Work-based learning as a catalyst for sustainability: a review and prospects

Abstract

Purpose The purpose of this paper is to highlight the continuing dearth of scholarship about the role of work based learning in education for sustainable development, and particularly the urgent demands of climate literacy. It is proposed that forms of work based learning can act as catalysts for wider cultural change, towards embedding climate literacy in higher education institutions.

Design/methodology/approach This paper draws data from action research to present a case study of a Climate Change Project conducted through a work based learning module at a mid-sized university in the United Kingdom.

Findings Contrary to the predominantly fragmented and disciplinary bounded approaches to sustainability and climate literacy, the case study demonstrates how a form of work based learning can create a unifying vision for action, and do so across multiple disciplinary, professional service, and identity boundaries. In addition, the project generated indicators of cultural change including extensive faculty level climate change resources, creative ideas for an innovative mobile application, and new infrastructural arrangements to further develop practice and research in climate change.

Practical implications This paper provides an illustrative example of how a pan-faculty work based learning module can act as a catalyst for change at a higher education institution.

Originality/value This paper is a contemporary call for action to stimulate and expedite climate literacy in higher education, and is the first to propose that certain forms of work based learning curricula can be a route to combating highly bounded and fragmented approaches, towards a unified and boundary-crossing approach.

Keywords

Education for sustainable development, climate literacy, work based learning

Introduction

Over a decade ago, the United Nations' established the Principles of Responsible Management Education (PRME) initiative to promote responsibility and sustainability as broad concepts within the curricula, to influence the next generation of professionals in workplaces and indeed in academe. More recently, and against this backdrop, PRME released a statement to respond to the increasingly divisive political landscapes which are appearing on global platforms, including new senior appointments in the US, the UK, and increasingly so across the globe. In an email communication that was sent to all members of PRME in February 2017, Andrew Main Wilson (Chair of the PRME Steering Committee) and Jonas Haertle (Head of the PRME), stated:

> Our global community has thrived on the commitment and the ideas brought by people from around the world… we are deeply concerned about growing protectionism, nationalism and populism on the global stage… Scientific progress depends fundamentally on an open exchange of ideas, scholars and students. To meet global challenges like climate change that are threatening our lives and those of future generations, we must depend on a science-based system of evidence. We call for more business and management-related higher education institutions around the world to join us and stand up for the principles and values we all share.

This statement followed a significant event a year earlier, hosted by UNESCO's International Institute for Educational Planning (IIEP), which debated the role of higher education in promoting Sustainable Development Goals (SDGs). A key outcome was the reiteration of the idea that higher education has a vital role in achieving the SDGs, but that the highly silo-structured nature of higher education was a significant impediment to realise its potential contribution. This structure was evident through disciplinary boundaries within higher education institutions, but also at the macro-system level (where higher education is an interdependent part of all educational and training systems) (UNESCO, 2016).

Together, these silos were recognised as inhibiting the sharing of practices and understandings needed to develop a coherent set of actions (ibid). Scholars treat this lack of connectedness to the issues of responsibility, ethics and sustainability, as a failing of business and management pedagogies (e.g. Wall, 2016a,b,c; Wall and Perrin, 2015; Wall and Jarvis, 2015; Miller and Xu, 2016). In addition, scholars critique the lack of a clear, *single* theoretical framework (Nonet, Kassel, and Meijs, 2016) on the one hand, and on the other, critique the diverse *pluralism* and related 'academic provincialism' in presenting perspectives in the educational setting (de los Reyes, Kim, and Weaver, 2016). These oppositional critiques indicate the diversity of views currently available within this field.

In conceptualising the diversity of ways sustainability has been integrated (or not) within and across curricula, Painter-Morland, Sabet, Molthan-Hill, Goworek, and de Leeuw (2016) found that most business schools tend to adopt one or more of the *four* main approaches originally proposed by Ruskino (2010) (see Figure 1 below). Overall, they argued that practice and scholarship appears to focus on fragmented, silo and 'bolted on' approaches, which need to be integrated at the institutional level (Painter-Morland et al 2016).

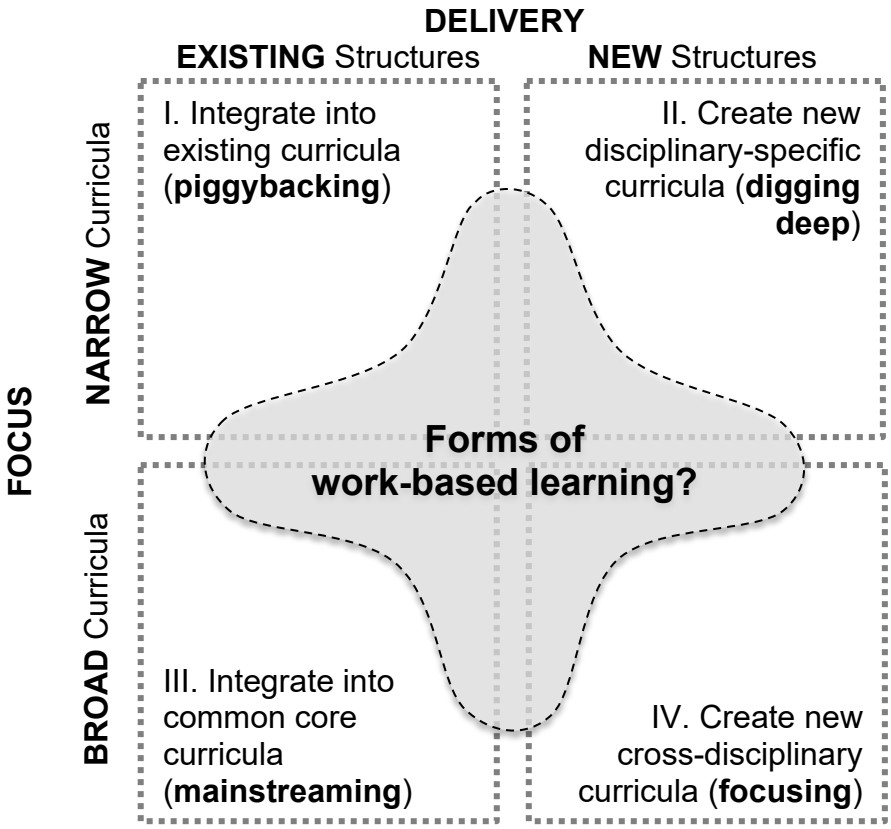

Figure 1. Matrix showing broad options of integrating sustainability into curricula, and the potential locations of work based learning. Source: Adapted and extended from Ruskino (2010) and Painter-Morland et al (2016).

This empirical work, however, did not consider the *fifth* category, co-curricular activity, originally proposed by Ruskino (2010). Within this fifth option, Ruskino (2010) positioned service learning, which has experiential commonalities with forms of work-based learning in higher education, such as learning in the circumstances of practice (Billett, 2014). Interestingly, however, Ruskino explained this fifth category of education as "exist[ing] independently of the four quadrants because they are outside of curricula" (p512). In this way, both the original conception of this model (Ruskino, 2010), and the latter empirical work (Painter-Morland et al, 2016), omitted consideration of the forms of work based learning which are either part of a programme of study (such as a module or unit), or which formed the main pedagogic vehicle of learning for an entire programme (Wall, 2015). In this way, forms of work based learning may offer additional insights into how sustainability is integrated or manifests in educational forms.

An additional limitation of this conceptual and empirical work is that is masks all aspects and dimensions of sustainability into a *generalised* agenda. A major concern, as highlighted by PRME's communication earlier, relates specifically to climate change, and in the context of higher education, climate literacy. Indeed, this was confirmed by searching all databases of the EBSCO Business Source Elite with only 5 full-text academic peer reviewed journal articles out of 1446 identified as being relevant to this more specific agenda (i.e. using the terms 'climate literacy', 'climate change literacy', 'climate change education' or 'curriculum' and 'climate change'). The scholarship of climate literacy therefore remains limited, against a

backdrop of urgent calls for higher education to do more to tackle this significant global issue.

This paper seeks to develop a greater understanding of the approaches that can be used to develop climate literacy in higher education institutions, and in particular, proposes that work-based learning can act as catalyst for wider cultural change, towards embedding climate literacy. In this way, this paper extends the conceptual and empirical work currently available about *how sustainability is integrated* into higher education, but more importantly, develops insight into *how change can be instigated* in higher education through work based learning curricula. The paper does this through a case study of a Climate Change Project conducted through a work based learning project at in a UK university, and draws from an action research study into its delivery. The next section of this paper examines climate literacy and the fragmented nature of it in practice and scholarship, which sets the scene for the methodological approach adopted. The findings are then outlined in relation to the creation of a unifying vision or framework for action across multiple disciplinary, professional, and identity boundaries. The final section discusses the wider implications of the findings and concludes with questions which might stimulate additional insights into how work based learning can be utilised to inculcate climate literacy in practice.

Fragmentation in the practice and scholarship of climate literacy

Climate literacy can be conceptualized as the understanding of the climate system, an ability to communicate climate change information in a meaningful way, and to make informed responsible decisions on actions that may impact the climate (Bofferding and Kloser, 2015; Veron, Marbach-Ad, Wolfson, and Ozbay, 2016). Yet in examining the broader pedagogical drivers informing how sustainability is understood in management education, Kurland, Michaud, Best, Wohldmann, Cox, Pontikis, and Vasishth (2010) identified major fragmentation with a diverse range of perspectives. These perspectives include disciplines such as consumer sciences, geography, management, political science, psychology, recreation and tourism, and urban studies (see p471 for an overview). For example, from a geography perspective, curricula tend to focus on the causes of global warming, energy use, and population, whereas from a management perspective, curricula tend to focus on managing against tragedies and addressing sustainability issues (Kurland et al 2010, p 471).

Other scholars such as Anyanwu, Le Grange, and Beets (2015) have found that climate literacy does not only consist of alternative perspectives, it necessarily crosses multiple boundaries, including biological, social and physical sciences, and is at heart an ‘interdisciplinary enterprise’. Yet there is evidence that discussion of climate literacy is primarily located within disciplines which might be considered ‘hard’ sciences such as physical geography (Kagawa and Selby, 2015). Contrary to this trend, and in response to it, there are continuing calls for climate change education to be integrated or embedded across all disciplines. The line of argument is that climate literacy should be part of a contemporary set of considerations that any person should be engaging with in organizational life, as opposed to a smaller sub set of people (Pavlova, 2013).

However, there are important systemic issues which impede the progression of this integrated perspective which crosses disciplinary and professional boundaries, compounded by the high level of fragmentation and pluralism within climate literacy. The first relates to the widespread misconceptions about climate change within the education sector. These include the conflation of climate change specifically with the

depletion of the ozone layer (Bofferding and Kloser, 2015; Liu, Roehrig, Bhattacharya, and Varma, 2015); relating climate change specifically to air pollution (Liu et al., 2015; Veron et al 2016); and confusing weather with climate (Liu et al., 2015). Linked to this, scholars have reported tensions between heavily content-driven pedagogic approaches which aim to inculcate 'correct, best practice' behavioral responses, and pedagogical approaches which promote critical thinking in contexts of uncertainty (Blum, Nazir, Breiting, Chuan Goh, and Pedretti, 2013). These trends explain why there have been numerous calls for greater professional development opportunities for educators to develop their awareness of contemporary understandings of climate change concepts (Anyanwu et al., 2015).

A second important systemic issue relates to how young people appear to be engaging with climate change and wider sustainability agendas. According to Ojala (2012), evidence suggests that young people appear to be either ambivalent or uncertain about environmental problems, partly influenced by how contemporary lifestyles reduce outdoor experience and therefore firsthand experience of environmental issues and their resolution (O'Malley, 2015). In addition, responsibility can also be avoided through negative emotions associated with climate change, as well as the resultant sense of helplessness (Ojala 2012). At the same time, experiential pedagogical approaches, which appear in many forms of work based learning, do appear to be effective in developing climate literacy in higher education (Porter, Weaver and Raptis, 2012; Korsager and Slotta, 2015). Again, however, such pedagogical approaches tend to focus on 'co-curricula' activities in Ruskino's (2010) matrix, such as an experiential learning day in a botanical garden (Sellmann and Bogner, 2013) or inter-organisational collaborations between universities, schools, and museums (e.g. Melrose, 2010; Veron et al., 2016).

The next section outlines how this study examined an alternative approach which developed climate literacy in a work based learning for academic credit framework *as part of degrees* rather than as co-curricula activity.

Methodological context, approach and methods

There were two overarching purposes for the conceptualisation of this study. The first of these was an instrumental purpose to practically develop and drive climate literacy as a strategic commitment to the PRME initiative. As part of this initiative, all higher education institutions commit to setting ambitious goals and monitoring the achievement of them. The second purpose was more scholarly in that it aimed to generate empirical insight into instituting and developing climate literacy using a different approach, that is, one which was unifying and boundary crossing rather than the commonplace, fragmented, silo approach. To meet this dual practical-scholarly agenda, an action research study was designed as a logically defensible approach to examine the lived experiences and trajectories involved in situated phenomenon such as change (Stokes and Wall, 2014). Rather than claiming probabilistic representativeness and generalisability, this approach sought a theoretical single-case sampling approach which prioritises and values insight into the phenomenon alongside the practical outcomes in a live setting (ibid).

The study was set in a mid-sized university in the United Kingdom, and was initiated and then led by an academic within the business and management faculty with primary responsibility for the PRME initiative. The academic formulated a broadly defined Climate Change Project within the context of a work based learning module. The module is conceptualised as an employability module which utilises a 5 week work placement in an organisation, during which time each student works on

formal work tasks (set by the employer) and works towards negotiated, experiential learning goals (set by the student with support from a tutor) (Boud and Solomon, 2001; Wall, 2013). Underpinning the learning experience are concepts of reflective practice, positioned as a way to inculcate a commitment to lifelong learning (Wall, 2014, 2015, 2016c). Unusually for the higher education sector, the majority of the university's undergraduate students across all faculties and disciplinary boundaries undertake the module in their second year of study for academic credit (the equivalent of 1 of 6 courses studied on an annual basis for an undergraduate degree, i.e. 20 credits at level 5). Approximately 1,300 students undertake the module each year, at the same time.

In the context of the work based learning module, the Climate Change Project was seen as a real work place project, overseen by the PRME academic, and employed 6 students as Research Assistants. Positioned within the overarching dual purposes of the broader action research study, high-level research questions were agreed which then guided the main stages of the research as well as the choice of methods adopted. These are outlined in Table 1 below. For the purposes and scope of this paper, data is primarily drawn from stage 2, which relates specifically to the experiences of initiating and implementing the work based learning project. This is aligned to the function and practice of adopting a theoretical sampling approach mentioned above (Stokes and Wall 2014).

Stage and research question	Focus, methods and rationale
Stage 1: *What action will we take?*	The Climate Change Project team decided to analyse the curricula across the university, identifying where climate and climate change was mentioned across small units of curricula (i.e. modules) and the larger units of curricula (i.e. programmes). This involved document analysis across formal curriculum description documents. The rationale was that this was expected to indicate areas of good or promising practices which could inform action on the project.
Stage 2: *What were our experiences of taking action?*	Utilising some of the reflective practice models from the work based learning module, the Climate Change Project team undertook cycles of action and critical reflection. These were conducted at individual levels (which fed into individual assessments), as well as team and project level at team meetings over the 5 week placement. The rationale was that this was expected to generate practical insights into progressing the project, as well as empirical insights into the process of instituting climate literacy in practice.

Table 1. Driving research questions and methods adopted in the study

Findings

This section identifies the empirical findings from implementing the action research approach to delivering the Climate Change Project at a university. As a way of organising and making sense of the experiences and reflections generated during the project, the researchers adopted a contemporary, integrative framework for the dimensions of culture (Giorgi, Lockwood & Glynn, 2015). This framework provided an organising device to consider the possible indicators of cultural change developed by and through the project in relation to climate literacy, but also the tensions and issues which might indicate a lack of development or even retrenchment. The key themes drawn from this action research are 1) the mobilisation of collective action across boundaries, 2) the developmental of institutional resources and infrastructures, and 3) the development of new technologies to engage others in climate literacy. These are summarised in Table 2, below.

Mobilising collective action across boundaries

Within the context of the work based learning module, the first question driving action related to the examination of the good or promising practices already established within the university. In searching the university systems which held descriptions of curricula at the programme level, the first finding was that the term 'climate change' (and associated terms) appeared in only 5 of the 500 programme specifications formally approved at the university. In analysing where in the specifications climate change was mentioned, the study found that there was *limited* reference to climate change in Conservation Biology (only brief mentions in the educational aims of the programme), International Development Studies (only brief mentions in the programme structure and features), and *moderate* reference in Natural Hazard Management (featuring in the programme structure, programme features sections, and in the module structure section). Programme specifications for Geography showed a *high level* of reference to the term 'climate change', featuring in most sections of the programme specification. This reflected the broader educational literature of sustainability featuring mainly in physical geography, and acted as a signal that greater work needed to be done across the university.

This informed the formal task of the work based learning project (discussed in the next section), in a way that involved the students working across disciplines (such as psychology, geography, business, tourism), and across professional groupings within the university, from the start of the project through to its completion. For example, the induction involved various skills training sessions delivered by professionals across the university, and included EndNote training, project planning and time management training, team building and leadership training, and reflective learning and diary keeping training. There was a sense that the students were no longer students but employed Research Assistants working with and alongside a wider collection of professionals, including librarians, academic specialists in disciplines different to their own, the institution's sustainability unit, and the careers and employability staff.

The formal task of the project seemed to unify action for the diversity of professional in a way which juxtaposed and framed climate change alongside lifelong learning, employability, and work based learning. The researchers had reflected that as opposed to fragmented approaches within the silos of the university, the work based learning project had unified a diverse group of students to work with a diverse

group of professionals towards a common goal and set of outcomes. This unifying, boundary crossing characteristic is captured in Figure 1 below.

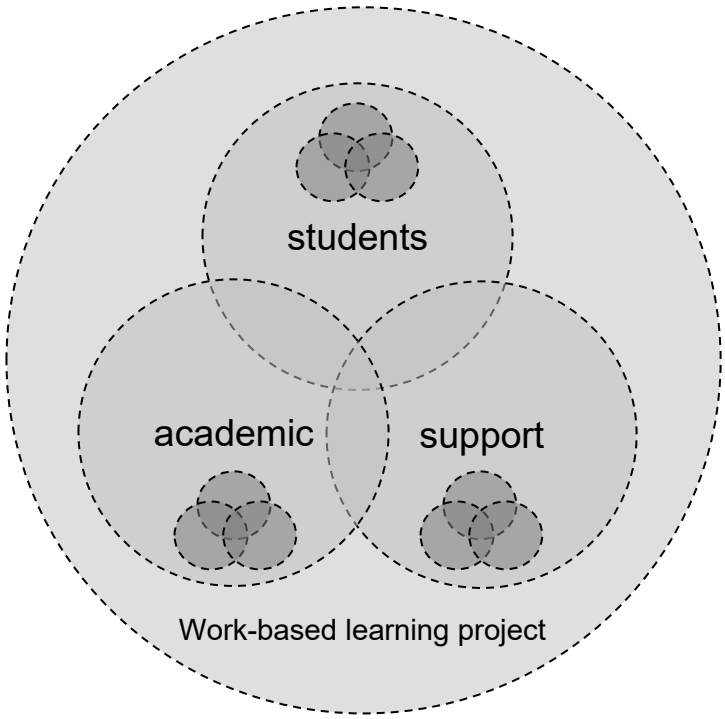

Figure 2 – Unifying and boundary crossing characteristics of work based learning

Developing institutional resources and infrastructures

In terms of the formal workplace task, set by the employer (in this case the PRME academic), the goal was to collectively generate extensive online resources and Endnote lists of "climate change" related resources for each of the different faculties. The intention was that these would facilitate and encourage engagement with the subject of climate change within the various departments of the university, partly by making the learning resources generated by the project easily accessible. The project did indeed generate an extensive range of faculty level climate change resources, and in doing so, encapsulated and explicated a strong sense of appreciation and value for climate change. In addition, the researchers also found that expressing these values and generating stories about climate change (two dimensions of culture), other, new initiatives emerged. Two of these recently created have included the cross-faculty and interdisciplinary Climate Change Special Interest Group (for staff), and the Student Climate Change Special Interest Group (for students), with remits to continue to embed climate literacy more deeply across the faculties and the wider university. A new story for a 'meta' group is starting to emerge which connects and binds these groups together. As an indicator of how this work had influenced stories and narratives within the university, one Dean of Faculty stated:

> climate literacy is an essential imperative and it is a moral duty that all business curriculum at both undergraduate and postgraduate programmes

> ensures that the businesses leaders make a difference to the management of sustainable resources and procedures, now and in the future. To achieve this goal, it is crucial that each module across all of business and management programmes develops and tests students' understanding and skills in relation to each business area such as Marketing, HR, Operations, Finance etc.

And beyond the faculty, the vice chancellor of the university said:

> Climate change and its impacts are already affecting the environment and society at a local and global level. At the University we recognise the vital role of education in the service of society, acknowledged by the Responsible Futures accreditation we achieved in 2015. We are striving to support the acquisition of knowledge and the development of skills to combat climate change, by both staff and students. The Climate Change Special Interest Group is a superb initiative and reflects the significant interdisciplinary interest by academic staff, but also by our dedicated support staff. As a signatory to the Principles of Responsible Management Education, the Faculty has importantly identified they are working towards climate literacy. This is a significant initiative, which we plan to apply across the University in a whole institution approach.

In this way, the project has initiated new resources and structural arrangements at the intuitional level, across departments, and has therefore expressed a greater sense of value (see Table 2 below). At the same time, although awareness was generated through the course of the project, the researchers also recognised a theme appearing from reflections which highlighted that not all staff or students were interested in the climate or climate change. Following the work of Ruskino (2010) and Painter-Morland (2016), some staff conceptualised climate and climate change as subjects that did not belong in their discipline, or that it should be kept as an extra curricula activity rather than relevant or important to the core of a subject area. Table 2 below summarises other themes emerging from the experience, in relation to cultural dimensions.

Generating ideas for engaging others

The final theme emerging from the experiences and reflections of the group relate specifically to the negotiated aspect of work based learning student experience. For this part, the Research Assistants were asked to consider a collective, climate change related project that they could work on together as a team. The team was prompted to consider selecting a project with two broad dimensions. The first was that it would be relevant to students, the university, the local council, and the local community, and the second, was that they draw on their own personal and previous experiences to inform the design of a project. The brief, other than that, was open.

The Research Assistants reflected on their own circumstances of being students, and especially when arriving university (at level 4). They drew on their experiences of not knowing how to recycle when they arrived at university, and some recalled unpleasant stories of being fined by the local council when they were not able to select the correct type of items to be recycled. Importantly, they also recognised the potential negative impacts of inappropriately recycling and littering, which affected local ecosystems as well as relations in the local community. The Research Assistants

decided to target students starting university, as they thought that such students may not have any experience of recycling, coming from homes where parents would normally take responsibility for such domestic tasks.

The Research Assistants reflected on what might engage new starts at universities and realised the importance of mobile phones in their own daily life – and particularly how important the university's proprietary mobile phone application (software) has become in daily student life. This mobile phone application is the central source of timetables, documents, module information and learning resources, and other university information. These insights lead the students to generate the idea and design of a mobile phone application related to learning how to recycle, which would be paperless and thereby also aligned to their own learning about sustainability.

However, the Research Assistants also realised that the mobile phone application would need to be engaging for the new students, and so developed a gamified design based on an existing and very popular basketball game. The idea was that rather than 'shooting hoops', the user would 'shoot waste' into the appropriate recycling bins. The Research Assistants believed that '*students tend not do things for nothing'*, so when the users of the game placed the right items in the right bins, they would be rewarded with points linked to levels and potentially even vouchers. This would then be the basis for instilling competition on an individual level, but also group level (e.g. departments, campuses, or even universities). An overview and summary of the findings using Giorgi et al's (2015) integrative framework of culture are outlined in Table 2 below.

Table 2. Example indicators of cultural development, tensions and issues, related to developing climate literacy. Source: Extended from Hindley and Wall (2017, forthcoming)

Cultural dimension	**Indicators of development**	**Indicators of tension or issue**
Values (what is considered important)	• Newly expressed values about enabling other staff and students to learn about climate and climate change • Establishment of a new Climate Change Special Interest Group and Student Climate Change Special Interest Group • New ideas from combining climate and climate change information, mobile phone applications usage, and gamification	• Valuing subject-specific content and own teaching (*over* climate and climate change) • Pockets of staff indifference towards climate and climate change
Stories (what people say about things)	• Large group, collective presentation at the university's staff conference – case study of collective action	• Emergence of stories related to 'no time' for extra curricula activity (reflecting Ruskino's (2010) co-

	• Stories of students benefiting from working together, with other students from different disciplines/courses, and with staff from different professional groups	curricular view of unaccredited activity)
Frames (or focus)	• Climate Change Project as a (temporary) work place • Work based learning as lifelong learning • Climate change and literacy in the context of lifelong learning	• Subject content as primary focus • Climate and climate change as a subject- or disciplinary-bound • Climate change framed as an issue for others (e.g. geography experts) • Climate change education framed as the legitimate domain of scientists
Categories (socially constructed)	• New institutional resources specifically for climate, climate change, climate change education, climate literacy	• Focus on subject content vs. non-subject content
Toolkits (sets of the above, practices, etc)	• Extensive faculty-level resources for learning about climate and climate change (references, links, documents) • Generation of the design and specification of a mobile phone app to encourage others to learn about climate and climate change • New infrastructures to mobilise the agenda	• Ongoing pockets of indifference seemingly perpetuated by lack of resources, funding or investment in local contexts

Discussion

The case study discussed in this paper suggests that conceptualising and positioning 'co-curricula' activity as 'independent and outside of curricula' (Ruskino, 2010; Painter-Morland et al, 2016) is a narrow way of conceptualising some forms of curricula where learning is generated in the circumstances of practice rather than the classroom (Billett, 2014). Indeed, the form of work based learning discussed in this study crossed the conceptual boundaries proposed in the matrix (see Figure 3 below). For example, The Climate Change Project was delivered through the work based learning module, as a *narrow* focus in the learning experience, but was integrated into

an *existing* curriculum (and therefore can be said to operate in quadrant I / *piggybacking*). At the same time, the work based learning module is a *core* curriculum for undergraduates across the majority of disciplines in the university, with *broad* focus in terms of multiple disciplinary resources as well as personal transferable skills (and therefore can be said to operate from quadrant III, or *mainstreaming*).

In addition, the implementation and outcomes of the Climate Change Project had created new institutional level resources for climate literacy, crossing multiple disciplines (and can therefore be said to operate from quadrant IV, or *focusing*). The establishment of the new Climate Change Special Interest Group for staff and the Student Climate Change Group, specifically to develop more specific approaches within particular programmes, are indicators that this change might spread to the final quadrant II, where the approach *digs deeper*. It is in this way, through the work based learning curriculum discussed in this study, that such curricula might have an important role within the higher education institutions in initiating and developing change within its own organisational structures. Together, these insights not only recognise the possible roles of work based learning in developing climate literacy, but also offers insight into how work based learning can initiate and prompt change in higher education institutions with respect to climate literacy. This is summarised in Figure 3 below.

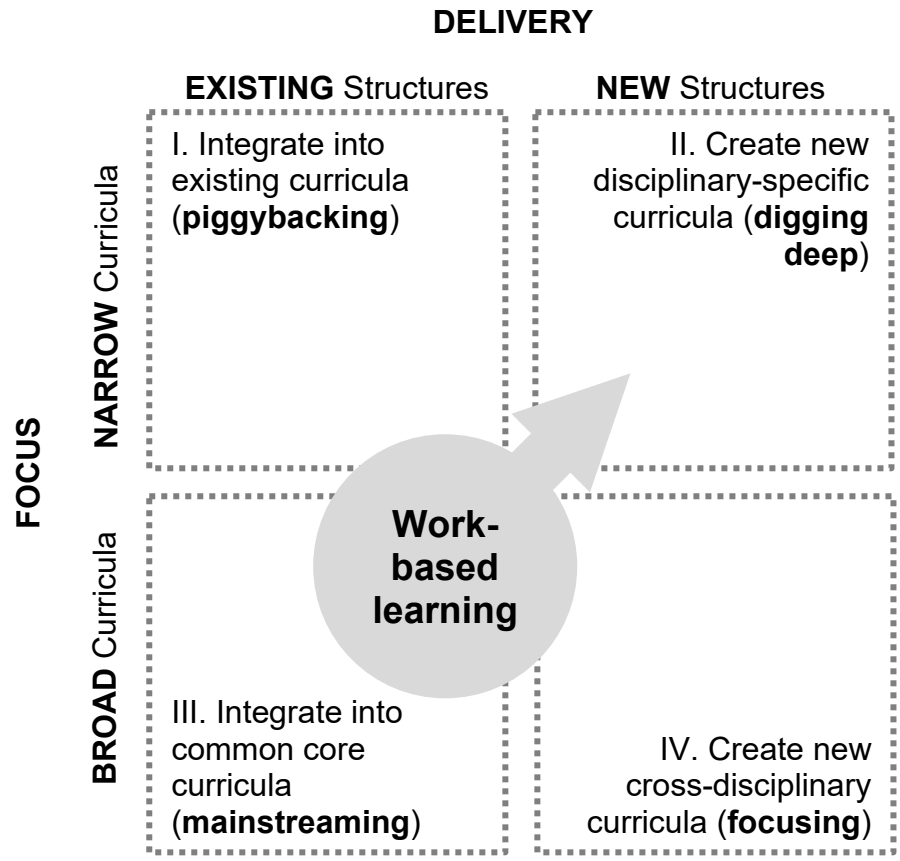

Figure 3. Matrix showing broad options of integrating sustainability into curricula, and the role of one form of work based learning examined in this study. Source: Adapted and extended from Ruskino (2010) and Painter-Morland et al. (2016).

Though this study only examined one form of work based learning, there are many other forms which involve some element of experiential learning in the circumstances of practice including work-integrated learning and accredited forms of service learning (Boud and Solomon, 2001; Wall, 2013). Across the landscape of diversity there are varying degrees of negotiated curricula, disciplinary content and input, and structural locations inside or outside of academic departments (Wall, 2013; Wall, 2016c). Different manifestations may shape the opportunities available to embed climate literacy within higher education, but also the opportunities to influence structures beyond the immediate curriculum space. That said, a common thread throughout these forms is the conceptual and practical linkage with lifelong learning and learning for employability, and the ability to deal with the complexity in life (Longo, Shankar, & Nuttall, 2017; Meakin and Wall, 2013). In this way, work based learning and its various forms might offer a way to overcome UNESCO's (2016) criticism of higher education not connecting beyond its immediate setting and into other educational systems including the lifelong and informal learning systems. Indeed, this is more aligned to Painter-Morland's (2016) call for more integrated and systemic approaches.

However, the efficacy and effectiveness of the various approaches of work based learning to inculcate climate literacy *beyond* the module experience, and *beyond* the higher education setting are still unknown. The case study highlighted some of the ongoing challenges that are faced when attempting to promote climate literacy, and reflect the extant literature. Perhaps most fundamentally (Wall, 2016c) is the barrier of the value placed on climate change knowledge and education, where subject knowledge is centrally important, and beliefs (or frames in terms of culture) position the climate and climate change as a concern outside of the curriculum, for some people. Similarly, work based learning can experience similar marginalisation from mainstream curriculum when it is claimed to be an illegitimate or improper subject (Rowe, Perrin and Wall, 2016; Wall, Tran and Soejatminah, 2016). When positioned alongside broader, strategic imperatives such as employability, however, these critiques can soften. Overall, these challenges echo the 'academic provincialism' explored and critiqued by de los Reyes et al (2016) and Painter-Morland et al (2016), and suggest they are still significant in impeding development.

Prospects

This study found promising possibilities for the role of work based learning to offer opportunities to embed climate literacy in higher education, but also how work based learning opportunities can help initiate change in the higher education institution. Importantly, Akrivou & Bradbury-Huang (2015) recently argued that for certain cultural norms to be established and then be sustained, the whole organisational structure of an educational setting needs to reflect the norms of responsibility, sustainability, and ethics. In a broad sense, internal structures reflect external structures (Wall, 2016a, b, c; Wall and Perrin, 2015), such as the structuring of curricula which intimately and implicitly considers the climate as a legitimate consideration (Cotton, Winter, & Bailey, 2013), and which formulates assessment criteria and strategies which promote connectedness to people and planet in addition to productivity (Wall and Jarvis, 2015).

This suggests that opportunities afforded by, and the wider changed created by, work based learning will be influenced by its form, position, and structure. For example, a climate change project conceptualised through work based learning which is only one out of 18 modules may have a more significant role in making wider systemic changes (e.g. quadrant II above), than on embedding values relevant to climate change. In contrast, a whole programme through work based learning focusing on climate and climate change may be more effective at the individual level, but less effective at mobilising systemic change in the institution. However, these are theoretical possibilities, and the empirical evidence to support such conjectures are not yet available. Additional questions worthy of further investigation include:

- How does the structural location of the work based learning curriculum shape the possibilities of climate literacy?
- How does the manifestation of work based learning shape the development of values, beliefs and knowledge related to the climate and climate change over the medium to longer terms?
- How do the answers to the above compare to forms of education primarily based in classrooms?

Conclusions

Amidst urgent calls for higher education to do more to embed sustainable development in the curricula, scholarship about the role of work based learning has largely been absent. So much so, it is difficult to locate work based learning in the pedagogic options currently available. This study discussed and examined how a form of work based learning was utilised not just to offer an alternative pedagogic option for embedding climate literacy, but also how it initiated change within a higher education institution. This approach, contrary to the predominantly fragmented approached currently available, generated a unifying, boundary-crossing approach to developing climate literacy, with positive indicators of cultural change. Although this approach offered promising signs of development, there were also indicators of significant barriers beyond the work based learning opportunity. This echoes the need to change the wider structures of higher education institutions, should the sector wish to embed deep, long lasting values, beliefs and knowledge sets to sustain responsible and ethical citizens in the 21st century.

References

Akrivou, K. and Bradbury-Huang, H. (2015), "Educating integrated catalysts: Transforming business schools toward ethics and sustainability", *Academy of Management Learning & Education*, Vol. 14 No. 2, pp. 222-240.

Anyanwu, R., Le Grange, L. and Beets, P. (2015), "Climate Change Science: The Literacy of Geography Teachers in the Western Cape Province, South Africa", *South African Journal of Education,* Vol. 35 No. 3, pp. 1–9.

Billett, S. (2014), "Learning in the circumstances of practice", *International Journal of Lifelong Education*, Vol. 33 No. 5, pp. 674–693.

Blum, N., Nazir, J., Breiting, S., Chuan Goh, K. and Pedretti, E. (2013), "Balancing the Tensions and Meeting the Conceptual Challenges of Education for Sustainable Development and Climate Change", *Environmental Education Research,* Vol. 19 No. 2, pp. 206–17.

Bofferding, L. and Kloser, M. (2015), "Middle and High School Students' Conceptions of Climate Change Mitigation and Adaptation Strategies", *Environmental Education Research,* Vol. 21 No. 2, pp. 275–94.

Boud, D. J. and Solomon, N. (2001), "Repositioning universities and work", in Boud, D. and Solomon, N. (Eds), *Work-Based Learning: A New Higher Education?*, Society for Research into Higher Education & Open University Press, Milton Keynes, pp. 18-33.

Cotton, D., Winter, J., and Bailey, I. (2013), "Researching the hidden curriculum: Intentional and unintended messages", *Journal of Geography in Higher Education*, Vol. 37 No. 2, pp. 192-203.

de los Reyes, G., Kim, T. W., & Weaver, G. (2016), "Teaching ethics in business schools: A conversation on disciplinary differences, academic provincialism, and the case for integrated pedagogy", *Academy of Management Learning & Education*, online first doi:10.5465/amle.2014.0402.

Giorgi, S., Lockwood, C. and Glynn, M. A. (2015), "The many faces of culture: Making sense of 30 years of research on culture in organization studies", *Academy of Management Annals*, Vol. 9 No. 1, pp. 1-54.

Hindley, A. and Wall, T. (2017, forthcoming), "A unifying, boundary crossing approach to developing climate literacy", in Leal, W. (Ed), *Sustainability in the Curriculum of Universities: teaching approaches, methods, examples and case studies*, Springer, London.

Kagawa, F., and Selby, D. (2015) "The Bland Leading the Bland: Landscapes and Milestones on the Journey Towards a Post-2015 Climate Change Agenda and How Development Education Can Reframe the Agenda", *Policy & Practice: A Development Education Review*, Vol. 21, pp. 31–62.

Korsager, M. and Slotta, J.D. (2015), "International Peer Collaboration to Learn about Global Climate Changes", *International Journal of Environmental and Science Education,* Vol. 10 No. 5, pp. 717–36.

Kurland, N.B., Michaud, K.E.H., Best, M., Wohldmann, E., Cox, H., Pontikis, K. and Vasishth, A. (2010), "Overcoming silos: The role of an interdisciplinary course in shaping a sustainability network", *Academy of Management Learning & Education*, Vol. 9 No. 3, pp. 457-476.

Liu, S., Roehrig, G., Bhattacharya, D. and Varma, K. (2015), "In-Service Teachers' Attitudes, Knowledge and Classroom Teaching of Global Climate Change", *Science Educator,* Vol. 24 No. 1, pp. 12–22.

Longo, C., Shankar, A. and Nuttall, P. (2017), ""It's Not Easy Living a Sustainable Lifestyle": How Greater Knowledge Leads to Dilemmas, Tensions and Paralysis", *Journal of Business Ethics*, online first doi:10.1007/s10551-016-3422-1.

Meakin, D. and Wall, T. (2013) "Co‐delivered work based learning: contested ownership and responsibility", *Higher Education, Skills and Work-Based Learning*, Vol. 3 No. 1, pp.73 – 81.

Melrose, P. (2010), "Climate Solvers", *Teaching Science: The Journal of the Australian Science Teachers Association,* Vol. 56 No. 1, pp. 45–49.

Miller, D. and Xu, X. (2016), "A Fleeting Glory: Self-Serving Behavior Among Celebrated MBA CEOs", *Journal of Management Inquiry*, Vol. 25 No. 3, pp. 286–300.

Nonet, G., Kassel, K. and Meijs, L. J. (2016), "Understanding Responsible Management: Emerging Themes and Variations from European Business School Programs", *Journal of Business Ethics*, Vol. 139 No. 4, pp 717–736.

O'Malley, S. (2015), "The Relationship Between Children's Perceptions of the Natural Environment and Solving Environmental Problems", *Policy & Practice: A Development Education Review*, Vol. 21, pp. 87–104.
Ojala, M. (2012), "Regulating Worry, Promoting Hope: How Do Children, Adolescents, and Young Adults Cope with Climate Change?", *International Journal of Environmental and Science Education,* Vol. 7 No. 4, pp. 537–61.
Painter-Morland, M., Sabet, E., Molthan-Hill, P., Goworek, H., and de Leeuw, S. (2016), "Beyond the Curriculum: Integrating Sustainability into Business Schools", *Journal of Business Ethics*, Vol. 139 No. 4, pp 737–754.
Pavlova, M. (2013), "Teaching and Learning for Sustainable Development: ESD Research in Technology Education", *International Journal of Technology and Design Education,* Vol. 23 No. 3, pp. 733–48.
Porter, D., Weaver, A. J. and Raptis, H. (2012), "Assessing Students' Learning about Fundamental Concepts of Climate Change under Two Different Conditions", *Environmental Education Research*, Vol. 18 No. 5, pp. 665–86.
Rowe, L., Perrin, D., and Wall, T. (2016), "The Chartered Manager Degree Apprenticeship: trials and tribulations", *Higher Education, Skills and Work-Based Learning*, Vol. 6 No. 4, pp. 357-369.
Rusinko, C. A. (2010), "Integrating sustainability in management and business education", *Academy of Management Learning & Education*, Vol. 9 No. 3, pp. 507–519.
Sellmann, D., and Bogner, F.X. (2013), "Climate Change Education: Quantitatively Assessing the Impact of a Botanical Garden as an Informal Learning Environment", *Environmental Education Research,* Vol. 19 No. 4, pp. 415–29.
UNESCO (2016), "Three challenges for higher education and the SDGs", available at http://www.iiep.unesco.org/en/three-challenges-higher-education-and-sdgs-3556 (accessed 17th February 2017).
Veron, D.E., Marbach-Ad, G., Wolfson, J. and Ozbay, G. (2016), "Assessing Climate Literacy Content in Higher Education Science Courses: Distribution, Challenges, and Needs", *Journal of College Science Teaching*, Vol. 45 No. 6, pp. 43–49.
Wall, T. (2013), "Diversity through negotiated higher education", in Bridger, K., Reid, I., and Shaw, J. (Eds), *Inclusive Higher Education: An International Perspective on Access and the Challenge of Student Diversity*, Libri Publishing, Middlesex, pp 87-98.
Wall, T. (2014), "Transforming the research-learning performance of professional lifelong learners", *Procedia – Social and Behavioral Sciences*, Vol. 116, pp. 189–193.
Wall, T. (2015), "Global Perspectives on Profound Pedagogies", *Higher Education, Skills and Work-Based Learning*, Vol. 5 No. 4.
Wall, T. (2016a), "Author Response: Provocative Education: From The Dalai Lama's Cat® to Dismal Land®", *Studies in Philosophy and Education*, Vol. 35 No. 6, pp. 649-653.
Wall, T. (2016b), "Reviving the ubuntu spirit in landscapes of practice: evidence from deep within the forest", *Journal of Work-Applied Management*, Vol. 8 No. 1, pp. 95 – 98.
Wall, T. (2016c), "Žižekian ideas in critical reflection: The tricks and traps of mobilising radical management insight", *Journal of Work-Applied Management*, Vol. 8 No. 1, pp.5 – 16.

Wall, T. and Jarvis, M. (2015), Business schools as educational provocateurs of productivity via interrelated landscapes of practice, Chartered Association of Business Schools, London.
Wall, T. and Perrin, D. (2015), *Slavoj Žižek: A Žižekian Gaze at Education*, Springer, London.
Wall, T. and Stokes, P. (2014) *Research Methods*, Palgrave, London.
Wall, T., Tran, L.T. and Soejatminah, S. (2016), "Inequalities and Agencies in Workplace Learning Experiences: International Student Perspectives", *Vocations and Learning*, online first 31st October, doi:10.1007/s12186-016-9167-2.