Education for sustainability: examples from a living lab

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Abstract

Education for sustainability continues to be driven by a small community of practice at the Northern Sydney Institute of TAFE NSW. This community has drawn together a number of strands of thinking in sustainability vocational education and training: the principles of education for sustainability; the emergence of learner directed adult learning; and the development of the idea of the campus as a living laboratory for sustainability. Analysis of interviews and surveys of participants in the community of practice identified three clear themes. These were: (1) a heutagogical approach to the living lab is a powerful way to learn for sustainability because it is real, but this relies on good facilitation; (2) a heutagogical approach to the living lab is valued by executive management and facilities staff and management although some faculty staff have reservations and; (3) a strong community of students, management, faculty and campus can drive a sustainable institutional culture.

Introduction

In the two years following the end of the international decade of education for sustainable development, education for sustainability practices have continued to evolve, despite major changes to the national VET agenda and operating environment. One place this evolution is taking place is 'at the chalk face', driven by a small community of practice specialising in environmental and sustainability management qualifications. This group is experimenting with learner-directed projects within nationally recognised VET qualifications, that are also increasingly directly contributing to the sustainable operation of campus facilities, within the structure of an ISO 14001 certified environmental management system.

The Northern Sydney Institute (NSI), part of TAFE NSW, offers a range of specialist courses in environmental management and sustainability, which at various times have included non-accredited courses in areas as diverse as carbon management and composting and worm farming, as well as qualifications in environmental management, sustainability, conservation and land management, and business and home sustainability assessment. (NSI, 2014) This range of vocational and paraprofessional courses is now relatively rare, as the discontinuation of national Greenskills funding[1] and changes to the national VET agenda and operating environment have necessitated many other Registered Training Organisations (RTOs) around Australia to withdraw from this type of offering. In addition, the delivery of many of these courses has taken place on a campus that also hosts major horticulture, floristry, tourism and

[1] 2010 saw the publication of a Green Skills Agreement representing Australian governments' commitment to collaborate with providers, employers and employees to ensure that green skills become a part of all VET provision, and that these skills remain relevant to the needs of industry. Skills for sustainability are defined in this document as 'the technical skills, knowledge, values and attitudes needed in the workforce to develop and support sustainable social, economic and environmental outcomes in business, industry and the community' (COAG p. 2).

hospitality programs, allowing hybridised curricula and leadership activities to influence these courses. The Institute has also supported the wider 'education for sustainability' community of practice through partnering in the first National Education for Sustainability Conference (Feb 2013) and, more recently, leading the renewal of the TAFE NSW Education for Sustainability Community of Practice.

Background

The practices exemplified by the following case studies draw together a number of strands of thinking in sustainability vocational education and training: the principles of education for sustainability; the emergence of heutagogical approaches to adult learning; and the development of the idea of the campus as a living laboratory for sustainability.

The principles of education for sustainability

One of the four strategies at the heart of the *National Action Plan 'Living sustainably'* (DEWHA 2009) is Strategy 2: 'Reorienting education systems to sustainability' which focuses on achieving a culture of sustainability in which teaching and learning for sustainability are reinforced by continuous improvement in the sustainability of campus management. Although this federal policy agenda has been superseded in many ways, the culture described above and the resultant case studies covered below can be regarded as legacies of this commitment.

The desired to culture embeds the seven principles of education for sustainability central to the National Action Plan (DEWHA 2009, p.9). Although the principles of education for sustainability provide a valuable framing for vocational education, they require a detailed and theoretically robust educational methodology to be applied practically. Some work has been done on this, for instance the useful pedagogical guidance and teaching resources offered by Swinburne (2011) based on the work of Stirling (2001; 2005). The thrust of this work is to distinguish technical content relating to sustainability (education <u>about</u> sustainability) from the transformational role that education can play to foster a more sustainable world (education <u>for</u> sustainability). The emancipatory focus in higher education theory promoted by Sterling is welcome for those of us committed to a more sustainable world, and is being implemented at the chalk face.[2] However, further methodological underpinning beyond the principles of education for sustainability are needed to formalise transformational practice in a VET system that is increasingly orientated towards what Anderson (2003) so neatly characterised as 'productivism'[3]. The emerging discussion of heutagogy provides a useful methodological framework that builds upon work on education for sustainability done to date.

Heutagogical approaches to adult learning

Finding a Common Ground, a key report leading into the national Greenskills reforms, cites Dryden (2003) who flags that there are three main methodological approaches within vocational education and training: pedagogy (teacher-directed); andragogy (student-centred) and heutagogy (learner-directed) (Golding *et al* 2007; p.27). They observe that: "The learner-

[2] In addition to the case studies in this paper Stirling also provides evidence, citing Cochrane *et al* (2007). These authors also point out that the issue is communicating the effectiveness of novel practice to the wider education system, saying: "making allowance for the emergence of the emotional and spiritual in people is not difficult. The difficulty lies in convincing others that this has to happen in the first place" (Cochrane *et al* 2007, p.363).

[3] Anderson, in speaking of the march of "productivism" across the VET landscape draws on Weber's famous 'iron cage' characterisation of a world increasingly succumbing to corporate and state 'bureaucratization' at the cost of our environments and our freedom.

directed approach represents the most radical departure from traditional transmissive forms of teaching, and most closely aligns with what could become a practical means of teaching sustainability" (Golding *et al* 2007; p.28). *Finding a Common Ground* proposes a number of actions to encourage the adoption of education for sustainability in VET, mostly targeting national policy. However some of the proposed actions also lend themselves to devolved responses, in particular determining an appropriate VET pedagogy which will promote sustainable development and "which distances itself from social reproduction and maintenance and recognises the rapid changes occurring within business, government and industry" (Golding *et al* 2007; p.34).

The literature discussing heutagogical approaches seeks to advance and refine constructivist approaches, particularly in response to the emergence of the Internet as a widely accessible learning tool (Blaschke, 2012). Heutagogical approaches promote exploration, creation, collaboration, connection, sharing and reflection as elements in educational design (Blaschke & Hase, 2016). These elements are not new; Blaschke & Hase claim grounding in the rich tradition of constructivist educational theories promoting action and experiential learning. What is new is the very strong emphasis on learner direction, the consequential changes to the role of the educator and the transition from a focus on competencies to capabilities. Blaschke & Hase (2016) recast the educator in a heutagogical approach as a 'learning leader'. The authors observe that the consequences for teaching are profound: "The learning leader needs to be able to relinquish the need for control and to adapt to the changing needs of the learner. Command over process and resources is critical, as well as the ability to be a co-learner together with the student." (Blaschke & Hase, 2016; p.37) This emphasis is quite different to current VET system requirements, which focus on superior technical understanding (see ASQA 2015).[4]

A key aspect of the control exercised by VET educators in the current paradigm is the rigorous enforcement of competency standards. *Finding a Common Ground* raises the concern that the "rigid curriculum requirements of VET courses and programs limit the ability of training providers to accept sustainability education as a valuable contribution" (Golding *et al* 2007; p.29). This concern may be overstated as heutagogical learning practice cultivates 'capabilities' that are characterized by learners' confidence in their competency. As Blaschke describes it: "When learners are competent, they demonstrate the acquisition of knowledge and skills; skills can be repeated and knowledge retrieved. When learners are capable, skills and knowledge can be reproduced in unfamiliar situations." (Blaschke, 2012) This suggests that heutagogical learning can be regarded as an interpretation of existing vocational practice rather than a rival. In support of this contention Chappell *et al* (2003) suggest that Training Packages were not designed to provide guidance in terms of the selection of suitable pedagogical practices or strategies. They go on to suggest that: "Research evidence suggests contemporary VET pedagogy must become more learner-centred, work-centred and attribute-focused". (Chappell *et al* 2003; p.vii). Providing pragmatic support to this call, there is solid evidence that employers are seeking capabilities beyond competencies. (See for instance: Shah & Nair 2011; Hart Research Associates 2013.)

[4] There have been efforts to use constructivist approaches in VET educator development in the past, focused on implementing the national VET policy and developing capacity in action learning, coaching and work based learning (ANTA 1998). In reviewing the potential to empower educators through this kind of development Herbert argues that "action learning can be a force for social change or a tool to reinforce the status quo … different uses of action learning can result in different forms and degrees of empowerment." (Herbert, 2001; p.395)

Heutagogy may well be compatible with the current VET system, however it is a more general educational approach and there is nothing that ensures a transformational outcome committed to sustainability. This potential arises from the normative commitment of the community of learners themselves, as evidenced by the long-standing and very stable high levels of social demand for sustainability related skills in vocational education across nearly all skill sets (see Sack *et al*, 2014; Brown *et al* 2013). The potential for transformative learning arising from this underlying social demand can be nurtured by tailoring the learning environment to communicate a sustainability context. This is the aim of the campus as a 'living lab' for sustainability.

Greening campuses: the living lab

The term 'living lab' is used in a diverse range of contexts, primarily focusing on ICT tools and driving innovation. Drawing on this wider context is a growing discussion about using higher education campuses as drivers of sustainability research and learning. The focus of this discussion varies, depending on the mission of the higher education institution, with universities focusing on the potential to foster innovations in applied research (IARU 2014; p.125) and vocational institutions, like community colleges and TAFEs, focusing on innovations in learning and facilities management. The research focused approach has been taken up by a number of Australian universities, variously concentrating on the leadership, research, partnership and teaching opportunities afforded by areas of native vegetation on campus, retro fitting 'green' technology into buildings and social innovation projects. (GO8 2015)

The alternate focus on integrating innovative vocational outcomes with efficient campus management is well captured by the American Association of Community Colleges (AACC) and the Sustainable Education and Economic Development Centre (SEED) guide *The Campus as a Living Lab*;

> "living laboratories" merge academics and campus facilities management to provide students with real-world skills and, for the institution, a path to meet its sustainability goals.
>
> (Cohen & Lovell 2014)

Although not as well documented, this kind of approach has been taken up to by Australian vocational training organisations, for example the Green Skills Hub at the Western Sydney Institute of TAFE (WSI 2010), the Green Skills Trade Education Centre at Western Institute of TAFE, the Flannery Centre and Box Hill TAFE Learning Hub. These projects concentrate on training of 'green' trade skills, but also seek to promote industry partnerships. For example the Green Skills Hub "models sustainable technology, design, and practices and delivers a range of green/environmentally friendly skills sets in a range of discipline areas including Building, Electrical, Electrical Engineering, Plumbing, Refrigeration and Information Technology." (WSI 2010)

What is less apparent in the development of living labs in Australian universities, TAFEs and other registered training organisations, is systemic integration of facilities management and faculty activities delivering learning outcomes. *The Campus as a Living Lab* guide notes that "[H]ands-on, applied education is generally associated with technical training, but there also are many opportunities to incorporate living labs into academic programs." (Cohen & Lovell 2014; p.11) The guide lists a range of opportunities to employ living lab approaches in academic programs across agriculture, business and accounting, engineering, environmental science, physics and psychology. These are associated with the opportunities to employ living lab approaches in technical programs across building automation, CAD, construction,

electrical, green-related technical programs, HVAC, and industrial maintenance. (Cohen & Lovell 2014; p.12)

The guide lists eight elements that, according to feedback from community colleges that have actively implemented living lab programs, have emerged as key components for successful adoption. Taken together these components have the potential to provide a context for heutagogical approaches to education for sustainability, reinforcing or awakening a vocational commitment to sustainability and equipping the workforce of the future with the skills required to drive sustainable change. These skills are normative, they influence the way people act; they are conceptual, they rely on analysis and awareness of context; and they are practical, they change things in the real world (Sack 2012; p.403).

Methodology

Over the last decade and a half a growing suite of tools aimed at measurement and benchmarking higher education sustainability have emerged. These range in sophistication but no internationally agreed tool has emerged. Shriberg (2002) finds that they converge on: decreased throughput (of energy, water, materials); incremental and systemic progress; sustainability education as a core function; cross-functional reach (across teaching, research, operations and service); cross-institutional action (bench marking, engagement with external stakeholders). Emerging practice adds the dimension of leadership and governance, which according to Shriberg & MacDonald (2013) extend to the impact achieved by alumni leadership. It is this impact that is at the heart of evaluating the effectiveness of heutagogical approaches and the living lab in driving transformation for sustainability. Unfortunately there is little robust data of this type to inform analysis.

In the absence of a robust measurement framework that addresses the effectiveness of sustainability education our research takes the approach of thematic analysis. The analysis draws on six semi-structured interviews of facilities staff, faculty staff and institute executive management and a short online survey of students in the Diploma of Sustainability and Advanced Diploma of Applied Environmental Management, to which twelve responses were received. The questions in both the interviews and the survey address the participant's awareness of the concept of the living lab, their views on the degree to which the key components of a campus as a living lab have been realised in the case study, what the enablers and blockers of this might be and the extent to which the learning experienced employed a heutagogical approach. A further series of questions assess the extent to which participants agree that the case studies realise the principles of education for sustainability. This is small sample, qualitative action research. The educators who designed and facilitated the learning programs within which the cases studies emerged designed the survey and interview tools, conducted the interviews and undertook the thematic review. Our interest as educators is in establishing the coherence of the program in relation to the literature reviewed above, as an avenue to identify opportunities for improvements in learning program design and to show case progress to date.

Case Studies and Results

Four case studies are considered. The first two are programmatic and involve the increasing integration of the Institute's environmental management system into curriculum in the Advance Diploma of Environmental Management and, secondly, the progressive integration of a kitchen garden into the cookery curriculum, culmination in the development and operation of a substantial kitchen garden by Horticulture students for use by the large hospitality school that shares the campus. These programs have been underway for several

years and some guarded analysis of their impact is warranted, as well as analysis of their effectiveness in delivering education for sustainability outcomes.

The remaining two cases are project-based and have resulted from the enrolment of facilities and teaching staff in the Diploma of Sustainability as part of their professional development alongside external students. The first project involves the development of a web-based platform to support a sharing economy for services resulting from practical learning activities and for surplus inventory. The second project involves the establishment of a community market within a campus boundary with the aim of showcasing sustainability activities on campus and providing an outlet for produce resulting from learning activities in the horticulture and hospitality faculties. Both projects are in development and assessment of their ultimate impact would be premature. Instead their effectiveness in delivering education for sustainability outcomes and their potential to achieve impact is analysed.

Thematic analysis

The research indicated that the conceptual framework of education for sustainability, delivered through a heutagogical approach and structured around the idea of the campus as a living lab was relevant to the case studies. All research participants (staff and students) were broadly familiar with the concepts of the living lab and of education for sustainability and largely saw the individual elements of these concepts being applied in the cases studies. A minority of students noted that the elements of the living lab described by Cohen & Lovell (2013) that relate to external support and impact had not been realised. With one exception all students agreed that all principles of education for sustainability described in the National Action Plan were addressed in the case studies. None of the research participants were familiar with the concept of heutagogy and instead were almost unanimous in describing the learning outcomes of the case studies as centred on the student and facilitated by the teacher (andragogy). However, a number of students indicated by their comments that they experienced the case studies as learner directed education (heutagogy). The research participants' explicit and tacit recognition of the instantiation of key concepts in the case studies provides some reassurance that this is an appropriate structural basis for our thematic analysis. Within the conceptual framework described, three clear themes were identified through analysis of the interview transcripts and survey responses. These were:

- A heutagogical approach to the living lab is a powerful way to learn for sustainability because it is real, but this relies on good facilitation
- A heutagogical approach to the living lab is valued by executive management and facilities staff and management although some faculty staff have reservations
- A strong community of students, management, faculty and campus can drive a sustainable institutional culture

These three main themes and the basis on which they have been distilled are discussed below.

A heutagogical approach to the living lab is a powerful way to learn for sustainability because it is real, but this relies on good facilitation

Tacit acknowledgment of a heutagogical approach is indicated by students' extremely positive experiences of project-based learning and facilitated peer-to-peer learning. One student commented that: "A general guide was provided by the teachers but the projects and business cases I completed were mostly free thinking and progressive ideas for a more sustainable future. These involved either individual work or group and teamwork by students." Some other comments were that "the projects were similar to those we could be completing/leading in the workforce" and that: "Group discussions were a great setting to hear about others interests, gain new perspectives in other areas ...but most importantly the

chance to brainstorm and receive feedback from the teacher and other students. Clarify ideas." Research participants framing the educator's role as a "guide" further supports the contention that these case studies are instances of heutagogy. One comment was, "The teachers were always ready and available as guides in these projects." Another student commented that the educator "was very helpful in keeping the project on task whilst guiding us on the required environmental principles."

All participants agreed that the case studies credibly demonstrated sustainability. Many students also commented on the effectiveness of the heutagogical approach to the living lab in educating for sustainability. The term "real" was often employed in participants' responses to highlight the importance of applied learning in an organisational context, for instance that it was "good to work on a real site with real sustainability issues". In line with education for sustainability principles this educational approach pushed students' understanding of what sustainability meant with one student saying; "this course challenged my ideals. It really put into perspective the social, economic and political connections and how we all can make substantial differences by applying the knowledge that we now have, thanks to our learning."

There were indications that students could see opportunities for more substantial adoption of the living lab approach with one student noting, in response to a question about education for sustainability principles, that "there is no process in place to see if any of our recommendations will be taken up by the sustainability coordinator. I know our suggestions wouldn't be adopted overnight but would've been good to have an idea of the ongoing process for decision-making by TAFE." This suggestion is complimented by a more general call for work based education in the field of environmental management: "Reaching beyond the confines of the campus to enhance and expand impact and industry exposure/engagement could be a focus going forward to broaden the scope of the course and sustainability experience."

Reflecting on the learning outcomes of heutagogical approach to the living lab as educators we see that essential employability skills such as working in teams, stakeholder management, negotiation, influencing and cooperation, that are often difficult to deliver in traditional classroom based pedagogy are seamlessly integrated into the learning program. Further we see that students not only demonstrated the required course competencies, but also develop the confidence to apply them in different situations, which Blaschke claims is characteristic of capabilities.

A heutagogical approach to the living lab is valued by executive management and facilities staff and management although some faculty staff have reservations

Executive management's strong support for pedagogy that innovates, engages and enables students was matched by campus operations staffs' enthusiasm to engage with student projects. Both were intensely aware of the core business of the institute in education and the need for management and operations to enhance the student experience. This was put succinctly by an executive manager, who said "you have to have both the educational and the operational intertwined. We are an educational organisation, and if we aren't straddling both, we are not doing our job". However, students rank the engagement of faculty staff and management in the case studies below both facilities staff and their own engagement – interestingly facilities staff rated their own engagement above students!

Lower levels of engagement in innovative educational approaches by some faculty staff are supported by interview responses relating to the Kitchen Garden project, which did not involve innovative pedagogy but was a clear example of the living lab. These staff pointed to the additional workload and risk management required by living lab projects, including

complex logistics, management of a safe worksite constituted entirely of trainees and addressing quality expectations for campus facilities. For instance one said: "Teachers have to run a building site at the same time as teaching. This means they are doing double the work. Easier for them to just do pretend projects in the sand pits".

Despite the strictures of term times, curriculum and functional demands on the delivered facilities, a traditional teacher driven educational approach can work with the living lab to achieve sustainability outcomes and student engagement. Teachers commented that these projects allow them to connect with operations staff, interact with other teaching faculties and to develop innovate curriculum. Teachers who do go 'the extra yards' with these living lab projects also identified a strong sense of job satisfaction. A teacher commented that one case study provided "a new perspective on the subject of garden maintenance which represents a hybrid between horticulture and land management".

Our reflections as teachers attempting to deliver living lab projects using heutagogical approaches is that at least some of the barriers experienced in traditional delivery can be avoided by innovate educational design. Students are usually highly committed to achieving outcomes from self-directed projects and this creates flexibility around timing and assessment, for instance continuing to work on projects after formal assessment has been completed or looking for opportunities to continue the project work under other units of study. This is particularly the case in the use of the Institute's environmental management system as a living lab – there are always opportunities to jump into the system in ways connected with previous work. Comments from facilities staff and from senior management indicate that quality concerns may be overstated, their experience is that students' work is of, or better than, commercial quality. We do acknowledge that the intricacy of logistics and site management should not be underplayed; matching learning and asset management outcomes is complex and requires appropriate resourcing and skilling of faculty and facilities functions.

A strong community of students, management, faculty and campus can drive a sustainable institutional culture

The need for a "cultural shift" within the organization was repeatedly raised by executive and management research participants as a strategic response to changes in the Institute's external environment. This was couched in terms of "sustainability", both organisational and environmental. In this context, executive and campus management participants repeatedly discussed the importance of an organisational community. The potential of the Kitchen Garden to be a focal point for the campus community was the strongest narrative contributing to this theme, with one participant describing; "a garden where we can really embody the idea of paddock to plate, where horticulture, hospitality and events students and staff meet, in a place that becomes the heart of the campus". The aspirations of management correlated closely with the enthusiasm of students, faculty and campus staff for the Kitchen Garden project. Teachers already had students requesting plots within or near the Kitchen Garden, where they can practice and develop their horticultural skills.

Analysis of the other projects indicates the potential for heutagogical approaches to further realize management aspirations for cultural shift. Participants indicated that student led living lab projects facilitate interactions between students, teachers and campus staff, contributing to a sense of campus community centered on the idea of sustainability. One student (a campus manager undertaking professional development) working on the sharing economy project commented: "Our project required collaboration between a variety of Campus Portfolio and Faculty Staff. It was directly linked to our learning outcomes. I feel used in its entirety it is an excellent representation and demonstration of how learning has evolved into an incredibly powerful tool for sustainability." Another student (a teacher undertaking

professional development) working on the community markets projects commented that the "project enabled me to meet and discuss my proposal with many people from NSI that I may not have engaged with otherwise."

On reflection the dual role that some research participants had as members of staff and as students undertaking professional development flags an exciting evolution of the model under discussion. The inclusion of staff in mainstream classes working on learner directed projects allows very substantial projects to be canvased with access to organisational resources. External students benefit from the exposure to the workings of large organisations and the staff benefit from first hand experience of core educational products.

Conclusions

The case studies illustrate how the transformational principles at the heart of education for sustainability are best realised by heutagogical practices delivered in the context of a 'Living Lab' approach, resulting in better outcomes for learners and better integration of faculty and facility functions. The case studies further illustrate how the concept of the 'living lab', as applied to education for sustainability, can be extended well beyond technology demonstrations, incorporating essential employability skills.

The research suggests that developing and maintaining a positive community within the organisation is both an important benefit and an enabler of the campus as living lab and that heutagogical educational approaches foster this community, building strong links between faculty, campus operations and with the student body, which is seen as a strategic benefit by management. To achieve this outcome the research suggests that a review of how faculty can be supported in using innovative pedagogy in educational design may be warranted. The research further suggests that the full integration of professional development into educational products has the potential to deliver further innovation.

The action research upon which this paper is based has limitations. It draws on a very small cohort. It does, however, demonstrate that the conceptual framework assembled can be coherently applied to these kinds of case studies and that this can deliver tentative results based on analysis. This methodology could usefully be applied to an expanded program of research looking beyond the use of these approaches in the environmental and sustainability fields. Such research might seek to pilot and evaluate heutagogical approaches to the formation of sustainability related academic or technical capabilities in the context of a 'Living Lab' approach.[5]

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[5] The Campus as a Living Laboratory Guide lists a range of academic and technical program areas where these capabilities might be relevant including: agriculture, construction, psychology and industrial maintenance. (see Cohen and Lovell 2013; p.12).

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