplinarity is first and foremost a state of mind requiring each person to have an attitude that combines humility with open mindedness and curiosity, a willingness to engage in dialogue and, hence the capacity for assimilation and synthesis (OECD 1972, 192).

Similarly, Godemann (2008, 637) suggests that academics need to be able to look beyond boundaries, be capable of self-reflexivity, able to engage in knowledge integration and take on new ideas. Yet interdisciplinarity is often viewed with suspicion, scepticism and reluctance, not least by those who view career prospects and rewards as lying within their known disciplinary areas. Chettiparamb (2007) remarks that the challenges that the OECD report identified in 1972 ‘can still be thought of as largely defining the current situation in UK academia’. Similarly, Sterling and Witham (2008, 400) note that from the time of the Toyne review of 1993 on HE’s response to the environmental agenda, through to the HEFCE policy on sustainable development of 2005 (HEFCE 2005), the area of curriculum change ‘has been and continues to be the most difficult aspect of the HE response to the sustainability agenda as regards its implementation, particularly if the intention is to address this holistically and with regard to interdisciplinarity’.

Godemann (2008, 626) suggests ‘the structure of universities remains highly specialized and is not oriented towards cooperation and conjoint inter-institutional work…Confined to the existing structures of knowledge generation and transmission, universities find it difficult to do justice to contemporary problems’. HEFCE’s strategic review (Policy Studies Institute et al 2008, 74) suggests that while ‘Much has been learned in recent years about how to stimulate successful interdisciplinary work in teaching and research,…the continuing predominance of disciplinary structures in both HEIs and the RAE presents ongoing challenges in the persuading of academics to make the investment of their time and career in pursuing an interdisciplinary path’.

These issues surrounding implementation were also echoed in discussions held by the Higher Education Academy Education for Sustainable Development Project, in partnership with the Academy Interdisciplinarity Project. The initiative was based on a perceived need, shared by a number of Academy Subject Centres, for greater understanding of and dialogue on the relationship between ESD and interdisciplinarity,
not least between academics working in specific disciplines and those working in broader multidisciplinary contexts. A series of three 'interdisciplinary meetings' were held at the University of Leeds, University of York, and University of Birmingham respectively between 2006 and early 2007 to:

1. support dialogue between academics in relation to the intellectual and pedagogical issues surrounding interdisciplinarity and ESD
2. provide a forum for academics to develop their understanding of the ways that they might work with the parameters and principles of interdisciplinary ESD
3. inform the strategic agenda for the Academy ESD Project on the issues at stake in the intersections of 'ESD', 'sustainability' and 'interdisciplinarity'.

Twenty-seven participants engaged the debate, over the three meetings, representing a wide range of academic backgrounds: architecture, engineering, design, bioscience, environmental sciences, geography, development studies, anthropology, philosophy, politics, history, archaeology, psychology, education and religious studies. Every member of the group had an active teaching and/or research engagement with issues of sustainability, and an orientation towards interdisciplinary working, and many had expertise in more than one discipline. Hence, the meetings present a 'sounding board' of opinions of academics engaged in debate and practice in this area. A detailed report by the debate's facilitators (Brooks and Ryan 2008) reflects the complexities both of the interrelationship between ESD and interdisciplinarity, and of the issues surrounding implementation. Findings and discussion points include:

- an agreement to view 'sustainability' as a 'threshold concept' whose richness and importance disallowed final definitions (5)
- an interdisciplinary approach combining human, economic and scientific analysis is a necessity for ESD (9)
- an opportunistic approach to potential synergies with other disciplines is required of disciplines (11)
- questions about whether ESD suffuses institutional strategies, or supplants them, serving as a catalyst for new priorities (13)
- a focus less in terms of content and towards pedagogies supporting skills development – critical thinking, and reflexive, democratised, and experiential learning, and the relevance of this to students' skills development and links to employability (13)
- linking skills to ‘service’ and notions of social responsibility and global citizenship can be attractive in terms of recruitment (15)
- values are critical – reflected in a tension between the ethical and scientific dimensions of ESD - and remain a crucial issue for personal and pedagogical practice (14)
- a sense that students entering HE are generally ill-prepared for interdisciplinarity and therefore potential for interdisciplinary ESD at postgraduate level is likely to be greater (16)
- the need for further persuasion and change at organisational and sectoral levels. ‘Inspired leadership’ is required, but also an entrepreneurial spirit is called for amongst interested academics, working with appropriate businesses, professional bodies and employers to influence senior management and curriculum design (16/17)
- linking to employability and skills agendas is a pragmatic approach to organisational change towards ESD, as is linking to the movement towards flexible and distance learning, short courses and professional training (18)
- a significant interest in extending the responsibilities of HE and its personnel to include public issues in their remit more openly, including potential to harness a culture of enterprise towards sustainability (23)

Brooks and Ryan (2008, 5) suggest that the discussion meeting findings ‘are in many ways congruent with the broader aims of skills and employability agendas of particular interest to those responsible for HE recruitment and programme provision’.

The HEA discussion meetings suggested a number of strategies for implementation (Brooks and Ryan 2008, 13) including:
- Specialist interdisciplinary ESD centres in HEIs, co-ordinating input from all departments
- Making ESD values inherent in all programmes, via assessment techniques for example
- Compulsory ESD modules common to all programmes within an HEI
- ESD as a strategic corporate commitment and/or collegial ethos
- Implicit ESD or the ‘hidden classroom’, not made explicit as ‘ESD’ in course outlines

Selby (2006) makes a distinction between pragmatic infusionist approaches whereby disciplines work with sustainability concepts within existing parameters, and more ambitious interdisciplinary and transdisciplinary approaches, suggesting a number of pathways through which sustainability can practically be addressed.
In sum then, the literature review presents a picture of rising socio-economic-ecological challenges characterised by complex problems requiring multifaceted and interdisciplinary approaches to policy; a rich discourse on the nature of interdisciplinarity, yet a gap between interdisciplinarity rhetoric and practice given the continuing strength of disciplinary thinking and structures. This results in a tension and challenge, which, at heart, might be seen as paradigmatic, as suggested in the opening quotation from Klein (2006, 16) in section 1.0.

The issues outlined in this review are illustrated and exemplified in different ways in the case studies that follow.

4.0 Case studies

As noted in section 2.0, the five case studies below present a range of interdisciplinarity initiatives in different institutional situations. Whilst noting these differences, the reader will be interested to note commonalities regarding the challenges of and achievements in developing interdisciplinary programmes. Not least, the reader will be aware that each of the cases represents an on-going story, whereby efforts have been made to embed and develop an initiative, that to a greater or lesser extent challenges norms, within a greater institutional whole that is founded on different and more traditional organisational principles.

4.1 Case study 1 – University of Strathclyde

Introduction

The University of Strathclyde, situated in the centre of Glasgow was established in 1964 when the enlarged Royal College was granted the Royal Charter. However, it originated in 1796 when John Anderson, Professor of Natural Philosophy at Glasgow University, left instructions in his will for ‘a place of useful learning’ (Barbeau 2006). It became a technical college by the 1890s and in 1993, the University merged with the Jordanhill College of Education. In 2006, the University of Strathclyde was Scotland’s third largest higher education institution (HEI) with a student population of around twenty six thousand and employing around three thousand staff (HESA 2007).

The initiative under review is the Postgraduate Training Programme in Sustainable Engineering (MSc, PgDip, PgCert). The programme was launched in academic session 1999/2000. Since then more than 500 postgraduate students have graduated from the programme. The online university prospectus describes the programme as a ‘training package’ that ‘combines study in specialist, advanced engineering technologies underpinned with training in sustainability’ (University of Strathclyde 2009). Currently
students on the sustainable engineering programme can achieve an MSc, PgDip or PgCert in one of the following specialist themes:

- Chemical Processing
- Computer Aided Engineering Design
- Energy Systems & the Environment
- Engineering Design
- Integrated Product Development
- Management of Competitive Manufacturing
- Marine Technology
- Offshore Renewable Energy
- Technology Management

Students take three generic modules before commencing the specialist training modules related to the above themes. These modules, which meet employers’ requirements for comprehensive engineering skills and satisfy key requirements to attain Chartered Engineer status, are selected from:

- Design Management
- Project Management
- Environmental Impact and Sustainability
- Information Management
- Financial Engineering
- Quantitative Risk Analysis

The teaching team comprises the programme director, course directors for each of the nine specialist themes, and the generic module leaders. Support for the project is a tripartite arrangement, with the students, the university academic supervisor, and the industry supervisor. With regards to pedagogy, the programme is approached in three way: instructional modules, group projects and dissertations. The programme is funded through the Full Time Equivalent (FTE) economy in the normal way; flowing to the departments who are offering particular modules in the programme, on a parity basis.

Drivers and issues

One external factor driving the programme is identified by David Grierson, Director of Post Graduate Studies, and key developer of the programme, as emanating from research councils who recently required students to develop interdisciplinary skills and research skills, accompanied by industrial collaboration. Internally, there was recognition across the university that knowledge exchange is a growing area that requires to be fully embedded within the institution. With input from industry and a range of engineering departments, the programme is described by Grierson as a ‘cross-disciplinary collaboration’ relevant to students seeking careers in industry, and to
industry staff seeking to further their professional development. It is noteworthy that he neither defines nor differentiates interdisciplinarity from the associated terms, ‘multidisciplinary’ and ‘transdisciplinary’:

Where we have the opportunity to do so we are bringing different disciplines together but we haven’t got to that level of tuning. We are looking at the differences between these things and are aware of it.

Critically reflecting on the scope of interdisciplinary learning opportunities within group projects he maintains that:

The ideal situation is to have teams of students from different disciplines. We have recently had students from chemical processing, from energy systems in the environment and from architecture working together on a particular project for example, but it is not as consistent as I would like.

Arguably the Sustainable Engineering programme is presently adopting an ‘additive’ rather than ‘integrative’ approach and coming close to Klein’s (1990) term ‘pluridisciplinarity’, through the initiative’s juxtaposition of disciplines that have some linkage. As regards implementing the interdisciplinary programme, Grierson describes ‘building common ground in cross disciplinary processes, projects and alliances’ as being a principal difficulty of programme implementation. Furthermore, balancing generic and specialist provision within an interdisciplinary programme was highlighted as a challenge.

The specialist nature of the initiative was cited by Grierson as a reason for an over crowded syllabus and teaching staff expressed their reservations around the capacity of the curricula to respond to a sustainability focussed, interdisciplinary initiatives. By the same token, Brian Dickson, Integrated Graduate Development Scheme Programme Manager describes the difficulty of getting ‘all staff to see this common thread [because] teaching staff worry about diluting down subject teaching’. However, increasingly open channels of communication are described as a key factor facilitating the integration of sustainability and interdisciplinary within the programme. According to Grierson there are different definitions as to what sustainability and interdisciplinarity mean and require, but:

there is a degree of convergence appearing. The more that we discuss the initiatives between us, the more we are able to find common ground in terms of what these processes and projects can be about and the various alliances. There is a commonality there, maybe not shared values but certainly an understanding that these aspects are important to our future conduct. There is a management committee, Sustainability Committee, which has representation from the faculties across the University.
General support for the programme has come from myriad directions; from formal and less formal structures, and at both top and grassroots level. The university has a sustainability strategy that is described as ‘much more of a feature than it has been in the past’, displayed at the front of the programme’s prospectus permeating into the learning environment in terms of estates management, management strategy. Furthermore, the programme has enjoyed a warm embrace by the faculties and recognised as flagship provision within the University’s newly formed Graduate School of Engineering.

Importantly, the postgraduate Engineering programme is looked upon as a model for the development of the new university-wide Strathclyde Masters programme in Sustainability (SMS). The David Livingstone Centre for Sustainability (DLCS) are facilitating a project, led by Grierson, that will provide a framework for developing and promoting new postgraduate activity in the area of environmental, social, and economic sustainability…With the support of Faculty representatives (nominated by Deans), students, and a working group of industry, practice, and government representatives, the DLCS (Architecture) project management team will work towards identifying new flagship courses, skills training workshops, and appropriate Continued Professional Development provision (HEA ESD Project).

The key objectives of the project include championing critical thinking and promoting interdisciplinary and multidisciplinary learning opportunities in the sustainability area.

As regards pedagogy, non-traditional learning modalities are embedded in engineering programme delivery. The sustainability focussed generic module aspect of the programme is supported by innovative learning technologies that are considered beneficial to the students. Since 2004 the sustainable engineering programmes has used a university-wide, virtual learning environment to deliver modules. Grierson perceives a ‘clear benefit’ to this as it brings together a cohort of students from all over the world and from different disciplines on issues of sustainability. Industry-based group project opportunities have increasingly focused on issues of sustainability, involving teams of international and UK-based students from various disciplines in addressing real-life industry problems under the joint supervision of academics and industrialists. This includes the opportunity for student groups to present their project findings to academic and industrial delegates at an annual Sustainable Engineering Project Conference.

Alongside the positive reception of the initiative from key stakeholders, improvements to the programme are identified. To meet the challenge of unsustainability Grierson identifies change required at three principal levels; individual, faculty, as well as whole-institution:
It is not an insignificant challenge but it is something that - if we are to develop a true response to sustainability and the demands of sustainable development - then it has to be done in a way that draws in the expertise and input from across the institution. In order for us to do that, then we recognise that some structural changes will be necessary.

More specifically, a number of areas requiring multi-level change at a strategic level are highlighted. The first area is around the programme’s identity. Thus, the programme’s mission statement is being revised to respond more fully to environmental, social and economic sustainability concerns. Furthermore, existing processes of communication and feedback in the form of staff and student committee meetings that inform the programme are a good example of a participatory decision-making process within an HEI. Part of the proposal to strengthen the programme identity originated from the Staff and Student Committee, a forum that comprises part of the programme’s engagement with students. Describing the decision-making process, Grierson expands:

The student representatives have recently requested that the programme title changes in order to reflect the sustainability contents. [Students] think this will improve their employment prospects and also a better reflection of what their experience has been within the programme...we have initiated a move to change the degree title.

Overcoming challenges around the course’s skills provision is identified as the second area of priority. The generic sustainability modular part of the programme is described as providing ‘soft-skills’, as differentiated from the ‘hard skills’ of the specialist themes. Where the former is considered to be principally concerned with communicating, listening, engaging in dialogue, solving problems, and considered more difficult to measure, hard skills are usually technical or administrative and considered more straight forward to observe and quantify. The third area for improvement is around ‘nurturing the social and political dimensions of sustainability’. Working to rectify the third area, provision for skills training is planned to synthesise with the new mission statement:

It is hoped that the existing series of skills training workshops that are aligned with the programme (in self assessment, personal marketing, effective group working related to the group projects, preparing for presentations at the event) will be expanded to include a parallel set of training workshops that are aligned with aspects of environmental, social and economic sustainability.

More widely, supporting the process of institution-wide embrace of sustainability, the term ‘sustainability’ appears to be increasing in prominence and popularity amongst students, and positively received in the graduate job market.

Reflections
This postgraduate programme case study reflects a positive story of gradual deepening of sustainability content and approaches in a mainstream environment, sufficient to attract interest in a cross-faculty programme that would help represent a whole university response to sustainability. At present no explicit epistemological or methodological position guides the Sustainable Engineering programme and deepening dialogue and debate around the different terms associated with interdisciplinarity is recognised as an area for development. Arguably, the initiative is currently closer to pluridisciplinary than interdisciplinary insofar as the integrity of the different disciplines encompassed by the programme remains largely intact. The social and political dimensions of sustainability are described as requiring nurturing within the engineering programme. The motivation for interdisciplinary, sustainability-focussed engineering programmes from industry and research councils is balanced by the concerns raised by university staff members around the dilution of disciplines and the risk of insufficient specialist skills provision. Encouragingly, the programme is developing further, partly as a response to student pressure.

4.2 Case study 2 – Royal Melbourne Institute of Technology (RMIT)

Introduction

RMIT is one of the largest universities in Australia. Its website describes the institution as a ‘global university of technology’ with more than 60,000 students. Learning takes place at several physical and virtual sites: physical campuses in Melbourne and regional Victoria, in Vietnam, online, by distance education, and at partner institutions throughout the world. Since 1970 the college merged with four other educational institutions and formal university status was granted in 1992 (RMIT 2009).

The interdisciplinary sustainability initiative reviewed here is a first year, undergraduate, year-long course entitled ‘Sustainability, Society and Environment’ that sits within the School of Global Studies, Social Science and Planning, under the Faculty of Portfolio of Design and Social Context. The initiative commenced in 2004, it lasts one semester and has an annual enrolment of approximately 500 students. In 2008, the course was substantially rewritten by the course coordinator, and key developer, Kathryn Hegarty.

The interdisciplinary, sustainability course is taught to students from different ‘professionally-badged’ programmes, by a team of ten, and is designed to be directly relevant to subject areas. The sustainability course is compulsory for the following core programmes within the School of Global Studies, Social Science and Planning:

- Environment
- Urban Planning
- Psychology
- Social Work
Students from disciplines outside of the School may electively enrol on the course. To prescribe which disciplines may enrol would, in the mind of Hegarty, ‘be contrary to Education for Sustainability and all the sustainability values’. Increasing numbers are taking it as an elective; a straightforward process of course enrolment under the Australian funding model. As a result, students are drawn from all faculties including engineering, business, all of the hard sciences, art and cultural studies, communication and media studies. To enable the development of a curriculum that is responsive and appropriate to the range of participating disciplines, the development team are adaptive, and described by Hegarty as ‘consistently attempting to map the curriculum and the skill sets taught to whatever disciplines are present’:

This is done through a visual and conceptual map we show the class each week, linking the activities in class (such as content, academic skill activity, generic skill activity, reflection) to the various skill sets. These skills include but are not limited to, critical analysis, analytical reading, problem solving, decision making, leadership, reflection on social diversity impacts, and so on. A wide range of academic, professional and ‘transferable’ (often called ‘soft’) skills are engaged; this mapping process allows students to see their skills in action, as well as identify the many commonalities across disciplines, in spite of obvious key differences.

Assessment of the course takes the form of written assignments. An assessment requirement is that each discipline considers the role and presence of other disciplines - and problem based inquiry and the use of case studies are designed to support this. Furthermore, assessment requires that students identify the relationship of the sustainability concepts they learn in the course to their professional fields. The course evaluation questionnaire is a generic evaluation, originally developed as a national tool. In 2008, the sustainability course received a record score for a first year subject within the host School, with a ‘good teaching’ aggregate of 82.4/100.

Drivers and issues

Describing wider, external factors driving the sustainability initiative, Hegarty states that:

The concurrence of media attention to urgent environmental and social sustainability issues, alongside years of advocacy and exhortation to our leaders, and many research grants obtained, has led to a ‘top down’ project to introduce a sustainability curriculum across all disciplines and professional fields.
In addition, top-down drivers from government are described as ‘calling for more broadly skilled graduates who can work across international contexts… in multi-disciplinary teams’. Hegarty points to a changing landscape conducive to interdisciplinary sustainability initiatives, with:

local shifts as new fields and scholars recognise where sustainability fits in their courses…And the recognition by leaders that we are morally and institutionally accountable to engage with this urgent challenge.

Furthermore, Hegarty asserts that there is recognition of the need for ‘green collar’ skills coming from industry groups who employ the graduates: ‘There is increasing emphasis on wider transferable skills, which are not particular to sustainability education but on which it does depend’. In Hegarty’s view, the nature of problems associated with sustainability such as climate change, are multi-dimensional, so the study of sustainability requires ‘skilled interdisciplinary practice and effective methods of teamwork’. She goes on to state that:

Team teaching has been successful since we have devised more rigorous professional development to assist teaching staff to frame their disciplinary/professional contribution through the lens of the course objectives. In 2008 this was one of the most successful outcomes of the subject.

Supporting the assertion made in section 3.0 regarding people’s different use and understanding of terms, Hegarty makes the following distinctions:

Trans-: across the top of the disciplines, and therefore, superficial and shallow

Multi-: to me, this is just where various disciplines’ representatives sit in a room and give perspectives from their discipline, without any cross pollination

Inter-: overlapping research and teaching and learning practice, where tools are shared and discovery is informed by the disciplinary knowledges in a complementary manner and characterised by respect and value for the tools of the other.

Hegarty’s understanding of ‘transdisciplinarity’ differs largely from other theorists. For example Lattuca (2001) sees transdisciplinarity as a form of interdisciplinarity and used to convey a deeper level of integration. Therefore comparative analysis of interdisciplinary – related typologies is complicated by the spectrum of understandings of the terms involved.

As regards pedagogy, the 2008 course guide lists a range of ‘Planned Student Learning Experiences’ including ‘problem based inquiry’ and an ‘ecological footprint calculator report’ as well as more conventional methods. Hegarty maintains that sustainability-focussed, interdisciplinary initiatives are beneficial to students in many ways. Such
learning and teaching focuses on the ‘real world’ and supports students to recognise ‘the complexity and murkiness of sustainability problems and challenges’. Crucially, this links explicitly to the stated expectations of industry around desirable graduate skills and attributes. They include the skill of self reflection during group collaborations i.e. ‘each student examining his or her own reaction to working with others; personality clashes, surprise at different views and so on’.

A related, barrier concerns potential confusion and alienation for students and academics when transitioning from a disciplinary to an interdisciplinary learning environment. Hegarty argues that students ‘need a lot of guidance and explicit clarity’ and staff might not have had any prior experience of interdisciplinarity. However, in spite of the difficulties, rising to the challenge of embedding ‘real-world skills’ into the curriculum is considered to be an imperative for Hegarty: ‘we need to get students to see that dealing with people or simply dealing with diversity and difference is an ongoing reality of being human’.

However, co-ordinating and implementing the initiative is not without significant challenges. The initiative is tempered by obstacles that include:

Dismissal by academics of relevance to their field, attitudes that sustainability values are ‘political’ and not accountable in terms of their graduates’ skills and knowledge…a lack of leadership or excuse making: as in ‘we haven’t got the resources’, or ‘we’ve reduced our carbon that’s enough’, or just a lack of sense of urgency.

Describing the reception of the interdisciplinary initiative, Hegarty claims that students are often challenged by group work assignments:

this is a very real challenge which is common in workplaces too…to excel in their work they must find strategies to build those skills and understand the role of human interaction and conflict in the problems we face. We ask students to reflect long and hard on the concrete processes.

Critically, in spite of the efforts made to relate the course to ‘real world’ challenges and dynamics by grouping seemingly unrelated disciplines together, interrelatedness between and across disciplines is not always as thoroughgoing as Hegarty would like:

In theory, our approach to interdisciplinary practice is very broad. We engage it as a notion and practice, we model it and we talk constantly about the role it plays in the ‘real world’. However in practice it is somewhat artificial.

In order to take forward the interdisciplinary and sustainability agenda, structural and operational changes are highlighted as needed. Hegarty advocates a radical agenda: putting sustainability-focussed, interdisciplinary teaching and learning into ‘all undergraduate programmes as a graduate skill’, accompanied by ‘promotion and
grant/funding opportunities for interdisciplinary practice to build academics’ willingness to develop greater skills’. However, she notes that this will not be easy because ‘universities are stuck in disciplinary silos…I would just like to see the fiscal cultures which lock us into silos removed’. The issue of disciplinary silos is compounded by a perceived rhetoric, reality gap around commitment and leadership: ‘commitment rarely translates into practice, as so few teaching staff seem able to lead on curriculum content which actually deeply fosters and assesses interdisciplinary pedagogy’. Generally reflecting on the initiative, Hegarty argues that multi-level buy-in is a prerequisite:

The journey must be both top down, with endorsement from university executives, but also bottom up, through champions for Education for Sustainability on the ground leading their colleagues through the disciplinary cultures and lenses.

Reflections

This case study from RMIT demonstrates a necessary connection between sustainability and interdisciplinarity underpinned by a clear philosophy espoused by the key developer. There have been apparent successes in embedding this approach, which is supported by industry. Industry-identified needs for graduate generic or ‘soft skills’ that encompass critical thinking, conflict management and debate has played a large part. Furthermore, the case study indicates that whilst wider transferable skills are not particular to sustainability, sustainability education depends upon transferable skills. However, the innovative approach developed at RMIT has met with constraints emanating from vertical disciplinary structures in the university and corresponding administrative structures.

4.3 Case study 3 – Centre for Human Ecology

Introduction

The Centre for Human Ecology (CHE), located in Glasgow, was established in 1972. It describes itself as a ‘network for ecological and social transformation…[that] offer[s] challenging courses for people who want to "be the change"’ (CHE, 2009). CHE might be described as an ‘alternative, civil society college’ in line with educational institutions that are small-scale, unique, non-statutory, outside the mainstream (to a greater or lesser degree), seeking to contribute to social and environmental well being, and imbued with an explicit ethos which reflects this orientation. Such centres are often regarded as possessing the flexibility that allows innovative pedagogy and interdisciplinarity. Between 2005-2009 CHE and the University of Strathclyde were in partnership offering a sustainability-focussed, interdisciplinary initiative; the MSc, PG Diploma & PG Certificate in Human Ecology in the Department of Geography and Sociology in the Faculty of Law, Arts and Social Sciences. The research in hand took
place early 2009, however, the partnership between the two institutions came to end at the end of the academic year 2008-2009 and the accredited MSc, PG Diploma & PG Certificate in Human Ecology has ceased. Notwithstanding recent developments the story of the interdisciplinary initiative is unique and merits close consideration.

The history of partnerships between CHE and mainstream Higher Education Institutions (HEIs) is complex. Prior to the partnership with the University of Strathclyde, the MSc Human Ecology was hosted by the University of Edinburgh (1991-1996) and was accredited by the Open University Validation Service whilst still based in Edinburgh (1996-2005). As an alternative society college co-delivering the MSc Human Ecology programme with a partner mainstream HEI, coordinator and tutor, Verene Nicolas describes one of the key challenges as 'finding academic legitimacy...[the programme has] always been on the margins'.

The course was based at the University of Strathclyde’s city centre campus, Glasgow, and was provided through a series of intensive workshops, each lasting from two to seven days. The programme’s identity was explicitly linked to interdisciplinarity. The University of Strathclyde described human ecology as an 'interdisciplinary field that explores the individual, collective and transpersonal aspects of the human condition' (University of Strathclyde 2009).

Former, programme co-ordinator Verene Nicholas writes (email communication, February 2009) that the programme’s literature read as follows:

The course’s fundamental aims are to understand how our relationship with the natural system and with each other has become dysfunctional, understand the root causes underpinning this fracture and inquire into processes which could bring our relationship with natural systems & one another back to health..... By the end of the year, students will have acquired the capacity to understand their “paradigm” (discourse, worldview and core values that underpin their practice) as well as understand and bridge others paradigms (as manifested in the diversity of people & organisations working towards change). They will also have discerned their ‘place of agency’ and started to engage with communities, organisations and grounded change initiatives.

The programme comprised a foundation of two core modules addressing:

1. Our species' impact on the biosphere, within a framework that acknowledges the inter-connectedness between the state of the planet and social and economic systems;
2. The ways in which consciousness and cultures co-evolve, shape, and are shaped by, the physical, social, and mental environment;
3. The contextualisation, analysis and active transformation of degraded environments, both physical and social.  
(University of Strathclyde 2009)

Core classes were taken in the following modules:

1. Ecology, Self, Community  
2. Integration, Vocation, Leadership

Optional classes included:

1. Ethical Enterprise  
2. Ecopsychology  
3. Spiritual Activism  
4. Action Research  
5. Investigative Research (delivered by Geography and Sociology)  
6. Manufacture of Consent (as above)  
7. Contesting Global Governance (delivered by Government)  
8. 2 classes from the MSc in Environmental Studies delivered by the David Livingstone Centre for Sustainability – Faculty of Engineering.

The programme was assessed by a ‘range of methods based on practical and professional skills including essays, reports and funding applications; presentations and role plays; and team projects’.

Drivers and issues

Whether human ecology is a discipline in the traditional mould is a moot point. Referring to section 3.00 above it might be more accurately termed an ‘interdiscipline’. When the programme partnered with the University of Strathclyde in 2005 it received national media attention, with the Guardian describing the programme not as an academic subject but as the socially acceptable face of political activism:

Call it what you like though, political activism is exactly what it is, insists David Miller, professor in sociology and then head of dept, "We're not talking about violence, or any of the stereotypical images associated with activism," he says, "What we look at is how to engage with the system in order to change things. This can, more often than not, mean working within - or in partnership with - existing organisations to exert influence, rather than operating on the outside. It's not about shouting from the margins, it's about being a role model for others and being effective (Crace 2005).

As regards the nature of the sustainability-focussed interdisciplinary initiative, course coordinator, Nicolas stated:
We say we have a multidisciplinary approach...it is not something we dwell on when we plan or deliver the course...the reason being that most of the people who teach on the course are not conventional academics...most of us are practitioners before we are tutors or lecturers...my role is very different from having a formal academic post.

Though not explicated, interdisciplinarity is conflated with transformative learning and described as 'essential' to education for sustainability because:

transformational learning is about tapping into the different parts of what makes us whole human beings. This is what we call the 'head, heart and hand' of human ecology. Education for sustainability requires an interdisciplinary and holistic approach ...I don’t think scientists are particularly good at helping students with how to shift consciousness and transform people's worldviews and values for example...But they of course have an invaluable role to play in helping us understanding the root causes of our societal and environmental crises...So the course is interdisciplinary in a much wider sense than purely academic as we engage our students in understanding their group dynamics, how to deepen self awareness and their sense of agency. All our tutors are working with groups, communities or professional organisations. The students really value our approach because it's grounded in reality.

Whilst Nicolas described the course as being, 'well received' by the University of Strathclyde, she states that the programme suffered from:

lack of recognition of the importance and effectiveness of our teaching and learning approaches.

Speaking more specifically to the challenges of the partnership with Strathclyde, Nicholas pointed to logistical, financial difficulties and their impact on teaching hours: The budget is solely based on student fees and this is described as impacting upon the human and financial sustainability of the degree. According to Nicolas, ‘human ecology can’t be taught on a light curriculum...our pedagogy requires a lot of face to face hours’. As a result, programme delivery ‘relies on a huge commitment from [CHE] staff... in face of no job security...with much volunteer time’. She further describes the commitment of CHE staff over the years as a principal high point of the programme. Several optional classes from geography and sociology as well as other departments were offered to human ecology students, indicating that the course might have been evolving into a true partnership between the CHE and the University. Nevertheless, the staffing and delivery difficulties described above raised important questions about the nature of the partnership between CHE and the University of Strathclyde, and the difficulty of putting the interdisciplinary and inter-collegial approaches into practice.
Both institutions described the partnership in enthusiastic and positive terms. However, the coordinator asserted that most CHE tutors:

- don’t have a contract with the university. They are paid on a sessional basis. I am the only one who is on the payroll. And most of us don’t have access to university’s facilities regarding professional development.

As regards the permeation of CHE’s practice of an interdisciplinary and transformative learning approach into the structures at the University of Strathclyde, she asserted that:

- the departmental staff have only been marginally involved in the teaching of the core modules so far but we exploring how this might change in the future.

Furthermore, Nicolas said that the human ecology team had not found its place within the departmental research strategy. This was described as mainly ‘due to the fact that we are not resourced to undertake research activities and no-one holds a full time academic post in human ecology in the department. It could also be that our research interests don’t easily fit the mould of mainstream academic research’. However, she adds that ‘collaboration takes place around the research design and dissertation class that’s offered to all postgraduate students in the department, and we also co-supervise dissertations.

As regards to pedagogy, in the words of Nicolas, CHE’s approach is explicitly action-oriented:

- we are very strong on action research including the first person dimension. It allows students to explore their impact on research participants, critically reflect on issues of power, values and validity in research as well as inquire in depth into their place and type of agency. This presents a very unusual way of thinking about and practicing research for the department.

Described as ‘new and exciting’ by the University of Strathclyde, the partnership between the university and CHE around the MSc Human Ecology appeared to be a unique attempt by two, very different educational institutions to interface. However, when comparing its pedagogy to that of the University of Strathclyde, the coordinator described that CHE felt that there is some distance between the approaches of the two institutions, posing some real challenges for deep dialogue:

- the way we deliver the MSc (particularly the core modules) is radically different from most university courses related to sustainability or human ecological issues that we know of world wide. Our head of department recently acknowledged that the department had a lot to learn from us when it comes to teaching. Whether there’ll be time and resources to engage in a fruitful dialogue of the matter remains an unanswered question.
When discussing interdisciplinary pedagogy, Nicholas said, ‘we come across real challenges such as staff heavy workload, lack of time to engage with a completely different body of literature and epistemologies, and an institutional trend towards homogenisation of degrees and resource cut. We are asked to open up modules to disciplines across the university but it primarily stems from a need to cut costs rather than a clearly expressed desire to deepen collaboration around interdisciplinarity’.

Reflections

Clearly, the University of Strathclyde’s commitment to a sustainability-focussed interdisciplinary and inter-collegial partnership with an alternative civil society that is explicitly radical, action-oriented and ‘deep green’ encountered serious challenges. The relationship often appeared to be one of mainstream hosting rather than recognising its transformative potential. Paradoxically, the MSc Human Ecology was aligned with one of the aims of the University to support innovative teaching. In 2009 the partnership ceased on the grounds that there were long-standing issues around where the course fits within the university; that the MSc was deemed marginal to the department’s research agenda; that the course required more time as coordination was more complicated than for a usual course and the active learning and interactive learning model was teaching intensive. As alluded to above, there appeared to be more systemic challenges around the ‘fit’ of the course within a mainstream HEI, as Nicolas stated, ‘academia does not value the way we are doing things…we have different priorities’.

Arguably, the basis for the relationship was more strategic; deriving from mutual benefit of student recruitment, than an attempt to inspire a radical approach to sustainability-focussed interdisciplinary initiatives at a mainstream HEI. A central issue may be one of legitimacy. On the side of CHE this took the form of academic credibility in the form of university accreditation and status for the Masters programme, while from the university’s perspective, it could point to an innovative programme and partnership as part of its response to sustainability.

Despite the eventually irreconcilable difficulties of ‘fit’ between conventional and unconventional institutions as exemplified by this case study, the arrangement nevertheless allowed a bold model of interdisciplinary study around sustainability to exist. If radical, action-oriented, explicitly normative interdisciplinary education for sustainability cannot be adequately accommodated within mainstream institutions, it may be that former partnerships such as the CHE-Strathclyde form offered one model for innovation, where both parties could potentially gain from the arrangement. Without greater dialogue between alternative colleges and mainstream HEIs around pedagogy and curriculum, stereotypes about purely cognitive-based pedagogy at HEIs, and alternative approaches to teaching and undertaking research at civil society colleges may well persist. However, CHE is keen to ‘keep one foot in academia’ for certain
areas of research, and will possibly develop its own diploma in Human Ecology. Furthermore, CHE is in dialogue with the Transition Town Network and in particular with the discussion around Transition Universities.

4.4 Case study 4 - St. Andrews University

Introduction

St. Andrews in Fife, was Scotland's first university, founded in 1413 and is the third oldest in the English speaking world. Sustainability is high on the university’s agenda as the following attests:

The University of St. Andrews has a mission to be recognised locally and internationally as a world-class institution that leads by example, fully integrating sustainable development into all that we do. The University of St. Andrews is committed to continuing to understand and improve its performance with respect to sustainable development (St. Andrews, 2009).

The sustainability initiative under discussion is an interdisciplinary undergraduate BSc/MA in Sustainable Development (SD). The programmes were developed following the success of a pilot interdisciplinary module in geography. A total of eleven Schools plus the Estates unit contribute to the programme’s core SD modules, which cover a broad range of environmental, social and economic aspects of sustainability using local, regional, and global examples. Teaching staff are drawn from the School of Geography and Geosciences, Biology, Management, Chemistry, Mathematics and Statistics, Economics and Finance, History, International Relations, Divinity, Philosophical, Anthropological and Film studies, Medicine and the Estates and Energy unit. The degree is coordinated by the School of Geography and Geosciences.

The programme is within the Scottish degree structure, hence in common with other Scottish degrees, students are admitted to one degree programme. However, for the first year, students take three different subjects, in the second year they take two or three different subjects and they do not have to finalise until the end of the second year as to which honours programme they will enter. The SD programme recruits many students who take a first year module, and second year modules, and then who switch into the degree programme. There are now approximately 260 students in the first year, 90 in the second year and 25 students in each of the two honours years. The programme was initiated in 2004 and student numbers have grown each year.

Approximately half of the credits required for the degree are made up of core SD modules, with the remainder made up from partner subject areas. Rehema White, lecturer and course coordinator, describes how this approach enables students to explore SD issues in an interdisciplinary environment whilst developing the academic skills and expertise in discipline areas that are necessary at undergraduate level.
Furthermore, sustainability infuses the university culture through research, through the degree programmes, through estates, and through student initiatives.

Teaching and learning methods include lectures, seminars, laboratory classes, field excursions, case studies and research projects, and are designed to be transformative rather than transmissive, with assessments organised to allow students to develop different skills, reflect on and participate in their own learning. A critical perspective is encouraged.

The programme is described as enabling students to:

- Develop a capacity for holistic and interdisciplinary thinking across ecological, social and economic realms
- Pursue specialist learning in a partner subject of choice together with interdisciplinary learning in core SD modules; enhancing their knowledge in a range of areas as defined module, discipline and issue
- Develop module specific skills, including the abilities to think critically; manage complex data sets; work unsupervised as part of a team and individually; develop and undertake research using a range of approaches and methods
- Develop critical understanding of the problems, and the sources of the problems facing today’s society and environment; and be able to identify and promote sustainable pathways and processes
- Enhance their personal responsibility as global citizens

Benefits for staff are described as follows:

- The interdisciplinary nature of the degree has raised awareness of the diverse sustainability-related academic interests within the university, leading to cross-school research initiatives and the formation of the St. Andrews Sustainability Institute
- Teaching and learning have augmented the university’s drive for institutional sustainable development

Drivers and issues

A central driving force in support of the interdisciplinary SD programme comes from outside the university. White states:

We have a new up and coming government that wants to do things differently. And we have the very strong Sustainable Development Commission so there is quite a lot of strong political will at the moment.

Internally, the university’s holistic conceptualisation of sustainability supports the initiative:
I think the university has a much broader view of sustainability than just talking about Interdisciplinarity...they see it as being around practice as well, so they see it as being relevant to estates and research.

In response to challenges around implementing the interdisciplinary initiative, White describes how she finds that there is ‘a lot of dialogue that has to go on at all sorts of levels’ to support and run the programme, and finds that she has to ‘talk to staff almost as much as I have to talk to students, and staff at all sorts of levels; individual level, at school level, at senior management level and so on’.

In addition, White asserts that in order to successfully implement an interdisciplinary programme, developers need to invest in bottom-up initiatives as well as top-down regulatory framework:

We started from an academic perspective thinking about what was necessary but then pragmatically that was populated by enthusiasm on the ground. It is about having some kind of academic regular framework but also having sufficient flexibility to take the opportunity of people who are enthusiastic and have skills and not to force people to contribute... There were joint meetings of people across schools to talk about what the programme might look like and that put together some sort of a skeleton curriculum, which was largely based around what people thought academically it should be like.

Since then, staff involved with the programme have been awarded funding from the University for a research project which aims to overcome the particular challenges faced by the delivery of a wide range of material to a diverse group students. It explores how differences in the language and delivery of subject material and the background of the learners influence understanding. The research is producing guidelines for interdisciplinary teaching that retain depth of academic theory whilst enhancing accessibility for learners, using the SD programme as a model course.

There are principles behind the programme, described by White as important in order to ‘make sure that it is not just a hotch-potch of whoever happens to feel like teaching anything’. The principles are outlined below:

- Employing a mixture of local and international case studies and examples
- Enabling the students to develop a range of transferable skills
- Making sure that we have links from theory to practice so that we have sufficient outdoor, experiential learning
- Developing a contemporary issues matrix, so we work with contemporary issues across sustainable development and try to represent a balance of different issues and perspectives
One of the key challenges experienced over the four years that the programme has been in operation, is described by White as concerning the programme’s location within existing disciplinary demarcations:

Who hosts it is always a really big thing... at this university they have said that an existing school must host an undergraduate degree programme. As soon as you host something by an existing school there is an issue with interdisciplinarity in that perhaps that school is going to bias the perspective. How are some of the resources going to flow to that school? Does that school have to support the initiative? In this case it was decided that the School of Geography and Geosciences would take it up, but there was certainly concern amongst senior management of geography and geosciences and a reluctance to invest sufficiently initially. University senior management were insistent that the School take responsibility and were not prepared to put in any external funding or support. So the result there was that it was under resourced and has been under resourced pretty much until now.

Furthermore, the depth of the interdisciplinary approach to sustainability depends upon ‘where it is in the programme… [and] on who it is that is teaching’. White maintains that there is a lack of consistency across the programme provision as regards to the workload model for staff teaching on the interdisciplinary programme. Explaining the process, she asserts that:

The workload involved in an interdisciplinary programme is not always recognised… Staff members are supposed to have some recognition of their inputs [into the SD programme] in workload modules but to my knowledge some schools have refused to do that… Every school is now supposed to have a workload model but every school is being given the freedom to develop their own workload model, and they are not comparable… I have a very poor view of some of the workload models that are being used.

As regards to the logistics of programme provision, the interdisciplinary initiative is described as requiring ‘increased commitment’, owing to the fact that ‘there are more meetings than those on a degree programme’. This demand is frustrated by the lack of resources for the programme, for example, White explains, ‘we don’t have more places allocated for students coming in even though we are growing’. Furthermore, at times, it was felt that there was resistance within departments to staff contributing to SD ‘because it puts pressure on everybody else’. Additionally, White argues that ‘if this programme had not had a dedicated programme coordinator it would have absolutely collapsed’. Programme delivery has involved ‘more self assessment and self reflection’ than more well-established programmes. In addition, feedback and focus groups with students are held and inform programme evaluation exercises.
As regards the use of the term ‘interdisciplinarity’, White makes a clear distinction between it, and related terms, multi- and trans-disciplinarity:

Multidisciplinarity involves different disciplines but they are not connected. Interdisciplinarity is when you have different disciplines but they are connected, they synergise so what you end up with is greater than the sum of the whole. Transdisciplinarity is when you actually have interactions between the disciplines leading to some kind of new paradigm.

However, what constitutes a discipline, or ‘disciplinarity’ is described as complex and contested as disciplines are often permeable and transcend strict boundaries:

There are lots of issues about what is a discipline. When we put people in these individual schools we tend to say that someone in social anthropology is an anthropologist but in actual fact their academic interest may overlap with someone in cultural geography or may overlap with somebody in social psychology. So when start looking at who individually teaches what, and what expertise they bring to the programme, it is a lot more diffuse.

For White, while both interdisciplinary and single disciplinary approaches to undergraduate sustainability provision are essential, the interdisciplinary aspect is felt to be the more important in affording an holistic perspective.

You need interdisciplinary and I think you also need very specialised single disciplinary approaches. But if you are going to educate students to have an understanding about sustainability, they need to have at least some interdisciplinary education.

As regards accommodating different disciplines across the schools within the SD programmes she states that:

Our perspective is that every discipline is relevant but in different ways…And that what is difficult sometimes is trying to get a balance across these different disciplines.

White suggests that many of the aspects of effective sustainability focussed interdisciplinarity could be seen to be ‘good teaching ‘practices in a broader sense. ‘It is difficult to know’ she says, ‘how much of what we are teaching students is a benefit of interdisciplinary learning and how much of what we are teaching students is a benefit of good teaching?’ Whist interdisciplinarity allows for a ‘broadening of perspectives’, discussion around pedagogy is further enabled through peer-learning and a large amount of student participation in discussions. However, White asserts that whilst this might be a feature of interdisciplinarity, a lot of goals around student participation ‘would be appropriate to good teaching anyway'.
Reflections

The St. Andrews case study presents a rare example of where a university has developed a sustainable development degree at undergraduate level with valid claims to interdisciplinarity. As far as possible, (and just what is possible has changed due to the presence of the programme), those concerned have sought to develop an holistic model of sustainable development and implement an interdisciplinary framework of teaching and learning. As in other case studies, the unconventional and cross-cutting nature of the programme has raised tensions and difficulties, and its evolution and the process is still on-going. However, it seems clear that a broad spectrum of stakeholders in the university has been, in a sense, engaged in a positive learning exercise as the programmes have developed. This has added to St. Andrews’ reputation, credibility and status as an HEI that is committed to sustainable development. As such, the case study of St. Andrews offers much that other HEIs seeking to develop interdisciplinarity in sustainable development programmes might learn from.

White maintains:

I wouldn’t say that every part of the programme is brilliant and it’s meeting all the expectations of what interdisciplinarity can be. [However] I think we are heading in the right direction…I feel quite comfortable about promoting the interdisciplinarity and saying that we are really doing it.

4.5 Case study 5 – University of the Western Cape

Introduction

Located in Bellville, 20 km north of Cape Town, the University of the Western Cape (UWC) was established in 1959 as an apartheid college for those who are classified as ‘Coloured’. Predicated upon the history of liberation struggles against oppression, discrimination and marginalisation, the UWC’s mission statement highlights its ‘distinctive academic role in helping build an equitable and dynamic society’. One of the commitments expressed in the mission statement addresses social and environmental sustainability as follows:

[to] help conserve and explore the environmental and cultural resources of the southern African region, and to encourage a wide awareness of these resources in the community (University of Western Cape 2009).

UWC has around 15,000 students which include a large proportion of students from economically disadvantaged local communities (including the townships comprised largely of people resettled from other parts of South Africa). Over 20% of the student
The body are postgraduates. It hosts an increasing number of international students (University of Western Cape 2009; White 2007a).

The sustainability-focussed, interdisciplinary initiative under review is entitled, Environmental Awareness: Techniques and Training (EAT). The EAT consists of five elective modules that has been developed since 2002. It aims ‘to conscientise and empower students from many different social and academic backgrounds to the necessity for people to engage in environmental sustainability issues with a focus on the needs of a country in continued transformation’ (White 2007 b, 2). EAT has its origin at a coincidental gathering of a number of UWC academics at the Southern African Consortium of Universities for Development and Environment (SACUDE) workshop, a project sponsored by the Danish Government in June 2002. Richard White, EAT Coordinator since January 2003, recalls exciting initial discussions to explore the idea of pulling those UWC people together to create a new environmental course. Following this event, informal and formal workshops took place at UWC, which included World Summit on Sustainable Development (WSSD) Perspectives and the Training of Environmental Practitioners in South Africa in October 2002.

There were a number of design criteria adopted for the EAT programme development. It was decided to have a series of ‘elective, not compulsory, modules,’ and to make EAT ‘complement existing UWC structure’ so that this allows ‘students to remain specialists in their chosen discipline(s) but also gain a valuable environmental training.’ Other key criteria included:

- Available to all – an elective for as many different programmes as possible
- Accessible to all academically (i.e. no knowledge base assumed)
- Balanced coverage of international and local issues
- Designed from the bottom up to suit the needs of students
- Based around interesting environmental issues with a stimulating presentation style including innovative assessment methods (White 2007a, 3.).

EAT’s elective modules are organised in three phrases which were incrementally launched since 2004: ‘Awareness’ (year 1), ‘Training’ (year 2) and ‘Implementation’ (year 3). The first phase attracted around 45 students in 2004 and the number has grown to around 100 in 2008. The Awareness phase includes two modules which explore basic concepts of the environmental issues at local, regional and international levels from several disciplinary perspectives. Students are encouraged to develop a holistic and balanced perspective. Two first year modules are split into topics, which are presented by a number of academics from different disciplines. During the academic year of 2008/9, first year modules were available to undergraduate students from five faculties (Arts, Science, Law, Education, Economies and Management Sciences) out of seven.

Two modules in the second phase aim at developing skills essential for environmental practitioners. The main purpose of a module at the third phase is to ‘takes the
knowledge from year 1 and the skills from year 2 and applies them to real-life issues’ (White n.d., 6). Students develop and run their own environmental projects throughout the year. This module ends with the symposium where all students present their projects to peers and an invited audience. Typical second and third year registration numbers have been around 30 and 15 respectively. At second and third year, students have been restricted to the Arts and Science faculties. In 2008, BComm and BAdmin students from the Faculty of Economics and Management Sciences were able to take a combined first/second year EAT programme in their second year (White 2007a).

Pedagogically, the EAT modules promote students’ active engagement through group work, presentations, project development. Developing student’ interpersonal skills and building their sense of confidence are considered critical by the EAT coordinator, Richard White. All modules are 100% continuously assessed and diverse assessment methods are included (e.g. applied exercises, group presentations, and projects). A large, overarching assignment (e.g. producing an information booklet for non-EAT students) is also attached to each of the modules in the year one, reinforcing the interconnectedness of the different topics and disciplines.

Except for one EAT coordinator funded by the university (for the period of 2004-8 by the Dean of three UWC faculties and for 2009 just by the Dean of Science), all the other academic members, over 25 staff per year representing five UWC faculties and 12 departments, have contributed to EAT on a voluntary basis. White has a number of roles within the taught component such as providing continuity, promoting discussion and being the focal point for academic enquiries should the topic coordinator not be available. Furthermore, he has also developed a considerable amount of the lecture material, particularly during the second and third years.

Drivers and issues

As mentioned above, EAT has its origin at the SACUDE workshop where a number of colleagues from UWC started informal discussions on a new environmental programme. EAT has developed organically through grassroots volunteerism, without being commissioned by the university. White considers that its inclusive and informal programme development which ‘cast [s] the net very widely’ is one of the reasons why EAT has become ‘the largest inter-faculty undergraduate initiative’ at UWC. Those who wish to contribute to EAT are encouraged to do so. Acknowledging that most of the contributors to EAT tend to approach it from their own disciplinary perspective, not necessarily from ‘an integrated disciplinary process,’ he sees the value of getting academics and students together from different disciplinary backgrounds. He also points out that ‘getting out of silos,’ is essential to learning for sustainability. This is because sustainability requires systems thinking that addresses problems at a fundamental level. Tahir Wood, a senior academic at the Academic Planning Unit at UWC, echoes this sentiment:
The challenges of sustainability require what one might call a problem-posing and problem-solving approach that is clearly at odds with the historically derived boundaries between established disciplines.

Developing and sustaining EAT has not been free from a number of challenges. First of all, EAT has faced some difficulties regarding how to accommodate it in the existing university structure. For instance, timetabling and particular programme requirements technically prohibited students from particular faculties, departments, or programmes from taking the EAT modules. It was also not easy for EAT to find the 'home' within the academic structure of UWC which is rigidly organised firstly in programmes, then departments, and then faculties. Even when EAT was accommodated at the Chemistry Department, another issue emerged. White commented that 'it took a long time to dispel the myth that EAT was just a Chemistry Department or Science Faculty initiative and not an inter-faculty initiative.'

Fitting into the university structure seems to be something expected from a senior management point of view. Tahir Wood states that EAT 'needs to be developed into the kind of initiative that can live within our system, since we do not really expect the managements system of the university to adapt to it.' Living within the system is further complicated not least because of the university’s newly introduced modular system that the EAT was not designed to fit. In addition, this new modular system was so far accepted by only a few faculties. According to White,

[The university has] moved the goal posts again, and in a way that it is becoming very prescriptive so the students are getting trapped into programmes. Departments are tending to teach more and more material to their students. So it is reducing the amount of options for students…

Reflecting upon changes related to the new modular system, he sees building ‘flexibility’ into EAT programme as key in order for the ‘majority of students to work together for the majority of the time’ (see the latest proposal for redesigning of EAT programmer in Appendix 6).

Another challenge, overlapped with the above described structural issue, lies in the nature of EAT’s voluntary based curriculum development and implementation approach. Although its flexible and inclusive approach has been a strength, it is ‘not sustainable long-term’ without sufficient institutional support, White asserts. He thinks that after five years’ experiment, EAT has not formalised institutional arrangement and did not receive institution-wide, top level support. While there is the rhetoric of institutional support, there has been insufficient allocation of secure long-term funding and human resources to the programme.

There is an underlying tension between grassroots curriculum development and the structured formal curriculum development approach. This is commented by Wood:
due to the un-integrated and often ad hoc nature of the curriculum structure, EAT tends to depend on voluntary services of a lecture or two from individual staff members. These voluntary activities naturally come into conflict with their official workloads – not a sustainable option. On a more general level we need to become better able to design curricular initiatives that are appropriately interdisciplinary in response to new challenges, but yet which have all the coherence of established disciplines – this is not an easy task.

Balancing emerging curriculum development and maintaining ‘the desired qualities of coherence and progression’ is not straight forward, as Wood expressed. With no clear solutions for heavy workload on the volunteering academics, it was decided that EAT would offer the only first phase in 2009, White explained.

In terms of the student response to EAT, it has been overall positive judging from their rating of the EAT modules (White 2007b). Positive impacts of the programme have also been evidenced by the establishment of student-initiated community initiatives as well as increased sense of their confidence and level of engagement in learning. There is, however, an issue regarding some students’ readiness to take challenges of thinking outside of disciplinary boundaries and being engaged in the EAT’s problem-solving approach. Most of the students are simply not used to being involved in learning actively. In order to counteract this challenge, White emphasises the importance of pitching the EAT modules close to the daily lives of students. Another issue is that non-specialist EAT modules are treated less seriously by some students, and have attracted those who considered them as ‘an easy option’ to obtain credits to complete their degrees since it requires no prerequisites and exams. It is also important to note a wider historical and social context which poses implementation challenges for EAT. In the words of White:

Sustainability is not a priority for South Africans. The priorities include cars, houses, cell phones, etc. They are endeavouring to live the American Dream as this is what they are exposed to in the media. There are also issues such as the continued growth between the haves and have nots. Environmental issues are seen as white, middle class pastimes, while most non-whites were dispossessed of land during apartheid. These issues are still current 15 years after democracy. Many students live below the bread line - environmental considerations are luxuries they cannot afford. Such pressures are increasing the difficulty of implementing EAT in most cases.

Reflections

The examination of the EAT programme at UWC has illuminated pros and cons of grassroots oriented curriculum initiative for sustainability. Its inclusive and emerging approach has opened up creative inter-faculty learning spaces by bring academics and students together to think beyond the narrow disciplinary silos. Yet, this innovation leaves room for improvement in terms of making it more integrative. In the face of the
disciplinary dominated award and management structures and ever-changing modular system at UWC, this EAT programme is at the crossroads. Institutional support for allocating financial and human resources as well as carefully negotiating curriculum spaces across the faculties seem to be key for the continuation of the programme. A creative solution awaits.

5.0 Interdisciplinarity at Plymouth

The University of Plymouth is the fourth largest university in the UK with just over thirty thousand students and a little under three thousand staff (Ciao 2009). In 1992, the polytechnic at Plymouth was one of thirty institutions of higher education elevated by the government to university status. In 2009, the University of Plymouth has an extensive partnership network which involves many of the non-university colleges in the south western counties. In 2004, HEFCE funded 74 centres for Excellence in Teaching and Learning (CETLs) to promote excellence in aspects of teaching and learning in higher education. The Centre for Sustainable Futures (CSF) is one of two ESD CETLs in England1 and is one of four CETLs awarded to the University of Plymouth. CSF is tasked with transforming the University of Plymouth from a university that excels in sustainability in certain areas, into one in which sustainability permeates the curricula, physical campus, relations with the local community, and the whole institutional culture.

Policies

Interdisciplinarity is recognised in the University of Plymouth Research and Innovation Strategy 2009-2012 (April 2009). It states that ‘We encourage interdisciplinary working, urging researchers to develop synergies between research areas, both within and beyond the university’ (2009, 4). Further, as one of the strategy’s ten themes, the university commits ‘to develop, support and champion areas of interdisciplinary research, social enterprise and community engagement’ (2009, 11). This strategy also identifies ‘sustainability education’ as a key area under one of five strategic priority subject areas, i.e. pedagogic research and environmental, social and economic sustainability as a further strategic priority (2009, 7). Whilst there are some pockets of initiatives and innovation (see below), in the past there have not been strong and coherent institutional drives to advocate and implement interdisciplinary initiatives in general, and sustainability in particular. However, the development of new research centres and institutes as proposed in the document could well provide the opportunity for cross-faculty collaborative research projects.

In terms of University of Plymouth policies relating to interdisciplinary teaching and learning, two policies are salient. First, the University of Plymouth Sustainability Policy, approved by the Academic Board in 2008 (University of Plymouth 2008), which emphasises the importance of interdisciplinary teaching and learning to address the

1 The second CETL-ESD is C-SCAIPE at the University of Kingston
challenges of sustainability. It states that the University ‘recognises the need for students to appreciate the interdisciplinary nature of the sustainability agenda’ (point 6). The Sustainability Policy Elaboration document (2007) describes the interdisciplinary elements in detail as follows:

4.4. It is recognised that all disciplines have a contribution to make to the sustainability agenda but also that sustainability, with its many interrelated strands (aesthetic, cultural, ecological, economic, environmental, ethical, philosophical, political, scientific, social, spiritual and technological), defies straightforward disciplinary containment. Efforts will therefore be made to ensure that the learning of all undergraduate and Masters students is enriched through exposure to perspectives and insights on sustainability emerging from other disciplines and from interdisciplinary dialogue.

4.5. In both the disciplinary and interdisciplinary aspects of its sustainability curriculum provision, the University recognizes that the interrelatedness of ecological, economic, environmental and social dimensions of sustainability necessarily involves an appreciation of the intersection of gender, class, ethnicity and race considerations and an examination of power relations between humans and other life forms.

Second, the University of Plymouth Teaching and Learning Strategy (Revised 2002) and the University of Plymouth Teaching and Learning Strategy 2009-2012 (April 2009) is worthy of examination and comparison. Both documents hint at interdisciplinarity. For instance, the former document mentions the importance of ‘promoting and sharing best practice in learning and teaching within and between individual disciplines’ (5.5.6.) among Plymouth academic and support staff. The latter document implies promotion of the interdisciplinary components of teaching and learning by broadly describing ‘co-learning, active participation and mutual respect’ as a basis for the teaching and learning (2009, 3). However, the latter document does include sustainability education as one of the ten key themes across all disciplines, and this might open up avenues for greater interdisciplinarity.

In sum, whilst there is positive movement, there remains room for greater synergy and coherence between these three University of Plymouth policy/strategy frameworks (Sustainability Policy, Research and Innovation Strategy, and Teaching and Learning Strategy) as regards support for sustainability initiatives particularly in relation to interdisciplinary teaching and learning.

**Plymouth Examples**

Identifying the previous and present University of Plymouth interdisciplinary initiatives for the purposes of this paper turned out to be difficult, not least because among some 60 people initially approached for this research (e.g. all the Heads of School, all the current and past CSF Centre Fellows, and some colleagues from Education
Development and Learning Technologies), only two were available to answer questions (see Appendix 5).\(^2\) Whilst this is acknowledged as a severely limited sample, it should be stated that other colleagues appeared to be unfamiliar with interdisciplinary initiatives relating to sustainability at Plymouth - or they simply pointed out the non-existence of such initiatives. However, in terms of research validity, it is not possible to weigh factors accounting for the low response rate, possible factors including lack of interest, diffusion of responsibility, and workload commitments. For illustrative - rather than representative – purposes only then, it is worth providing some past examples identified by two participants: Anita Jellings (Dean of Students) and Sue Blackburn (Lecturer at School of Architecture and Design):

\[
\text{HND (from the early 1970’s) and BSc Rural Resource Management Programme (from the early 1990s) (closed intake in 2004)}
\]

These programmes included lab-based, field-based and real world case study work to explore different aspects of rural development, ‘covering philosophical, social science, economics, and environmental management from the perspective of different stakeholder groups’. The coursework had a placement year to apply theory into practice. In general, problem-based interdisciplinarity learning was ‘a norm’ at the former Seale Hayne Campus (Sue Blackburn, personal communication).

\[
\text{The Littoral Project}
\]

Littoral is, according to Sue Blackburn, ‘an umbrella title in the Faculty of Arts for creative and collaborative research projects that explore common themes of coast/sea/estuary’. Using part of the Exmouth Customs House for art projects, this experiential and collaborative project promoted ‘a dialogue between artists and curators’. The project later involved colleagues from different disciplines, including Marine Biology. The Littoral TQEF (HEFCE Teaching Quality Enhancement Fund) Project, which lasted for two years from January 2006 to December 2008, brought together those interested in interpreting the meaning of the littoral zone of landscape and created space for dialogue between them. The Littoral Project also developed multidisciplinary collaborative learning projects for staff and postgraduate students from different disciples including archaeology, anthropology, geology, cultural geography, art history, humanities (personal communication).

\[
\text{MRes Landscape Programme}
\]

This programme ‘covers the spectrum of landscape research in the arts and cultural geography involving heritage, landscape perception, commodification and landscape values in urban, rural, coastal and marine settings’ (Sue Blackburn personal communication).

\(^2\) In addition to the following examples, another initiative, supported by the Research in Teaching award, was the joint Centre for Creative Design and Technology Arts and Technology.
Both academics think that one of the general issues relating to the interdisciplinarity initiatives is that of academic resistance, which, as noted in the literature review, is not unique to Plymouth. In the words of Anita Jellings, ‘academics don’t like giving up any chunk of programme time to something that is not their subject’. She also pointed out their concerns around being involved in ‘completely different disciplines’. A further barrier, also not limited to the Plymouth experience, is the limit put on experimentation and innovation by professional bodies’ requirements.

The existing University of Plymouth structure is another constraint. Sue Blackburn thinks that there are strong school-based boundaries, which make cross-school initiatives practically difficult. She comments that there exists ‘a surprising resistance to thinking outside of the box and a distinct aversion to literatures from other pedagogies’. At the same time, where there is willingness to engage in interdisciplinarity, timetabling and funding arrangements are often not conducive to such approaches (as is the case generally in HEIs).

**Centre for Sustainable Futures and interdisciplinarity**

Since its inception, the Centre for Sustainable Futures (CSF) has been working to promote interdisciplinary teaching and learning for sustainability through different avenues.

(1) *Embedding interdisciplinarity in University of Plymouth policies*

CSF has commented on the previous Research and Innovation Strategy and a draft of the Teaching and Learning Strategy. For the latter, inclusion of interdisciplinary and transdisciplinary teaching and innovation was one of the key suggestions. Thus CSF proposed that the university should:

> review existing and potential opportunities for interdisciplinarity and transdisciplinarity approaches to teaching with a view to boosting innovation and staff development in these areas (communication to consultation, Selby and Sterling, March 2006).

More recently, CSF pointed out that the last consultative draft Teaching and Learning Strategy needed to flag the importance of interdisciplinary, cross-disciplinary and transdisciplinary approaches to teaching and learning (communication to consultation, Selby and Sterling, July 2008).

(2) *CSF Centre Fellowship scheme*

CSF has been encouraging Centre Fellows (academics part-bought out from different Schools/Faculties) to develop interdisciplinary curriculum initiatives. However, developments in this area have been extremely limited. It might be because of two interrelated reasons: a lack of School/Faculty culture to encourage interdisciplinarity initiatives and a lack of motivation and practical tactics among the fellows. At the same
time, links and interaction between Centre Fellows from different schools and disciplines have proved a positive experience for many.

(3) MSc in Learning for Sustainability (First intake in the 2006/7 academic year set within Faculty of Science; next intake in the 2009/10 academic year set within Faculty of Education). This interdisciplinary Master programme explores ethical, theoretical and practical frameworks which enable individuals, organisations, communities to engage in social change towards sustainability. The course was taught by teaching staff from Science and Education. Immersion experience in learning communities and organisations in the South West is one of the unique components of the programme. The programme was first validated by the Faculty of Science in a deliberate attempt to bring together science and education discourses and expertise. However, low recruitment in the first year demonstrated perhaps, the difficulties of interdisciplinary working.

(4) Wednesday Seminar Series
Since September 2007, CSF offers a Wednesday Seminar Series which are open to all the students and staff members. Each week different sustainability-related themes are discussed in an interactive manner. This series has been designed to be interdisciplinary, featuring topics and speakers that cut across interdisciplinary boundaries.

(5) CSF Common Module document (See Appendix 6)
CSF drafted the sustainability common module scheme, which was inspired by the EAT (Environmental Awareness, Teaching and Training) initiative at the University of Western Cape, one of the case studies discussed above. It suggests making modules available to students from the schools/faculties buying into the scheme throughout the three years under graduate programme. It remains an aspiration, subject to conducive developments in teaching and learning policy.

6.0 Analysis
Earlier sections, 3.00 and 4.00 contain a measure of analysis and commentary. This section builds on the review and case studies to offer an overview of key ideas and conclusions that arise from the research exercise (see Appendix 7 for further detail).

A main comment concerns the relationship between sustainability and interdisciplinarity. Neither is necessarily linked to the other: sustainability and sustainable development can be and are studied and approached from within distinct disciplines, whilst interdisciplinarity as an approach to the knowledge and pedagogy need not be centered on sustainability. However, it is clear that, given that so many issues associated with sustainability – for example, related to resource use and availability, equity and justice, social cohesion and community well-being, ecological integrity, economic viability, uncertain futures, local and global policy responses and so on – are complex, multi-
faceted and unbounded, single issue disciplines seem ill-equipped to encompass and handle them alone. Against this background, increasingly, disciplines informed by other disciplines, and disciplines working towards interdisciplinary arrangements, are likely be in evidence. In some institutions, there may be sufficient flexibility to allow experiments with ‘true’ transdisciplinarity. While sustainability and interdisciplinarity may not be always found together in higher education, many sustainability theorists and practitioners - including all the key developers in the case studies - see some expression of interdisciplinarity as necessary to achieve multiple perspectives, insights and understanding on sustainability issues – not least as these are often seen to be ‘wicked’ rather than simple and contained problems. A further driver in this direction, is the interest amongst employers for graduates who possess ‘soft skills’ and flexibility in their understanding and approach to issues. Furthermore, the increasing profile of sustainability amongst policy makers and the public is reflected in interdisciplinary research agendas in higher education, and it follows that there could well be corresponding pressure for teaching and learning policy and practice to follow suit in terms of embracing interdisciplinarity.

However, it is clear from the review (3.00) and case studies (4.00) that the institutionalisation of interdisciplinarity – whether or not it is oriented towards sustainability – is not at all simple. Not least, the holistic and cross-cutting modes of organisation and inquiry do not sit easily with disciplinary structures, as evidenced by all the case studies. Success depends on many factors, including the energy and vision of the protagonists, the response of students and colleagues, the level of support and resources from senior managers, and the level of integration envisaged. All initiatives detailed in the cases are required by organisational structures to sit within a school and faculty. Kathryn Hegarty of RMIT and Rehema White of St. Andrews in particular emphasise the point that space to manoeuvre across disciplines is hampered by the necessary bias of traditional allegiances; the Faculty of Arts and Humanities, the Faculty of Science and so forth. Where interdisciplinarity is attempted within a faculty, and where similar disciplines work together, the initiative may be easier to develop and sustain. For example the engineering related disciplines appear to converge with relative ease at Strathclyde. However, adding the social aspects of sustainability into the mix has proved a significant challenge.

The case study of the Centre for Human Ecology provides an interesting example, where its work was legitimated by its much larger, former partner institution (the University of Strathclyde), but its relative freedom allowed experimentation with alternative pedagogies that many sustainability educators advocate. At the same time, interest shown by Strathclyde and by other ‘host’ institutions in the programmes reviewed in the case studies, indicates the potential of small scale innovation to affect the wider institution: this is particularly well illustrated by St Andrews. It may be that the potential for mainstream change towards interdisciplinarity and sustainability is – inevitably - engendered first on the margins of conventional policy and practice.
At the same time, making progress is hampered by a lack of consensus about both the meaning and implication of terms. The cases display a broad spectrum of responses ranging from key developers making no attempt to define interdisciplinarity, to a thoroughly debated and succinct typology. This finding echoes key finding (5) from the Brooks and Ryan 2008 report with regards to sustainability: ‘an agreement to view ‘sustainability’ as a ‘threshold concept’” whose richness and importance disallowed final definitions’.

What is clear from this research is that there is no easy formula for developing interdisciplinary programmes around sustainability. In most cases, and in the case studies reviewed here, it has been a matter of growing an idea in conditions which have then been proved more or less fertile. For the future, the growth of interdisciplinary programmes linked to sustainability will depend on a willingness on the part of policymakers and academics to ‘design in’ interdisciplinary approaches in their teaching and learning policies and practices, so that some of the struggles (evident above) to assert the identity and logistics of interdisciplinarity are eased, and the benefits to academics and students of working in this way are more quickly won and apparent.

In sum, whilst there is expertise and experience in HEIs in this country as regards interdisciplinarity, it still appears on the margins of mainstream practice which remains dominated by discipline-based practices and structures. Initiatives which link sustainability and interdisciplinarity are rarer still. Embedding interdisciplinarity into the policies, practices and culture of the HEI is difficult because it challenges cultural and structural norms, yet, where it is done well, it affords a renewal of pedagogy and stimulus to learning, and a boost to collaborative endeavour and cross-fertilisation that benefits the host institution – both internally and in terms of its reputation. Given that sustainability-related issues are increasingly evident and pressing, and that addressing sustainability in the real world often demands interdisciplinary approaches, it is safe to assume that HEIs seeking to innovate in a changing world will need to pay increasing attention to interdisciplinarity and sustainability and their interrelationship. Whilst there are some signs of this with regard to research, there is a distinct danger that similarly oriented teaching and learning will fall behind any such movement. Yet, as noted above, one of the leading scholars in the field, Julie Thompson Klein, believes that interdisciplinarity is a key to universities re-thinking their purposes and practices as fundamental level, suggesting that ‘The ultimate goal is to reconstruct what is taught and how it is taught’ (Klein 2006, 16). Whether or not this is likely or possible, the last word goes to Higher Education Minister David Lammy who challenges HEIs:

Increasingly in the future, passion and knowledge for sustainability will set you apart (Lammy 2009, 24).
7.0 Recommendations – general

- Review, at senior management level, past and current manifestations of interdisciplinarity teaching and learning in the HEI in relation to sustainability, and elucidate factors which have facilitated and constrained such work.

- Review at senior management level, any interdisciplinary teaching and learning initiatives in the HEI with a view to introducing sustainability as a touchstone for further development.

- Review manifestations of interdisciplinary research in relation to sustainability and examine how far this has encouraged interdisciplinary teaching, with a view to increasing linkages - and opportunities for collaboration - between interdisciplinary research and interdisciplinary teaching/pedagogy.

- Recognise the links between institutional policy aspirations related to sustainability and social responsibility on the one hand, and the need for interdisciplinary teaching programmes which reflect this ethos on the other.

- Review teaching and learning policies for the express encouragement of and support for interdisciplinarity in relation to sustainability, and for any disparities between policy and practices.

- Provide incentives for interested academics to pool ideas, experience and enthusiasms on interdisciplinarity and sustainability with a view to initiating pilot projects.

- Consider how to develop, support and encourage pilot innovative interdisciplinary teaching and learning experiences around sustainability issues, from small scale to large scale, depending on circumstances and opportunities.

- Link interdisciplinary initiatives around sustainability to ‘skills for employability’ programmes, and vice-versa.

8.0 Recommendations – University of Plymouth

- Review all the above recommendations in relation to the University of Plymouth.

- Develop closer links and consistency between policies i.e. link interest in interdisciplinarity as outlined in the Research and Innovation Strategy 2009-2012 (key theme 5) with education for sustainability in Teaching and Learning Strategy 2009-2012 (key theme 6), in support of research informed teaching.
• Review how better consistency can be developed between the university’s endorsement of interdisciplinarity in the student learning experience as noted in the university’s Sustainability Policy, and the university’s Teaching and Learning Strategy.

• Further investigate examples of interdisciplinary teaching and learning and create a mechanism to collate and disseminate them across the university.

• Review the Sustainability Common Module Scheme proposal (see Appendix 6).

• Develop formal and informal support mechanisms for academic staff members who would like to develop interdisciplinary teaching and learning initiatives on sustainability.
9.0 References


http://www.strath.ac.uk/alumni/sp (Last visited 1 June 2009)


http://www.heacademy.ac.uk/projects/detail/esd_interdisc_series2007 (Last visited 1 June 2009)


Centre for Human Ecology (CHE)
http://www.che.ac.uk/mambo/content/view/30/1/ (Last visited 1 June 2009)

Chettiparamb, A. (2007) Interdisciplinarity: a literature review, The Higher Education Academy Interdisciplinarity Teaching and Learning Group, Subject Centre for Languages, Linguistics and Area Studies, University of Southampton.

Ciao Review Site
http://www.ciao.co.uk/Plymouth_University__Review_5601717 (Last visited 1 June 2009)


Crace, J. ‘Protest and Revise’, The Guardian, 18th October 2005
http://www.guardian.co.uk/education/2005/oct/18/studentpolitics.students (Last visited 1 June 2009)


G8 Summit, Sapporo Sustainability Declaration, 1 July 2008 http://g8u-summit.jp/english/ssl/ssl/index.html (Last visited 1 June 2009)


http://www.hefce.ac.uk/pubs/rdreports/2008/rd03_08/ (Last visited 1 June 2009)


University of Kingston. CETL-ESD C-SCAIPE

University of Plymouth. MRes Landscape Programme
http://www.plymouth.ac.uk/courses/postgraduate/taught/3576/MRes+Landscape


http://csf.plymouth.ac.uk/files/UPSUSTPOLICY12.pdf

http://csf.plymouth.ac.uk/?q=policy


University of Strathclyde
http://gs.strath.ac.uk/content/view/78/103/ (Last visited 1 June 2009)

University of the Western Cape (UWC)
http://www.uwc.ac.za/?module=cms&action=showfulltext&id=gen11Sr7Nme54_7625_12100550562&menustate=about (Last visited 1 June 2009)


Acknowledgements

We would like to thank the following who assisted the research:

Sue Blackburn, Brian Dickson, David Grierson, Kathryn Hegarty, Anita Jellings, Verene Nicolas, Rehema White, Richard White, Tahir Woods for participating with in-depth interviews; David Selby for proof reading; Catherine Woodburn, Vicky Hill and John Downie for document design; Heather Witham for raising awareness of the research across the sector; James Derounian, Neil Gordon, Alun Morgan, Zoe Robinson, Arran Stibbe, Bland Tomkinson, Tony Westcott, Kevan Williams and for responding to the questionnaire; and Brian Chalkley and Debby Cotton for comments on the section relating to the University of Plymouth.

About the authors

**Joanna Blake** is a Research Assistant at the Centre for Sustainable Futures. She gained professional experience in community development in Brighton and Hove before moving to Devon. Previous roles include coordinating partnership development on a European Social Funded project and working with health and education projects in India and Peru.

**Fumiyo Kagawa** is a Research Team Coordinator at the Centre for Sustainable Futures, University of Plymouth, U.K. She is currently completing her doctoral studies examining the interface between emergency education and education for sustainability.

**Dr Stephen Sterling** is Schumacher Reader in Education for Sustainability at the Centre for Sustainable Futures, and Senior Advisor to the Higher Education Academy ESD Project. He is also a Visiting Research Fellow at the Centre for Research in Education and the Environment at the University of Bath. He has worked as a consultant in environmental and sustainability education in the academic and NGO fields nationally and internationally, and has published widely.
Appendices

Appendix 1- Questionnaire sent to JISC Lists

Getting It Together - Interdisciplinarity and Sustainability In The Higher Education Institution

Many thanks for your interest in our research into sustainability and interdisciplinarity. We are looking for a limited number of case studies to research for our forthcoming publication. If you are interested in participating and, with your colleagues, providing data for a case, please complete the short questionnaire below:

Name:_______________________________________________________

Institution:____________________________________________________

Email address:________________________________________________

Address:_____________________________________________________

Telephone:___________________________________________________

1. Please briefly describe the sustainability-related interdisciplinary programmes you have running (level or levels at which taught; disciplines involved; date of launch of programme; nature of programme; number of students participating in the programme; size and composition of teaching team).

2. Please bring our attention to paper and web-based documentation on the programme in the space below (mailing us the paper documentation if possible).

3. Please briefly itemise in bullet form the three principal benefits and opportunities you see arising from your interdisciplinary programme(s).

4. Please briefly itemise in bullet form the three principal drawbacks as you see them of your programme(s).

5. Would you say the programme has been welcomed or otherwise received by your university community?

6. Please confirm by signing below that purposefully-chosen colleagues and randomly-chosen students might be contactable and available for interview.

Signed _______________Date ________________
### Appendix 2- Data from initial questionnaire responses

<table>
<thead>
<tr>
<th>Institution</th>
<th>Contact</th>
<th>Department</th>
<th>Interdisciplinary Initiative</th>
<th>Level</th>
<th>Year began</th>
<th>Approx. no. students per year</th>
</tr>
</thead>
<tbody>
<tr>
<td>University of Bristol</td>
<td>Siobhan Harris</td>
<td>Arts, Engineering, Sciences, Social Sciences</td>
<td>Sustainable Development</td>
<td>UG module</td>
<td>2005</td>
<td>70</td>
</tr>
<tr>
<td></td>
<td><a href="mailto:Siobhan.Harris@bristol.ac.uk">Siobhan.Harris@bristol.ac.uk</a></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>University of East Anglia</td>
<td>Kevan Williams</td>
<td>Norwich Business School</td>
<td>MBA in Strategic Carbon Management</td>
<td>PG/professional course</td>
<td>2008</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td><a href="mailto:kevan.williams@uea.ac.uk">kevan.williams@uea.ac.uk</a></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>University of Gloucestershire</td>
<td>Arran Stibbe</td>
<td>Department of Humanities</td>
<td>Language and Ecology</td>
<td>UG module</td>
<td>2004</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td><a href="mailto:astibbe@glos.ac.uk">astibbe@glos.ac.uk</a></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>University of Gloucestershire</td>
<td>James Derounian</td>
<td>Department of Natural and Social Sciences</td>
<td>Community Development &amp; Governance</td>
<td>Foundation Degree, CertHE &amp; BA (Hons)</td>
<td>1980s</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td><a href="mailto:jderounian@glos.ac.uk">jderounian@glos.ac.uk</a></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>University of Keele</td>
<td>Zoe Robinson</td>
<td>School of Physical and Geographical Sciences</td>
<td>Greening Business: Employability and Sustainability/ Forthcoming BSc Environment and Sustainability</td>
<td>Greening Business - Level 1 UG module</td>
<td>2008</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td><a href="mailto:z.p.robinson@keele.ac.uk">z.p.robinson@keele.ac.uk</a></td>
<td></td>
<td></td>
<td>Environment &amp; Sustainability - UG programme</td>
<td>Environment &amp; Sustainability - 2009</td>
<td></td>
</tr>
<tr>
<td>London South Bank University</td>
<td>Alun Morgan</td>
<td>Faculty of Arts and Human Sciences</td>
<td>Education for Sustainability Programme</td>
<td>Postgraduate Diploma/Master of Science (MSc) (with option of Continuing Professional Development)</td>
<td>1994</td>
<td>125</td>
</tr>
<tr>
<td></td>
<td><a href="mailto:morgana@lsbu.ac.uk">morgana@lsbu.ac.uk</a></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| University of Manchester | Rosemary Tomkinson  
rosemary.tomkinson@manchester.ac.uk | Faculty of Engineering and Physical Sciences | Pilot interdisciplinary engineering module | UG module | 2007 | 90 |
|--------------------------|-------------------------------------|-----------------------------------------------|-------------------------------------------|------------|------|----|
| RMIT University, Melbourne, Australia | Kathryn Hegarty  
kathryn.hegarty@rmit.edu.au | School of Global Studies, Social Science and Planning | Sustainability, Society and Environment | UG module supported by a Community of Practice | 2004, rewritten 2008 | 500 |
| St. Andrews University | Rehema White  
sustainability@st-andrews.ac.uk | Department of Geography and Social Science | BSc/Scottish MA in Sustainable Development | UG programme | 2004 | 300 |
| University of Strathclyde | David Grierson  
d.grierson@strath.ac.uk | Department of Architecture, Faculty of Engineering | Postgraduate Training Programme in Sustainable Engineering | MSc, PgDip, PgCert | 1999 | 500 |
| University of Strathclyde in partnership with the Centre for Human Ecology | Verene Nicolas  
verene.nicolas@strath.ac.uk | Department of Geography and Social Science | PG Cert, PG Diploma, MSc Human Ecology | PG programmes | 2005-2009 | 15 |
| University of the West of England | Tony Westcott  
tony.westcott@uea.ac.uk | School of the Built and Natural Environment | 18 UG programmes | UG core modules | 2001 | 400 |
| University of the Western Cape | Richard White  
rwhite@uwc.ac.za | Multi-departmental | Environmental Awareness: Techniques and Training (EAT) | Elective UG module | 2002 | 140 |
Appendix 3 - SSI Questions for key developers

1. You are an originator or key player in an initiative within your university to address the sustainability agenda through interdisciplinary curriculum development and course provision. Could you begin by telling the outline story of that initiative, identifying ‘high points’ and ‘low points’?

2. What considerations lay behind you and your colleagues choosing an interdisciplinary approach to learning and teaching about sustainability?

3. Do you consider an interdisciplinary approach to learning and teaching about sustainability to be essential or useful? Please explain your answer.

4. What disciplines are embraced within your sustainability-related interdisciplinary curriculum? Why those? Could there be other disciplines included in your view and, if so, which and why?

5. Could you describe how your sustainability-related interdisciplinary programme(s) works? How is curriculum developed? Do you have whole team planning or devolved planning? What blocks of time are available? Is there team teaching? If so, how does that operate, and is it successful? Is there team evaluation of the programme? Is assessment conducted in any special way?

6. Could you also explain how the programme(s) work institutionally? How are staff members freed up to teach the programme? How are financial aspects and allocations worked out? How do students buy into the programme(s)? How does the interdisciplinary provision fit into a student’s wider programme? How are the interdisciplinary programme(s) promoted?

7. In your view, how thoroughgoing (how wide and deep) is your interdisciplinary approach to learning and teaching about sustainability?

8. What do you see as the benefits of interdisciplinary approaches to sustainability for the student learning experience? What are the concrete benefits in terms of knowledge, understandings and skills? How have students responded to your programme(s)? What issues have arisen?
9. Does engagement in sustainability-related interdisciplinary programs dis-benefit students in any ways?

10. What issues have arisen in developing an interdisciplinary approach to learning and teaching about sustainability with school senior managers and colleagues and with university senior administrators? On a spectrum between warm embrace and hostility where have responses to programme(s) primarily fallen? Who have been your warmest supporters? Why? Who have been your most strident opponents? Why?

11. What structures are necessary in your view to facilitate an effective interdisciplinary programme, and what structures militate against it? What reforms, structural and otherwise, would most help promote interdisciplinary programs in general and your programme(s) in particular?

12. Do you distinguish between interdisciplinary, multidisciplinary and trans-disciplinary approaches to learning and teaching about sustainability? If so, how? Can you give examples of each of these in practice within your university’s programs?

13. In your view do interdisciplinary learning frameworks for sustainability have implications in terms of pedagogy? If so, what are they? Are there any special benefits in terms of a praxis orientation to the learning?

14. It is often said that there is a difference between the rhetorical embrace of the importance of interdisciplinary teaching, learning and research and its actual embrace. In your estimation, where does your university stand? Does the interdisciplinary reality match any interdisciplinary rhetoric? Does the reality fall short of any rhetoric? Is there a pro-interdisciplinary rhetoric about either sustainability research or sustainability teaching? Are the two linked in policy terms? In actuality?

15. You have brought together the interdisciplinary and sustainability agendas within your programme. What is your sense of the degree of understanding of each agenda within the university community? The degree of buy-in? Is the perception of the two agendas that they are: (a) complementary, (b) opposed or (c) unconnected?
16. Is there any other aspect of the relationship between sustainability and interdisciplinarity that you would like to discuss?

17. Finally, do you have paper or web-based information in the public domain that we might have or see?
Appendix 4 - Questionnaire completed by senior personnel

1. Could you please introduce yourself and outline your role in general, and in relation to the sustainability oriented interdisciplinary programme.

2. Is there support at policy level for interdisciplinarity in relation to sustainability in teaching and learning? If so, what added value is this thought to bring?

3. In your view, how thoroughgoing (how wide and deep) is the said interdisciplinary approach to learning and teaching about sustainability? How far, if any, is there a disparity between the reality of interdisciplinarity practice, and interdisciplinarity rhetoric or policy?

4. What issues have arisen in developing an interdisciplinary approach to learning and teaching about sustainability with colleagues? Have those involved and affected been mostly receptive or resistant, or both? Can you elaborate the majority response?

5. What structures are in place to facilitate an effective sustainability oriented, interdisciplinary initiative?

Your answer might touch on the following:

- What university policies or strategies or support systems are in place to facilitate the interdisciplinary initiative?
- Is there paper or web-based information in the public domain that we might access?
- What reforms, structural and otherwise, would most help promote or strengthen interdisciplinary programs in general and your programme(s) in particular?

6. Do you distinguish between interdisciplinary, multidisciplinary and trans-disciplinary approaches to learning and teaching about sustainability? If so, how?

7. Do you consider an interdisciplinary approach to learning and teaching about sustainability to be essential or useful? Please explain your answer.
8. Is there any other aspect of the relationship between sustainability and interdisciplinarity that you would like to discuss?
Appendix 5 - Questionnaire for University of Plymouth personnel

1. Do you know of any past or present interdisciplinary, teaching and learning initiatives at University of Plymouth. If yes, please provide details.

2. What factors impeded the initiative’s success?

3. What factors contributed to the initiative’s success?

4. What is your view of the relationship between interdisciplinarity and sustainability?

   How far, in your opinion, is an interdisciplinary approach necessary to promote an understanding of sustainability?

5. Could you provide feedback on the CSF Common Module proposal in terms of the desirability and feasibility of such an initiative.

6. What conditions (eg. Policy, structures, resources, capacity) would be required for this kind of initiative to get off the ground)?
Appendix 6 - CSF Common Module Document

CENTRE FOR SUSTAINABLE FUTURES Common Module Document

THE MTA FOR SUSTAINABILITY SCHEME: DEVELOPING A PROGRESSION OF COMMON [OPEN AND ACCESSIBLE TO ALL SUSTAINABILITY MODULES AT UNDERGRADUATE LEVEL AT THE UNIVERSITY OF PLYMOUTH

INTRODUCTION

This is a proposal to establish a progression of common sustainability modules throughout the three years of undergraduate programmes at the University of Plymouth. The modules would be available to all students of faculties and schools buying into the scheme. Taught by academic staff from participating schools and faculties, their distinguishing feature would be the integration of disciplinary insights and perspectives through interactive, participatory and team facilitated forms of learning. The aim would be to achieve expedited approval and validation of the scheme at level one for September 2007, at level two for September 2008, and level three for September 2009. The Centre for Sustainable Futures would coordinate, orchestrate and otherwise take responsibility for the scheme from 200710. The proposal is largely based upon the EAT (Environmental Awareness: Techniques and Training) initiative at the University of Western Cape (UWC), South Africa as developed by Richard White and colleagues.

THE IDEA

Two elective modules would be made available under the MTA (Mindfulness, Training, Action) for Sustainability Scheme to undergraduate students attached to participating faculties at levels one, two and three. The modules would constitute one quarter of a student’s load at level one, and one third at levels two and three. Students electing at level one could continue to the next two levels as they chose but students not taking level one would have to demonstrate the necessary knowledge and understanding to elect for level two. Students not taking levels one and/or two could not opt for the Scheme at level three. At level one (Mindfulness) the two modules, one per term, would be devoted to students: developing an holistic understanding of sustainability concepts, ideas and issues through inputs from a range of disciplines; becoming mindful of the implications of sustainability for the personal, social and future professional dimensions of their lives; applying their learning and understanding to a range of issue-based casestudies, local through global. Topics covered in an interdisciplinary way would include: Environmental and Ecological Thought, Introduction to Environmental and Ecological Ethics, Health and the Environment, Sustainability and Social Justice, Environmental Conservation, Water, Climate Change, Environmental Education, Environmental Law, Ecotourism, the Built Environment. Outcome: the Sustainability mindful student. At level two (Training) the two modules, one per term, would be devoted to developing the skills and capacities for becoming and being an effective sustainability practitioner and professional; for instance, conducting impact
assessments, environmental monitoring, campaigning and lobbying skills, decision making skills, fieldwork and other practical skills, quantitative and qualitative research skills, communication (receiving and conveying ideas and information) skills, community development skills. Skills development would happen to a significant extent within fieldwork contexts. Academic staff from participating faculties and schools would bring their experience and insights to bear on each skill. Outcome: the sustainability skilled student. At level three (Action) the knowledge from level one and skills development of year two (including incidental skills learning at level one and additional knowledge accrued at level two) would be applied within a real life context through a student designed and implemented project. The term one module would be devoted to planning the project with planning and familiarization visits to the project location. The term two module would be devoted to undertaking the project with regular onsite involvement. Students would be supervised by two academics drawn from different disciplines. Outcome: the sustainability engaged student. Students completing the MTA for Sustainability Scheme would have a good (holistic and interdisciplinary) grasp of sustainability thinking and issues, would have developed the skills of the sustainability practitioner, and would have sharpened their understandings and honed their skills within a real situation. Each successive year of MTA builds on what has gone before.

KEY DESIGN CONSIDERATIONS

The key criteria for the detailed design of the Scheme would be:

- Accessible to all students (or to all students attached to participating faculties and schools)
- No particular knowledge base required for entering the programme at level one
- Scheme open and elective throughout (save for lateral move into Scheme in year three)
- Students participating still need to major in a chosen discipline
- Taught throughout by interdisciplinary teams bringing the insights, perspectives and understandings of a range of disciplines to each topic considered or skill developed
- Employment of interactive, participatory and experiential learning methodologies, with an accent on the field as extended classroom
- The scheme should allow for actual or virtual interventions – in both classroom and field – from regional, national and global sustainability experts
- Arenas of sustainability, personal, local and regional through to global, all given equal exposure
- Scheme allows for extension into a full programme if participant faculties and schools felt this desirable
- Scheme responds to and aligns with what the government and corporate sector are calling for in terms of sustainability literacy
KEY ASSUMPTIONS

Key assumptions include:

- A holistic and interdisciplinary understanding of sustainability is important if students are to become well versed in the field as well as effective change advocates and agents
- Such a programme will better enable students to ‘think outside the box’ not least because they will encounter multiple challenges from outside their ‘home’ discipline
- A shared lexicon, cutting across disciplines, is vital for sustainability efforts and endeavours
- The existence of CSF provides the University of Plymouth with an optimal window of opportunity (200710) for launching such a scheme and marking itself out as the leader in sustainability in higher education
- The faculties and schools currently affiliated to CSF through Centre Fellowships would be the pathfinders in participating in the Scheme (School of Architecture and Design; Faculty of Education, Plymouth Business School, School of Law, School of Geography, School of Earth, Ocean and Environmental Sciences, School of Biological Sciences, Environmental Build Group and Faculty of Technology, School of Computing, Communications and Electronics)
- Current and future Centre Fellows would be interested in involvement in the Scheme
- By marrying a discipline based major focus of study with the MTA Scheme, the University of Plymouth would be well placed within a short period of time to make the claim that it is producing graduates who are rounded, sustainability literate, and, on that account, eminently employable professionals

David Selby
8.1.2007
Appendix 7 - Detailed findings

This appendix reflects some detailed findings and trends from the case studies and literature review. The aim of this section to provide pointers to innovators who wish to develop interdisciplinary programmes around sustainability.

- Innovation around interdisciplinarity, that is, both its establishment in an institution, but also its consequent embedding and development, often requires one or more persons with energy, vision and determination to ‘push it through’, often against the odds.

- Interdisciplinary curriculum developers need to be opportunists, able to capitalise on openings, rewards, and expressions of interest in their institution.

- For interdisciplinary programmes around sustainability to survive and thrive, they have to have support, resources and encouragement from senior management, reflected in appropriate structures and policies.

- The acceptance, embedding and continuing operation of interdisciplinary programmes takes more work than conventional disciplinary programmes, including additional assistance to students, coordinating and communicating between members of a team of academics from different disciplines and schools, and championing the programme within the university and to policymakers.

- Successful implementation and development of interdisciplinary programmes involves professional staff development and constant review.

- The establishment of interdisciplinarity in mainstream institutions is often seen as complementary, rather than as a competing alternative, to established disciplines.

- Multidisciplinarity can be a stepping stone to interdisciplinarity, but is not itself sufficiently integrated to be labelled as interdisciplinarity.

- Getting beyond multidisciplinarity in an ostensibly interdisciplinary programme, i.e. achieving deeper levels of integration takes time, commitment and constant review.

- Achieving transdisciplinarity in mainstream institutions is particularly difficult, and may be largely the province of educational establishments outside the mainstream who can work across boundaries more easily.

- There is wide agreement amongst academics interested in sustainability that it requires the adoption of interdisciplinary approaches to teaching and learning if understanding beyond disciplinary boundaries is to be engendered.

- Interdisciplinarity is often more about the development of a range of ‘soft skills’ than content.
• Good interdisciplinary programmes will support the development of critical and self-reflective skills.

• There is no pedagogy exclusive to interdisciplinarity: rather, interdisciplinary programmes are often characterised by attempts to incorporate active, participative and experiential pedagogies.

• Interdisciplinary programmes are often associated with innovative and varied assessment methods.

• It more difficult to achieve interdisciplinarity in undergraduate settings, partly for structural reasons, but partly as undergraduates are less ready for the kinds of thinking and skills that interdisciplinarity requires.

• There are real and continuing obstacles to interdisciplinary initiatives in HEIs relating to established structures and policies based on a disciplinary-based culture.

• Where to place interdisciplinary programmes administratively, so that they are not dominated by one school, is a common problem.

• Innovation requires both bottom-up mobilisation and energies, and top-down support.

• The outlook for interdisciplinary programmes is made more positive by rising interest in HEIs in being seen to respond to the sustainability agenda: however change in teaching and learning policies is slow to take effect.

• One way forward for interdisciplinarity programmes is to link more overtly to the skills debate and employers’ calls for graduates to possess ‘real world’ and ‘soft’ skills of flexibility, adaptability, creativity etc.

• Rising interest in and pressure towards interdisciplinary research, often in tandem with interest in sustainability issues, presents an opportunity for increased interdisciplinarity in teaching and learning.
PedRIO Papers

Paper 1
Widening Participation: PedRIO Horizon Scanning Report
Debby Cotton, Pauline Kneale and Tricia Nash

Paper 2
The Gender and Ethnicity Attainment Gap Research Project
Debby Cotton, Rosemary George and Mel Joyner

Paper 3
Community Engagement Towards a Sustainable Future
Joanna Blake

Paper 4
Getting it together. Interdisciplinarity and Sustainability in the Higher Education Institution
Joanna Blake, Stephen Sterling and Fumiyo Kagawa

Getting it together. Interdisciplinarity and Sustainability in the Higher Education Institution
Joanna Blake, Stephen Sterling and Fumiyo Kagawa

PedRIO paper 4
http://hdl.handle.net/10293/1124
www.plymouth.ac.uk/research/pedrio