EDUCATIONAL CONTEXTS AND DESIGNS FOR CULTIVATING LEADERS CAPABLE OF ADDRESSING THE WICKED ISSUES OF SUSTAINABILITY TRANSITIONS

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Blekinge Institute of Technology
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Department of Strategic Sustainable Development

Educational Contexts and Designs for Cultivating Leaders Capable of Addressing the Wicked Issues of Sustainability Transitions

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In late 2017, I had been working as a facilitator and educator for Engineers Without Borders Australia's Humanitarian Design Summit, an international program that educated university students in concepts of humanitarianism in developing countries. It was a program that introduced young students to a world different from their own and did so in a way considerate of the delicate balance that international development requires. The desire to do 'good' was present in most students but the subtleties around how to do that 'good' was often less formed. In a world where history, power and oppression continued to cast their shadows, students often failed to see the systemic challenges faced by developing communities or to understand the ingrained assumptions that they brought with them to fix those challenges. The program presented me with an eye-opening experience as I contemplated the question of 'how' to educate students in a way that was aware, reflective and considerate. At that early stage my experience as an educator was reliant on intuition, instinct and the luck of a privileged personal education that had surrounded me with caring, open, and considerate teachers, colleagues and peers. Still, I felt the glaring absence of language and understanding regarding educational structures and design that left me wanting to learn a more deliberate process for education from which potentially a great teacher could emerge. So, when I engaged in a series of conversations with the Department of Strategic Sustainable Development (TISU) at Blekinge Institute of Technology in Karlskrona Sweden regarding the possibility of undertaking a PhD, the opportunity to develop and construct that language and process emerged. Since then I have been learning how to apply a robust and refined scientific process to the experience of being an educator that I fumbled through at the beginning of my journey. This Licentiate is a humble attempt at defining my voice as an educator and academic and because of that I ask the readers for gentleness and an open mind as they engage with these words. I wish to send a big thank you to my parents and sister who set me free without consideration of the cost to themselves. Thank you to the colleagues and friends who offer me intellect, imagination and compassion. Thank you to my students who continue to support my pursuit of open, transparent and often fallible teaching. Thank you to Göran Broman, Merlina Missimer and Edith Callaghan for gentle and wise advising, Jayne Bryant for showing me that family is not blood, Giles Thomson for being a role model and embodying the sweet sense of humanity the world needs and to my friends from MSLS with whom I found home. For now, I hope this Licentiate reminds us that education is a pathway to reach sustainability and engage the pursuit of moral maturity. I aim to present some outcomes and avenues we can pursue towards those ends and to make a small contribution to an important topic.

James Ayers, Karlskrona, Sweden, December 2020.

Abstract

The ongoing sustainability crisis offer numerous, multifaced societal challenges as a result of the ongoing degradation of socio-ecological systems by human activity causing massive ecological damage and human suffering. Overcoming these difficulties begs for the rapid transition of society towards sustainability. This desire for urgent action has been hindered by the lack of coordinated global leadership focused on addressing these challenges and implementing a transition towards a sustainable future. The sustainability crisis and its manifestations, which include for example climate change, air and water pollution, deforestation and social segregation, are interconnected and volatile issues whose parts influence and impact each other causing the crisis to worsen. The earth system is pushed towards tipping points from beyond which it may become impossible to maintain the human civilization. The failure of leadership to address the wicked nature of these crises means humanity has been left ill-equipped to deal with the complex problems posed by sustainability.

This thesis considers the role of Education for Sustainable Development (ESD) in overcoming these issues and operating as a leverage point towards sustainability. It focuses on investigating how the development of sustainability leadership education in Higher Education can contribute to addressing the sustainability crisis. It looks at the role that educators can play in designing learning environments that ensure leaders and leadership capable of addressing wicked problems posed by global unsustainability. The aim of this research is to investigate what educators should consider when designing learning environments that promote the qualities needed for leading in complexity towards sustainability. It does this by examining a number of ESD programs as case studies to investigate the efficacy of those programs at creating sustainability outcomes within their students. It also undertakes a literature review to describe and articulate the unique challenges faced by sustainability leaders from a personal and professional perspective. The study is situated closely to the ongoing ESD discussion regarding competencies-based learning for sustainability and the research aims to provide some contribution to that dialogue. It does this through the investigation of competencies acquisition and the discussion of emerging areas of leadership that hold beneficial outcomes for the development and practice of sustainability leaders.

The results of the thesis suggest a number of outcomes for consideration by educators and include a number of main findings. Firstly, educational programs can be capable of achieving the acquisition of 'sustainability' competencies within their students, but if these competencies are not taught within a larger sustainability contextualization, then students can fail to see the purpose of the competencies 'for' sustainability. Secondly, reflective practices, developed as the result of reflective pedagogies, can provide beneficial qualities in students as future sustainability leaders and require distinct pedagogical structures in order to guide reflective practices towards sustainability outcomes. Finally, a number of unique personal and professional challenges to sustainability leadership exist and need to be overcome if the domain of sustainability is to ensure the ongoing resilience and wellbeing of individuals and groups acting as sustainability leaders.

This research suggests a novel contribution to a number of areas within ESD research, including creating knowledge within the competencies discussion regarding emerging areas of study that may influence the future of defined sustainability competencies. It also highlights the need for educators to consider the role of wellbeing and resilience in current and future sustainability leaders.

Keywords: sustainability, education, leadership, complexity, wicked problems, competencies, wellbeing, resilience.

Thesis Disposition

This compilation thesis includes an overview component and the following papers. The format of the papers has been adjusted to fit the format of this thesis but the content remains unchanged.

Paper A

Ayers, J. Competence Literate but Context Lacking? Investigating the Potential of Study Abroad Programs to Promote Sustainability Competence Acquisition in Students. *Sustainability* **2020,** 12, 5389.

Paper B

Ayers, J.; Bryant, J.; Missimer, M. The Use of Reflective Pedagogies in Sustainability Leadership Education — A Case Study. *Sustainability* **2020**, *12*, 6726.

Paper C

Ayers, J. Callaghan, E. The Unique Challenge of Sustainability Leadership. *Submitted to Journal.*

Other Publications

Coddington, A.; Ayers, J. Being-and-Becoming a Sustainable Practice. *Presented at the Design Research Society Conference,* 2018.

Thomson, G.; Ny, H.; Nikulina, V.; Borén, S.; Ayers, J.; Bryant, J. 'Rapid Scenario Planning' to Support a Regional Sustainability Transformation Vision: A Case Study from Blekinge, Sweden. *Sustainability* **2020**, *12*, 6928.

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1. Introduction

The sustainability crisis poses numerous, multifaceted and interconnected global challenges that span man-made and natural systems, permeating ecological and social boundaries and asks questions of our ethical, behavioral, cultural and political states. Society faces the immense socio-ecological challenge of "decreasing ecosystem quality and increasing risk of tipping the biosphere into a state where it would be difficult or impossible to maintain the human civilization" (Broman and Robèrt 2017, 17). The increasing scale of human activity is having a profound impact on the natural environment, and led to an outcome which has negatively influenced both society and ecosystem functioning (Kajikawa, Tacoa, and Yamaguchi 2014).

Narratives in both academic research and mainstream media indicate that we are in the midst of global ecological and societal unravelling in which the last 50 years has seen the most rapid transformation of the human relationship with the natural world in history (Steffen et al. 2015). In 2005, the Millennium Ecosystem Assessment concluded that 60 % (15 out of 24) of the ecosystem services they evaluated were being degraded or used unsustainability. The report argued that while these changes to ecosystems have led to net gains for human well-being, they have also led to the exacerbation of poverty for some groups of people, and in the longer term, reduce the likelihood that socio-ecological sustainability can be achieved (Millennium Ecosystem Assessment (Program) 2005). Since this warning in 2005, however, we have seen little to no reduction in humanity's negative impact on ecosystem services. More recent indicators suggest a continued narrowing of biodiversity around the world (Diaz et al. 2019) the increased pollution of oceans and water ways (Lindsey and Dahlman 2020; United Nations Environment Programme 2019). These issues are compounded by a growing prevalence of degrading human-nature interactions causing increased experiences of water scarcity, climate change, air pollution and social segregation, among many other complex challenges that threaten the viability and integrity of global society (Lang et al. 2012).

This crisis of sustainability has occurred due to humanity's ignorance regarding the consequences of consumption, inattention to human dependence on ecological realities and the exceeding of planetary boundaries (Lehtonen et al. 2018). Addressing these challenges is difficult due to the "fact that many of the current socio-environmental problems connected to sustainability transcend spatial, temporal, sector and disciplinary boundaries" (Polk 2014, 439). This means they do not just cross borders, but that sustainability permeates domains, confusing and disrupting methods of problems solving, which remain tied to reductionist fields of understanding and categorization.

The characteristics of the sustainability challenge as global, interconnected and uncertain, emphasize and articulate the crises' quality as a complex challenge. This means our unsustainable state and its related issues are often regarded as a prime example of a 'wicked problem' (Rittel and Webber 1973) as they are determined by their tendency for multidimensional, path-dependent and unpredictable natures. When viewed from this perspective and in light of its resulting socio-ecological suffering, sustainability has been articulated as a "tragedy" of a wicked problem (Levin et al. 2012, 126). Furthermore, the tragedy is driven by systemic and partly

unpredictable dynamics that connect disparate trends and actors whose experience and understanding of the challenges differ (van der Leeuw et al. 2012), which further complicates our response. As Waddock claims (Waddock 2013, 92) "if ever there was a wicked problem, the sustainability – or, more accurately, unsustainability – of the current world system is one". It has even been argued to be a "super wicked problem," defined by four key extra characteristics, namely that:

- time is running out,
- those who cause the problem also seek to provide a solution,
- the central authority needed to address it is weak or non-existent, and that,
- partly as a result, policy responses discount the future irrationally (Levin et al. 2012, 123).

The wicked and dynamic nature of the sustainability challenge and the difficulties society faces in resolving them, mean a state in which the possibility of creating 'solutions' becomes questionable. As Andersson and Törnberg argue "an attribution of wickedness to a problem illustrates a feeling that the problem almost seems to avoid resolution" (Andersson and Törnberg 2018, 119). Our persistent inability to predict, prevent and deal with these problems (ibid) mean a volatile state for humanity to navigate and for leadership to address. From this perspective, the sustainability crisis can be articulated as an all-encompassing, global issue, one driven by humanity while effecting its entire operating system and structures. Without rapid and radical action, the likelihood of severe, catastrophic destabilization of society remains a present, and increasingly likely outcome. To potentially avoid this, a key component of the pursuit of sustainability is for humanity to reconsider its relationship with nature (Steffen et al. 2015) and to develop a society promoting social sustainability within the biosphere (Missimer, Robèrt, and Broman 2017). The potential ways in which humanity can achieve these outcomes offer a number of possibilities, yet the actualization of a transition towards a sustainable future remains stalled and hindered by the failure of unified societal leadership. If humanity is to identify the single most important component for building 'future-safe' options, and overcome the mentioned failure, it could be the development of leadership that promotes sustainability thinking and planning in a strategic and scientific manner (Broman et al. 2017). Still, despite pockets of potential and advocacy, humanity has yet to summon the required response and the sustainability crisis continues to increase despite the call for coordinated global leadership.

Much of the responsibility for the development of sustainability literate leadership lies in education (Broman et al. 2017) and the field of Education for Sustainable Development (ESD) has developed significantly since the formation of the United Nations Decade for ESD (Combes 2005). ESD is a vibrant area of research and practice built on values of sustainability. It aims to develop leaders equipped with the "knowledge, skills, attitudes and values that empower learners to make informed decisions and responsible actions" that affect sustainability (Agbedahin 2019, 4). While no one pedagogy or methodology holds a panacea response to sustainability learning outcomes, research has been investigating the significance of pedagogies and teaching methods (Redman, Wiek, and Barth 2020; Wiek, Withycombe, and Redman 2011; Lozano et al. 2017) in order to provide guidance to educators regarding effective outcomes for sustainability-focused learning. Ongoing discussions has led to a general consensus emerging within the academic arena

that suggests ESD should utilize education that promotes both knowledge 'about' sustainability while also providing the tools to implement and lead solutions 'for' sustainability (Missimer and Connell 2012; Papenfuss et al. 2019; Pacis and Van Wynsberghe 2020). To achieve this, educators are required to consider numerous approaches that represent a spectrum of educational philosophies and methods, from more traditional knowledge retention styles of learning to more emancipatory perspectives.

These emancipatory approaches offer a challenge for sustainability educators as they ask the question of 'how to' overcome dominant paradigms of leadership that are part of the cause of the current crisis of unsustainability (Bendell, Sutherland, and Little 2017). Educators adopting positions towards sustainability are now tasked with understanding the process of providing liberating educational experiences that couple learning with unlearning (David Kolb 1984). This suggests educators must not simply treat their students as empty 'vessels' to be filled with relevant knowledge and information regarding sustainability. Instead, educators must consider them through an emancipatory lens that attempts to deconstruct previous paradigms and worldviews in order to develop students into beings with the "capacity to sustain focused commitment, resilience and deepened competence over time…" through an experience in which education strengthens the "fiber of hearts and souls" (Eaton et al. 2016, 3).

Currently as society stands facing a number of potential future paths, some sustainable and some not, educators guided by values of sustainability are tasked with the role of both becoming and developing leaders skilled in sustainability. They must do this by creating an education system designed to instill leaders with the traits they need to imagine, develop and implement sustainability transitions. Taking inspiration from the encouraging development of sustainability leadership, educators should seek to utilize an emerging consciousness that is slowly occurring in society. One that has resulted in individuals and groups choosing to live their lives and lead their organizations in way that accounts for their impact on the earth, society and health of local and global economies (Ferdig 2007). However, the sustainability crisis continues to increase in magnitude and complexity, placing more pressure on educators to rapidly implement sustainability thinking and outcomes into their work. This thesis aims to contribute to questions posed to education on this matter and seeks to influence the implementation of effective learning environments driven by sustainability. It does this by seeking to answer the following research question:

What should educators consider when designing learning environments that promote the qualities needed for leading in complexity towards sustainability?

2. Background of the Fields

This section provides background into the key fields of research utilized within this thesis.

2.1 Sustainability Leadership

The growing socio-ecological crisis has led scholars to explore definitions of sustainability leadership and the characteristics of sustainability leadership as a unique area of study. Contemporary literature has highlighted sustainability leadership as both an academic concept (Bendell and Little 2015; Ferdig 2007; Visser and Courtice 2011; Hull, Robertson, and Mortimer 2018) and a practice (Broman et al. 2017; B. C. Brown 2011; Parkin 2010; Paul Hawken 2007; Burns, Diamond-Vaught, and Bauman 2015). Yet the concept of leadership for sustainability holds a plethora of understandings and epistemologies and remains part of an ongoing debate (Hull, Robertson, and Mortimer 2018).

Because of this, defining sustainability leadership involves navigating a multitude of possibilities in which a single understanding of sustainability leadership remains unlikely. Rather, the ongoing discussion considers numerous models of leadership and does not simply rely on individualistic 'leadership' narratives (Bendell, Sutherland, and Little 2017) that consider an understanding of leadership from a more traditional perspective. These viewpoints are seen to emphasize the 'attributes and actions of leaders,' that include notions of leader charisma, empathy, honesty and visionary capacities (Hull, Robertson, and Mortimer 2018) as the main symbols of leadership capacities. Such 'traditional' or 'individualistic' narratives are seen to be insufficient in their ability to address the wicked nature of sustainability problems (ibid) as explained above. Due to the belief that the complexity and wickedness of sustainability does not suit traditional leadership models, a consensus has emerged within sustainability leadership research that suggests collaborative and inclusive processes, which remove the traditional requirement of hierarchical power, provide effective options for leadership to respond to complexity using more decentralized approaches.

This concept of collaborative and nonhierarchical leadership aligns with emancipatory approaches of Education for Sustainable Development (See Section 2.2) and suggests that nonhierarchical leadership offers significant potential as localized, contextual and distributed responses means that sustainability action can occur across numerous levels of an issue by any individual or group whom feels compelled. The shared consensus in literature regarding the potential of collaborative leadership does not however, synthesize into a single, accepted definition of sustainability leadership and a list of potential understandings have emerged. A number are offered below as examples and descriptions of differing perspectives and understandings of sustainability leadership (Table 1.), including:

Table 1. Descriptions of Sustainability Leadership.

Author	Description
Waddock et al., 2013.	Waddock et al. argue that for leaders to cope effectively with sustainability and create greater system resilience, they need to act with wisdom, integrating three main attributes, 1.) systems understanding (the true), 2) moral imagination (the good), and 3) aesthetic sensibility (the beautiful).
Ferdig, 2007.	Ferdig articulates that anyone who takes responsibility for understanding and acting upon complex sustainability challenges qualifies as a sustainability leader whether or not they hold formal leadership position or acknowledged political and social-economic influence.
Visser & Coutice, 2011.	Visser & Coutice, suggest a sustainability leader is someone who inspires and supports action towards a better world and offer a 'Model of Sustainability Leadership' that suggests three important elements of 'Leadership context, Individual Leader and Leadership Actions' should be considered by leaders.
Bendell et al., 2017.	Bendell et al. offer the definition that "sustainable leadership is any ethical behavior that has the intention and effect of helping groups of people address shared dilemmas in significant ways not otherwise achieved' while also offering the reminder that leadership is about change 'involving acts rather than positional power" (p. 16).
Hull et al., 2018.	Hull et al. consider sustainability leadership from the perspective of traits of 'shared leadership' that suggest leaders should align 'direction,' in order to coordinate stakeholders and resources to achieve goals, be 'distributive' and able to coordinate across large scales with stakeholders who will likely never meet, work with the difficult task of being 'collaborative' across stakeholders and adopting 'adaptive' capacities that allow for shifting environments.
Burns et al., 2015.	Burns et al. suggest sustainability operate with three key elements that conceptualize sustainability leadership. They are, "a way of being and acting embedded in sustainability values, leadership rooted in living processes and also as an inclusive, collaborative and reflective process" (p. 89).

For educators considering the connection between education and sustainability leadership a number of challenges appear. The suggestion that sustainability leadership requires decoupling from traditional, hierarchical leadership into more collaborative and inclusive models, has meant that sustainability leadership education should foster individuals and groups who can focus on developing relationships and understanding context as important abilities. This means developing leadership traits that stem from experience in collaborative educational environments that function with the characteristics of ecosystems and resemble complex systems (MacDonald and

Shriberg 2016) rather than in more traditional hierarchical and teacher-centered learning environments. Designing collaborative learning environments within the bureaucratic institutions of Higher Education remains a difficult task for educators as the institution remains tied to traditionally focused instrumental approaches that utilize 'banking' models of education (Calleja 2014) and learning and assessment outcomes that aim to transfer knowledge to the student in order for them to reassemble it (Bodinet 2016).

Therefore, while students as future sustainability leaders are required to recognize and respond to complexity in their future careers and professions, they fail to engage with or explicitly experience complexity within the educational environments in which they learn. Compounding this, successful leadership qualities requires students to develop personal comfort with uncertainty as they adopt thinking that consider values, humility and adaption (MacDonald and Shriberg 2016) as well as develop capacities that help them navigate the personal and professional difficulties presented by the sustainability challenge. These include issues of wellbeing and resilience (Brundiers and Wiek 2017) that will be required if students are to cope with the wicked challenge of sustainability. These considerations remain central to the questions held by educators as the field of ESD progresses in its understanding and design of learning environments. Especially if they are to effectively promote the qualities needed in students to imagine and implement sustainability transitions.

2.2 Education for Sustainable Development (ESD)

If humanity is to confront the challenges and overcome the crisis of sustainability, Higher Education systems, and specifically Education for Sustainable Development (ESD) hold a significant role in developing individuals (and thus groups) skilled at imagining and implementing sustainability transitions. Research exploring effective ways to engage in sustainability education remains an ongoing and vibrant academic discussion that holds diverse perspectives and examines the potential of differing pedagogies and methods in addressing and overcoming the sustainability crisis through education (Glasser and Hirsch 2016; Redman, Wiek, and Barth 2020).

The practice and research of ESD has grown since the United Nation's Decade for Education for Sustainability Development (2005 – 2014) while a recognition of the importance of environmental education has meant the topic was present as a significant part of three major UN summits on sustainable development beginning with the 1992 Conference on Environment and Development, the World Summit on Sustainable Development in 2002 and the 2012 conference on Sustainable Development. As the UN developed and utilized the framework and language of the Sustainable Development Goals (SDGs) to connect and mark humanity's progression towards achieving sustainability, education was seen as a significant catalyst that stood at the core of the 17 goals. Goals that require not only a global shift in action and perspective, but that call for evolving mental models in humans all over the world towards sustainability (Leicht et al. 2018), an outcome for which education remains integral.

Education for Sustainable Development requires the systematic integration, inclusion or mainstreaming of crucial sustainable development issues and concepts into all forms and teaching (Adomßent et al. 2014). This means that educational methods will continue to evolve as diverse

structures and pedagogies designed for ESD are prototyped as educators and research strive to develop increasingly effective pedagogical and learning strategies. These strategies are often distinct and contextual depending on the design, epistemology and assessment of individual courses and their needs. Furthermore considerations of pedagogical approaches for ESD are seen to span across macro to a micro levels (Trencher et al. 2018). For example, Barth et al., suggest that within sustainability education the process of developing change agents with necessary competencies to undertake social transitions will occur in the micro level of courses (with their topics, learning objectives, pedagogies and assessments) while the rich and ongoing nature of ESD research highlights progress occurring at a macro level (Weiss and Barth 2019). This macro perspective is further symbolized by the underlying belief that the educational aims of ESD remain deeply rooted in the need to facilitate a maturing development of the human relationship towards nature (Fedosejeva et al. 2018). The dynamic nature of ESD means that continued experimentation will occur if educators are to guide the systemic and practical implementation of sustainability-focused programs in order to create conditions for students to become future sustainability leaders.

Within these programs, ESD practices highlight the need to educate both *about* sustainability and prepare students to implement and lead solutions *for* sustainability (Papenfuss et al. 2019). This means focusing not only on 'what' is learnt, but also 'how,' with educators required to develop an understanding of which pedagogies are most suitable for what sustainability outcomes (Wiek et al. 2013; Barth 2015; Lozano et al. 2017). This discussion is encapsulated by the consideration of 'instrumental and emancipatory' approaches to education (Wals et al. 2008). With the first seen as a more 'traditional' approach that treats students as passive recipients of information, while emancipatory methods, which suggest the need for transformation and liberation from mindsets of unsustainability remain popular and are widely used within ESD practices (Papenfuss et al. 2019). Certainly, the adoption of pedagogical approaches that encourage learners to critically consider and reflect on traditional worldviews, practices, and behaviours are needed (Ives, Freeth, and Fischer 2020; Missimer and Connell 2012; Calleja 2014). This requires engaging students in a praxis of dialogue and action that help them deconstruct themselves and the world they live in (Wamsler 2020; Lehtonen et al. 2018), transgressing boundaries and creating pathways to participation and shared meaning making (Heiskanen, Thidell, and Rodhe 2016). Instrumental approaches are seen as challenged by emancipatory needs of ESD and in some areas the decision to focus on competencies-based learning (discussed below) to promote sustainability outcomes has become critically correlated with instrumental approaches that seek to transmit knowledge on sustainability (Wals et al. 2008). This stands in opposition to the promotion of individual transformation through emancipatory education, a concept that is considered a crucial element of sustainability learning (Hoggan 2016; Wals et al. 2008; Wamsler 2020; Berner, Lobo, and Silva 2013). Examining ESD within the concept of leadership, a pathway emerges between literature and practice that seeks to pair emancipatory approaches to the question of how education can play a role in introducing emerging leadership models to society in order to overcome the dominant paradigm of leadership, which is often seen as a driver of unsustainable practices (Bendell, Sutherland, and Little 2017)

The role of ESD role in Higher Education, despite its emergence as a dynamic field, remains a central piece of humanity's response to the increasing sustainability crisis. Yet if its existence as

a vibrant and often contested field can be seen as a symbol of disagreement and uncertainty about which models will prove the most effective, it can also be seen as a manifestation of the enthusiasm and desire the field shares in collectively discovering the efficacy of these pedagogies and educational models. To that extent, this research attempts to situate itself within that conversation and contribute in some small way to its ongoing evolution.

Education for sustainable development: Competencies-based learning

This thesis is situated in proximity to an ongoing discussion regarding the use and value of competencies-based learning for sustainability. While not all papers presented discuss competencies explicitly, this thesis aims to develop an understanding of 'what' is required by those working within complex sustainability issues and the contexts in which they can learn them. The competencies discussion therefore provides a significant grounding for this consideration as it aims to articulate the required characteristics needed to implement sustainable futures. Competencies remain a focus area of ESD and the need for well defined, overarching competencies have emerged as readily apparent (Glasser and Hirsch 2016) if educators are to guide educational and pedagogical approaches within the ESD domain. As an emerging conversation, the competencies discussion has been challenged, however, by a sea of terminological confusion and a lack of consensus regarding what constitutes and defines a comprehensive set of sustainability competencies (Sandri, Holdsworth, and Thomas 2018). Further challenges are faced by the difficulties of developing tools that assess the acquisition of competencies, which has inhibited the uptake of competencies-based learning outcomes within ESD as educators struggle with measuring success of their programs in terms of competencies acquisition.

Despite these ongoing considerations, a number of competencies lists have been developed by numerous authors without reaching an agreement that stipulates a single definitive list (Redman, Wiek, and Barth 2020; Wiek, Withycombe, and Redman 2011; Brundiers and Wiek 2017; Glasser and Hirsch 2016). One outcome emerging from the conversation is a highly cited paper by Wiek et al. who conducted a systematic literature review of existing research in order to synthesize competencies-related findings into a framework that articulates five competencies. This finding is designed to 'benefit a range of institutional processes from designing and revising academic programs through to teaching and learning evaluations' (Wiek et al., 2011). The Wiek et al. framework it has been acknowledged as a sufficient and promising foundation from which to develop complimentary, robust, detailed and contextualized competencies (Glasser and Hirsch 2016) and currently it has been the focal point of a number of relevant studies. The competencies from the original research (2011) include; Systems, Anticipatory, Normative, Strategic and Interpersonal competencies and while a number of further suggestions have been considered for the framework from the authors and others, the original framework (2011) has played a significant role in situating this research.

Currently the framework remains central to the ongoing competencies-based discussion and continues to emerge (Brundiers and Wiek 2017; Brundiers et al. 2020). The authors acknowledge that the list remains an evolution and has since been built upon in further research with the inclusion of a sixth 'Integrated Competence' (Wiek et al. 2015) and the discussion of an

'Intrapersonal' competence (Brundiers et al. 2020) as well as consideration of a number of other 'professional' traits they found to be important for sustainability-related learning and action. (Brundiers and Wiek 2017). A meeting held by major researchers in the competencies field utilized workshops in order to increase "the sophistication of the discussion around ESD core competences," and to begin building a community of practice regarding the development, testing and refinement of competences in the field (Glasser and Hirsch 2016, 122). Some voices do remain critical of the competencies approach suggesting that competencies closely align with 'expertise' and do not stimulate the emancipatory approaches needed within ESD to transform student thinking away from systems and structures that perpetuate unsustainability (Wals et al. 2008). This thesis, however, supported by the consensus forming in the literature (Glasser and Hirsch 2016) uses the current competencies discussion as a useful context in which to situate this research and aims to contribute to this ongoing discussion.

2.3 Adopting a Strategic Approach to Education for Sustainable Development

The Framework for Strategic Sustainable Development (FSSD) is to situate this research within a wider global context in order to understand the relevance of ESD as a leverage point that influences the achievement of global sustainability. The FSSD promotes the adoption of a strategic and systematic approach to sustainability in a number of ways. They include:

- A funnel metaphor that facilitates understanding of the sustainability challenge and the self-benefit of competent proactivity.
- A five-level structuring and inter-relational model (5LM) distinguishing and clarifying the inter-relationships between phenomena of fundamentally different character.
- A principled definition of sustainability useful as boundary conditions to guide backcasting planning and redesign for sustainability.
- An operational procedure (ABCD) for the creative co-creation of strategic transitions towards sustainability (Broman and Robèrt 2017).

The Sustainability Principles are described in Table 2.

Table 2. The Sustainability Principles of the FSSD (Broman and Robèrt 2017).

In a sustainable society…	
nature is not subject to systematically increasing…	and people are not subject to structural obstacles to…
SP1) …concentrations of substances extracted from the earth's crust.	SP4) …health.
SP2) …concentrations of substances produced by society.	SP5) …influence.
SP3) … degradation by physical means.	SP6) …competence.
	SP7) …impartiality.
	SP8) …meaning-making.

The FSSD provides concrete procedural support for application of this principled definition in proactive strategic planning and redesign towards sustainability (Broman and Robèrt 2017) and adopts a systems perspective on the sustainability crisis and potential responses. The systematic overview and strategic approach of the FSSD have been influential on this research by providing an ability to clarify and structure where and how the research is situated in a global picture and its potential to contribute to global sustainability.

Education for sustainability leadership as a leverage point

In order to investigate the role of this research from a global viewpoint and situate the role of education for sustainability leadership as a leverage point to influence global sustainability, the 5LM of the FSSD has been used as a lens to position how localized action is interrelated to the wider systems in which those actions occur. The levels operate by:

- Providing clarification of the System that is being examined (Systems Level)
- Identifying the overall goal desired within that system (Success Level)
- The stepwise plan with prioritized actions is at level 4. Level 3 includes the strategic guidelines by which potential actions are prioritized into that plan (Broman and Robèrt 2017) (Strategic Guidelines Level)
- The 'concrete' actions adopted to reach success (Actions Level), and:
- The tools that support the planning and implementation of those actions (Tools Level).

Using the 5LM, a descriptive pathway emerges that highlights the role of ESD as a significant leverage point that contributes to the fulfilment of sustainable futures. An explanation of this pathway within the 5LM is given below in Figure 1.

Level			
System	**Society in the Biosphere**	**Institutions in society**	**Higher Education Sector**
Success	Sustainable society (SP's met globally)	Driven by sustainability competent and value-driven leaders	Widespread implementation of sustainability-focused educational programs
Strategic guidelines	Systematic support and development of institutions	Implementation of individual, organizational, political and public sustainability leadership	Education for Sustainable Development (ESD)
Actions		Education for sustainability leadership	Sustainability-focused degrees, pedagogies, courses
Tools			Learning environment design, teaching techniques

Figure 1. Mapping the contribution of ESD to global sustainability.

By looking at *society within the biosphere* (System Level) as the apex 'global' system, we can define humanity's desired future as that of a sustainable society within the biosphere (Success Level). This level of success is determined by alignment with the sustainability principles of the FSSD (Table 2) as the boundary conditions of sustainability. This articulates humanity's desired outcome.

The second system, nested within *society in the biosphere,* considers *institutions within society*. Success at this level is the development of institutions driven by sustainability literate leaders that can imagine, guide and implement successful sustainability transitions. Definitions of sustainability literacy remain contextual and contested, yet the development of scientific, systematic and strategic leadership towards sustainability (Broman et al. 2017) identifies the desired outcome of sustainability leadership within these institutions. If systematic and strategic sustainability leaders are developed and employed across institutions and sectors this can be seen as the strategic application of leadership working towards the fulfillment of sustainability (Strategic Guidelines).

The final system that we engage is within the *Higher Education sector* in which success is the creation and implementation of educational programs that facilitate the development of sustainability-focused programs (Success Level). The methods of implementation are supported and stipulated by Education for Sustainable Development (Strategic Guidelines) which offers

methodological assistance, guidelines and ongoing research to support the implementation of sustainability focused education. This implementation also then utilizes numerous tools, such as pedagogies and teaching methods that help within this fulfillment (Action and Tools level).

Using this model, we can see that outcomes at each level can influence the global intention to reach a sustainable society as implementation and effects reverberate between systems. For example, pedagogies that effectively develop sustainability competencies and literacy at the actions level of higher education have flow-on effects to reaching success in the institutional system and thus the societal system contributing to the fulfillment of a sustainable society in the biosphere. This research aims to contribute to these outcomes by investigating educational programs designed to promote sustainability knowledge. It does this through the critical examination of pedagogies, methods and learning environment design for sustainability. It intends to help further develop understanding and knowledge for educators regarding the development of effective strategies, actions and tools in education that promote sustainability leadership with the hope that using education as a tool, society's ability to implement sustainability transitions at institutional and global levels is enhanced.

2.4 Problem Statement

The current education system, developed during the Industrial Age, is largely geared towards 18th and 19th century knowledge and values (Bodinet 2016) and does not facilitate the learning needed for handling the complexity of wicked problems such as we see with the sustainability crisis. This complexity asks society to develop emerging forms of leadership that use collaboration and inclusivity and are developed through education, that promote values *of* sustainability and action *towards* sustainability. In responding to this crisis, educators now face an emerging issue challenging the purpose of education, that is the world's ongoing sustainability (Hasslöf and Hasslöf 2015). Thus, despite the primary purpose of sustainability education being the instruction, mentoring and training of students as future citizen-stakeholders (Tarrant and Thiele 2015), education that places emphasis on the delivery of information remains the norm (McLoughlin and Lee 2008). This means that graduates remain ill-equipped to respond to 'wicked' sustainability challenges (Wiek, Withycombe, and Redman 2011). This highlights the need for higher education to develop pedagogy contextualized by understanding and responding to the sustainability challenge and developing an understanding of the requirements needed by students to operate in complexity and implement sustainable futures. In developing education that promotes the liberation of students from mindsets that perpetuate unsustainability and provide the distinct competencies needed students need to imagine and implement sustainable futures. Educators have an integral part to play if education is to fulfill its role as a leverage point that contributes to the development of sustainable futures. From this perspective this research pursuits the research question stated below:

Research Question:

What should educators consider when designing learning environments that promote the qualities needed for leading in complexity towards sustainability?

3. Research Methodology

This section provides a background into the key methodologies used to undertake this research.

3.1 Research Lens

Research is influenced by the lens through which it is seen. In the case of the present research it adopts a pragmatic approach due to the belief that the subject of the human world is a completely different enterprise from the natural world, and that these must be known differently (Savin-Baden, and Major 2013). Furthermore, pragmatic research holds the intention of linking theory and practice, extract theory from practice and then apply it back to practice (ibid.). Because pragmatism offers a problem centered and a pluralistic approach to research that is concerned with the consequences of action and real-world practice (Creswell 2014) it thus suits this research as it intends to contribute *to* sustainability rather than only to *understanding* sustainability (Missimer 2015). Furthermore, this study aims to contribute to the development of real-world practices in the Higher Education sector and for the progression of ESD, and by adopting a pragmatic approach the research can make sense of information and determine relevant outcomes for the differing areas of research investigated in this thesis. By utilizing a pragmatic approach, a process emerges that allows for the intentional and strategic combination of multiple methods and techniques depending and according to the concrete needs of particular situations (Greenwood 2007). It provides the ability for the research to explore, not an objective and ultimate 'truth', but to better understand a dynamic, evolving area of research as seen from a certain perspective, at a certain time.

3.2 Research Philosophy – Adopting an Action Research Approach

Building upon this pragmatic approach this thesis utilizes an action research (AR) process to examine and study its chosen areas. While there is no 'short answer' to the question of what action research is, one definition identified by Reason and Bradbury articulates AR as a participatory, democratic process concerned with developing practical knowing in the pursuit of worthwhile human purposes grounded in a participatory worldview emerging at this historical moment (Reason and Bradbury 2008). This methodology was utilized for several reasons, namely that it intends to influence the systems it studies, that it is conducted from inside the field and institution it examines and because it attempts to develop arenas of collaborative learning that consider the design, enactment and evaluation of liberating actions within its research outcomes (Greenwood 2007).

The primary purpose of action research is to produce practical knowledge that is useful to people, and furthermore it aims to contribute to the increased well-being - economic, political, psychological, spiritual – of persons and communities, and to a more equitable and sustainable

relationships with the wider ecology of the planet (Reason & Bradbury, 2008). Secondly, this research has been undertaken from within the educational institution and programs that it seeks to affect and has been conducted by an author who operates as both a practitioner and researcher within the field of Education for Sustainable Development. From this context, action research can be used to unify inquiry, the improvement of performance and the development of persons in their professional roles (Elliot 1991). This aligns with this research as it intends to influence the development of effective sustainability education by improving the programs it studies. Action research provides a relevant and useful approach due to adoption of a defined cyclical processes that includes thinking, acting, data gathering and reflection in order to change practice and to develop change using systematic reflection and strategic innovation (Savin-Baden, and Major 2013). Adopting this research approach, the study foundations are based on:

- having a focus on a problem to be investigated
- developing a systematic process of inquiry, and
- creating explanations that lead to increased understanding (Stringer 2014).

The research as a whole has been structured from the perspective of Stringers' 'Look, Think, Act.' action research process (Stringer 2014). This is due to its potential to provide valuable option for research in complex 'systems of ecologies' because it allows researchers to follow simple rules that make learning possible and probable, and that by following simple rules the research makes learning sustainable (Patterson et al. 2010). This methodology operates as an overarching framework encapsulating the entirety of the three research papers as a whole and within the individual research pieces themselves. Stringer believes that the role of action research is to engage the complex dynamics of any social situation, enhance professional and community practices and increase the wellbeing of the people involved (Stringer 2014). As this research strives to increase understanding and improve ESD practices through its ability to produce effective, informed sustainability leaders and educators, action research and Stringer's approach provides a useful and relevant research approach.

The research has utilized case study approaches backed by literature reviews that provide context and language to create understanding and description of the areas researched. Case studies (Paper A and Paper B) are seen as an important tool for educational research (Corcoran, Walker, and Wals 2004) and intend to investigate educational programs as a contemporary phenomenon within their real life context and because they allow for investigation of a distinctive situation in which there are many more variables of interest (Yin 2014). A non-systematic narrative review was also used (Paper C) as it is a method that provides context and foundations for research later research findings (Savin-Baden, and Major 2013) and was chosen because it attempts to introduce and synthesize an emerging and potentially lacking area of research regarding personal and professional challenges faced by sustainability leaders.

3.3 Qualitative Methods Used Within this Research

The study utilized a number of methods appropriate for educational research based upon the use of Stringers 'Look, Think, Act' process of action research. Each stage and method are explained in Table 3 and in further detail below.

Table 3. Description of this research process using Stringer's Model (Stringer 2014).

Action Research Cycle	**Aim**	**Paper A**	**Paper B**	**Paper C**
Look Gathering data	…to gather information that enables researchers to extend their understanding and experience of the stakeholders.	Literature review / Feedback forms	Literature review / Survey / Interview	Literature review
Think Reflection and analysis	…to use systematic processes of analysis to provide the means for a deeper and more extended understanding of the situation.	Content analysis / Keyword analysis	Thematic analysis	Narrative analysis
Act Implementing solutions	…to formulate actions that lead to a resolution of the problem(s).	Recommendations for educators	Recommendations for educators	Conceptual model

Look: Gathering data

The primary objective of this 'Look' phase is to gather information that enables researchers to extend their understanding of the experience and perspective of the stakeholders involved within the research (Stringer, 2014). In the case of this research, 'experience' in general speaks to stakeholders from two educational programs (Papers A and B) and also uses the narrative literature review (Paper C) to speak to stakeholders within the emerging domain of sustainability leadership. The thesis utilized two case studies (Paper A and B) and one narrative review (Paper C) as the sources of data used in the research.

Mapping the field through literature review

There are a range of rationales for utilizing literature reviews as a research method and way of 'gathering data' (Stringer 2014). In this thesis, non-systematic literature reviews were used to determine knowledge prior to the research in order for a foundation for the study to be laid out (Savin-Baden, and Major 2013). This method provided Papers A and B with a grounding informational background and Paper C with its data source as it discussed an emerging theme within sustainability research that is currently lacking in study. Non-systematic reviews are aimed at identifying and summarizing what has been previously published and seeking new study areas not yet addressed (Ferrari 2015). Papers A and B utilize literature reviews to frame and summarize existing research by highlighting current patterns themes and issues and situate the relevance of the research (Seuring et al. 2005). Paper C uses a literature review in order to clarify the emerging field of study.

Gaining deeper understanding through surveys and interviews

In order to gather further data, Paper A utilized surveys in line with its initial Literature Review to situate the student perspective within the framing provided by the literature. Paper B utilized surveys for student reflection and semi-structured interviews of staff who taught the pedagogies that were studied in the paper. Surveys for both Paper A and B included open-ended questions conducted at the end of the program in which students provide commentary and feedback regarding their learning as a result of the experience. These methods allow for deepened understanding of participant experience in order to move towards greater understanding on which to develop viable solutions within the AR process. This is because surveys and interviews provide participatory voices from within the areas of research and are based on the idea that AR is only possible with, for and by persons and community within the scope of the study (Reason and Bradbury 2008). These approaches allow those voices to emerge.

Think: Reflection and analysis

Within Stringer's Framework, the purpose of the 'Think' phase is to sift through the accumulating body of information that emerges from the "Look' phase, identifying 'significant features and elements that seem to have a significant influence on events" (Stringer 2014, 203). In this research, the process was undertaken using a number of differing tools of analysis. They, and their relevance to the research, are discussed below.

Keyword analysis

Paper A utilized the Wiek et al. competencies framework (Wiek, Withycombe, and Redman 2011) as a coding method to examine competencies within the data of the study. It did this by investigating the frequent repetition of defined keywords present in the data (Bernard and Ryan 2010), the keywords being derived from the competencies framework. The defined competencies concepts and methodologies of the framework provided a vocabulary and structure in which program content and student surveys were examined. Keyword analysis allowed the study to look for the frequent repetition of words while highlighting unusual terms that emerged in the study

(Savin-Baden, and Major 2013). This allowed the research to suggest results that uncover competence learning and discover outliers found in the data.

Content analysis

In Paper B, student surveys and staff interview were examined in line with a content analysis approach in order to make valid inferences from the data (Savin-Baden, and Major 2013). Content analysis strives to "make replicable and valid inferences from data" within its context (Krippendorff 2013, 21). It was a useful tool at an early stage of research as it allowed for the printed text of the surveys and interviews to be examined and for categorizations to emerge from the text (in this case benefits and challenges of the pedagogies) and for results to stem from these categorizations. Content analysis differs from the descriptions of thematic analysis below through its ability to be more quantitative in its ability to measure the frequency of content outcomes (Vaismoradi, Turunen, and Bondas 2013).

Thematic analysis

Thematic analysis is often discussed as not being the most scientific sounding method but one of the best for qualitative research outcomes (Savin-Baden, and Major 2013) and is often used as a way of identifying what is common to a topic and of making sense of those commonalities (Braun and Clarke 2006). Thematic analysis offers a process of recovering the theme or themes that emerge in the data and is sometimes also known as a narrative analysis (Savin-Baden, and Major 2013). It offers a point of difference from content analysis as it intends to emphasize the consideration of context (Vaismoradi, Turunen, and Bondas 2013). This method was utilized for Paper C in which emerging themes captured from literature were synthesized into thematic areas through the repeated handling of the data (Savin-Baden, and Major 2013). This examination provided a distinct articulation of developing narratives within the field of sustainability leadership. This resulted in a conceptual model that now waits for empirical testing (see Future Research). Within this process, the thematic analysis utilized intuition and sensing, combined with the author's position as a researcher and practitioner within the field in order to deduce themes that emerged from the data. The themes provided are presented as an emergent narrative in the results of Paper C.

Act: Implementing solutions

In Stringer's model of action research, the 'Act' stage includes the notion of formulating actions that will lead to a resolution of challenges seen within the fields of study (Stringer, 2014). This can take a number of forms and this research adopted the option of Recommendations for Educators (Paper A and B) and a Conceptual Model (Paper C). These outcomes offer novel information to the field and intend to be used within an empirical study for validation and refinement in future studies. While the papers do offer a number of potential solutions, this thesis primarily focuses on the first two phases of Stringer's cycles and offers a descriptive insight into the research area with the intention of providing a deeper prescriptive element in the post - licentiate phase of the research.

Recommendations

While the thesis presents independent research pieces in the form of three papers, it represents one larger and ongoing research piece. Thus, the recommendations to educators provided in Paper A and B include proposals that aim to be implemented within learning environments in the future. They do this as prescriptive suggestions for design and remain to be examined for efficacy and validity in future research. Therefore, they can be seen as the first of a series of steps that with enable them to potentially achieve a resolution of the issues being investigated (Stringer 2014).

Conceptual model:

The conceptual model suggested in Paper C formulates the results of an initial descriptive stage of research and requires further studies in order to validate and then test the model for validity as an effective empirical framework. Models are designed to provide an abstraction or simplification of reality and can communicate ideas and emerging research that lay the groundwork for future research (Heemskerk, Wilson, and Pavao-Zuckerman 2003). Nonetheless, this conceptual model can be seen as the initial suggestion presenting a potential solution to the challenges of sustainability leadership the study attempts to articulate.

4. Summaries of Appended Papers

This section provides a brief summary of each paper in the Licentiate.

4.1 Paper A: Competence Literate but Context Lacking? Investigating the Potential of Study Abroad Programs to Promote Sustainability Competence Acquisition in Students.

Published as: Ayers, J. Competence Literate but Context Lacking? Investigating the Potential of Study Abroad Programs to Promote Sustainability Competence Acquisition in Students. Sustainability 2020, 12, 5389.

Summary

Paper A investigated the potential of study abroad pedagogies in promoting the acquisition of sustainability competencies in its students. The Engineers Without Borders Australia Design Summit program was examined as a case study in order to articulate whether sustainability competence acquisition occurred as a result of student experience within the program. It did this by investigating program content and student feedback which was compiled through surveys in which students provided detailed descriptions regarding their learning outcomes during the program. The findings of the research showed significant evidence that sustainability competences were acquired by students as a result of the program. However, there was the possibility that students became 'competence literate but context lacking' as findings suggested students often displayed evidence of competencies acquisition but failed to see the use of these competencies for sustainability implementation or outcomes. This would be due to the nature of the 'sustainability' competencies defined by the Wiek et al. framework as 'neutral' concepts and methodologies that need to be contextualized *by* sustainability in order to be used *for* sustainability.

The study suggests a number of possible avenues for educators, in terms of learning and environment design, that allow them to contextualize competencies acquisition within sustainability in order to overcome the issues of students who are 'competence literate and context lacking'. By contextualizing competencies learning, the potential of competencies as significant tools for sustainability is enhanced. These avenues for contextualization include, the use of a principled definition of sustainability to frame competence learning, the possibility of utilizing sustainability 'epistemic' teachers as guides to contextualize learnings towards sustainability, and utilizing student experiences with unsustainability in order to develop a personal relationship with sustainability that creates increased awareness of sustainability challenges and acts to motivate students as aspiring sustainability leaders.

Relation to thesis

The study utilizes a widely used sustainability competencies list to examine a specific pedagogy to investigate whether its learning environments are conducive to sustainability competencies acquisition. It provides contribution by discussing the environments in which competencies acquisition for sustainability occurs. It provides a novel insight into the possibility that competencies can be acquired without the understanding of their use *for* sustainability, as well as providing a contribution regarding the notion of 'how to' design and consider learning environments that can contextualize competencies learning in order to achieve the desired outcome of helping to implement sustainability transitions. These outcomes help to answer the research question by providing an examination of sustainability competencies and their potential acquisition as well as the contexts in which this acquisition occurs. The recommendations provided by the research provide some novel contributions for ESD educators to consider as they design learning environments aimed to increase sustainability knowledge and outcomes in students.

Authors contribution

I was the originator of the study and the sole author of the paper. I conducted the analysis of the data, which was collated and received with support from Engineers Without Borders Australia. My advisors provided feedback on content and writing.

4.2 Paper B: The Use of Reflective Pedagogies in Sustainability Leadership Education

Published as: Ayers, J.; Bryant, J.; Missimer, M. The Use of Reflective Pedagogies in Sustainability Leadership Education — A Case Study. Sustainability 2020, 12, 6726.

Summary

This paper examined two pedagogical tools utilized in the Masters in Strategic Leadership towards Sustainability (MSLS) program that employ reflective learning techniques to develop qualities for sustainability leadership. The research investigated student and staff responses to these tools examining their efficacy as part of the MSLS program's Leading in Complexity course. The study adopted a case study approach and investigated the Portfolio and Pod components of the course examining them for their 'usefulness' as pedagogies. The results suggest that the use of defined 'sustainability leadership' structures in which reflection can be contextualized can be useful for student learning towards sustainability. The Paper outlines the role of the Leadership in Complexity Skills Map used in the course as a framework to guide student reflection towards sustainability to ensure that reflection occurs within a defined direction. Findings showed that some students acknowledged that they were challenged by these pedagogical structures and found them to be restrictive for reflective processes or had difficulties with the requirement of engaging in reflective processes in general. However, the findings suggested that the pedagogies created significant value regarding individual and collective reflection and created outcomes such as student comfort with multiple perspectives. The study also found that these pedagogies had positive outcomes on self-awareness and self-directed learning of students but that the process of hosting reflective practices often caused exhaustion and took an immense mental and emotional toll on staff members facilitating them.

Relation to thesis

The paper discusses the novel nature of pedagogies that promote reflective capacities in students in the context of building sustainability leadership outcomes. These capacities provide a number of important qualities in sustainability leaders and promote the ability to consider individual and collective reflection as a personal practice and leadership skill. This includes encouraging lifelong and self-directed learning, the development of collaborative skills as students engage with multiple and diverse perspectives as a result of the process of collaborative reflection. The study also provides reflections and recommendations directed towards ESD educators that suggest a number of factors that should be considered in the development of learning environment design for reflection. Thus, the study provides a novel contribution to the research aims of this thesis with its suggestions regarding the potential of reflective capacities within sustainability leaders and the development of these traits using a defined structure in which to guide the learning, in this case the Leadership in Complexity Skills Map. The study also outlines a number of suggestions for educators regarding construction of learning environments and the contexts in which reflective practices can be fostered which is currently an area in ESD research.

Authors contribution

I was the lead author on this paper suggesting the conceptual framework of reflective learning and writing the first drafts before moving into a collaborative process to finalize the paper through revision and refinement with my co-authors.

4.3 Paper C: The Unique Challenge of Sustainability Leadership

Published as:

Ayers, J. Callaghan, E. The Unique Challenge of Sustainability Leadership. *Submitted to Journal.*

Summary

This paper examines literature to identify that sustainability leaders potentially face a set of unique challenges to their leadership that emerge from confronting the ongoing and increasing sustainability crisis. The challenges emerged from literature as a result of a narrative review and are situated in the understanding that the sustainability crisis represents a unique and novel predicament for leaders. This is due to the distinct nature of the sustainability crisis in comparison to other crisis and emergencies faced by humanity over history. This distinct nature is due to the consideration that the sustainability crisis involves an awareness that the ecological basis on which life exists is being fundamentally degraded and that there remain no distinct 'first responders' to the sustainability crises. These challenges are seen as barriers to the effective action of sustainability leaders and highlight the requirement of leaders to be aware of the difficulties faced within sustainability leadership and the need for proactive responses to these difficulties. Four challenges emerged from the literature that may impact individuals and groups, potentially negating their effectiveness as leaders and harming their personal wellbeing. The unique challenges to sustainability leadership are:

- The psychological burden of unsustainability.
- Achieving a 'nearly' impossible task.
- Being complicit to unsustainability, and
- Being the messenger.

The paper also suggests that due to the unique challenges faced within sustainability leadership traditional forms of leadership that include hierarchical and charismatic leadership archetypes are insufficient in responding to the sustainability crisis due to its complex and interconnected nature. The paper then articulates from the literature a number of specific characteristics of sustainability leadership that can play a role in helping develop resilient and effective leadership. The characteristics include:

- Acting and living responsibly.
- Adopting a scientific and systemic approach.
- Leveraging collaborative and adaptive leadership.
- Focused on action and outcome-oriented, and
- Promoting inspiration and scale.

The paper suggests that leaders can practice and develop these characteristics in ways that allow them to respond to the challenges of sustainability leadership and provide wellbeing. The

research suggests that it is possible to foster actions that encourage the ongoing resilience, wellbeing, and impact of sustainability leaders if they adopt proactive approaches to leadership in light of the challenges of sustainability. These findings require empirical investigation and have been considered within future research (see Future Research) yet aims to develop a novel area of research within sustainability leadership discussions.

Relation to thesis

The paper attempts to introduce a novel research area that is currently lacking within sustainability science and leadership studies. It does this to provide a basis in which researchers can better understand the capacities needed by sustainability leaders to ensure ongoing participation and wellbeing in sustainability work. The research argues that for sustainability leaders to be impactful and effective, they must understand and then confront these unique personal and professional challenges and can do so by adopting certain leadership traits. In order to develop a set of leadership capacities to overcome these challenges, the challenges must be identified and articulated. The paper aims to develop a growing awareness regarding these challenges in researchers and educators in order to address them. It intends to provide a basis on which future competencies and traits that ensure resilient individuals and groups can be investigated.

Authors contribution

I was the lead author and conceived the idea of the study. This included identifying literature and conducting the narrative review. I wrote the drafts of the paper and from here it became a collaborative process with my co-author both conceptually and in terms of writing.

5. Main Results and Discussion:

The three research pieces (Paper A, Paper B, Paper C) form a number of outcomes that provide the contribution of this thesis. This contribution is offered below in the form of results and discussion in relation to the guiding research question, which is:

What should educators consider when designing learning environments that promote the qualities needed for leading in complexity towards sustainability?

The findings are situated across four themes and emerged as important outcomes in the context of the action research process adopted by this thesis. From the position of researcher and educator these four statements have been articulated with the intention of impacting the programs they studied as well as providing considerations for other and future ESD programs. The findings are that:

1. **Contextualizing Competencies Acquisition is as Important as the Competencies Themselves.**
2. **Reflective Practices for Sustainability Require Structures to Guide Them (and are Difficult to Teach).**
3. **Students as (Future) Leaders must Prepare for Unique challenges.**
4. **A Number of Central Questions have Emerged for Educators (and will Guide Future Research).**

They are discussed in greater details below.

5.1 Contextualizing Competencies Acquisition is as Important as the Competencies Themselves

As discussed in Section 2.2, this study is situated in the context of an ongoing ESD discussion regarding competencies required by individuals to affect sustainability outcomes. Competencies are seen as a crucial element of the progression of ESD learning and outcomes and the Wiek et al. framework remains an important contribution to this debate (Wiek, Withycombe, and Redman 2011).

This framework was utilized within Paper A as a conceptual model that framed the examination of a study abroad program in order to find if it promoted acquisition of the five defined competencies (Systems, Anticipatory, Strategic, Normative and Interpersonal) of the said framework (Wiek, Withycombe, and Redman 2011). Despite the fact that the program itself was not explicitly designed for 'sustainability' learning, it facilitated learning of Human Centered Design and offered sustainability as a core underlying philosophy of the program. Thus, the research provided a relevant case study within which to consider the ongoing competencies discussion. Specifically, the consideration in ESD of which pedagogical pathways encourage acquisition of competencies. The study analyzed data using keyword analysis of statements showing students acknowledging acquisition of competencies learning within their written

reflection on program learning. This led to interesting results which suggested that the program *was* efficient in promoting competencies acquisition as evidenced by significant mentions of the competencies, their concepts or methodologies, within the data set. This was enhanced by the presence of the competencies' concepts and methodologies within the taught content of the program as well.

This finding, however, was countered by the verdict that students often did not connect their competencies acquisition with sustainability contexts or to guide sustainability outcomes in their application of the competencies. That means that the study showed that competencies defined as 'sustainability' competencies within the framework can be and were acquired, but that this acquisition can occur neutrally, without realization that the competencies are intended for use for sustainability. The evidence of students becoming 'competence literate but context lacking' was shown by the reporting of 450 individual statements across 137 students that correlated with competence acquisition according to the framework, yet only 12 explicit mentions of the term 'sustainability' or 'climate change' within student learning outcomes occurred. For example, students on the program would display 'systems competence' as described in the framework by constructing a community asset map. Yet their practice did not guarantee sustainability understanding or outcomes while the action of mapping was not framed *by* and done *for* the purpose of sustainability.

This emphasizes a significant question within competencies research. That being, is there the potential for pedagogies to be able to promote the acquisition of 'sustainability' competencies without students developing a basis understanding of how to connect them to sustainability? If true, how then, can educators design learning environments in order to ensure that competencies acquisition is done *for* sustainability? This highlights a novel point within ESD development. If educators are to guide competencies learning for sustainability, then considering the design and structure of learning environments that ensure both acquisition and contextual understanding remains key. One potential consideration for educators is that if they are to avoid the trap of students becoming 'competence literate and context lacking' is that competencies learning needs to be framed within the wider perspective of sustainability. Currently the competencies can operate as neutral learning outcomes showing an assumption in the framework that suggests that by acquiring the competencies, progression towards sustainability occurs. While the program was not designed for sustainability explicitly, the fact that its central teaching was Human Centered Design shows that educators can teach topics closely aligned to sustainability without resulting in sustainability implications. However, Paper A outlines three potential avenues that may help educators overcome the challenge of creating competence literate but context lacking learning environments. These outcomes are shared below, they are:

- The use of robust, scientifically derived sustainability principles based on the principles of the Framework for Strategic Sustainable Development, to provide students an understanding of the boundaries of socio-ecological sustainability and with which they can situate their learning while holding a definitive understanding of sustainability.

- The use of a 'sustainability' epistemic facilitator to frame and contextualize learning towards sustainability as 'students are supposed to observe is something that they have to learn and the role of the teacher is of decisive important for this learning' (Lidar, Lundqvist, and Östman 2006, 60).

- The use of learning environments that connect the experience of the student with 'unsustainability' in order to promote a personal and visceral understanding of the sustainability challenge.

The rationale for each of these outcomes is shared below.

Using sustainability principles to frame competence acquisition

The Sustainability Principles of the Framework for Strategic Sustainable Development (FSSD) provide a scientific, peer-reviewed understanding of the boundary conditions of sustainability. They do this by articulating three ecological and five social definitions of sustainability (Table 2) that educators can use to frame learning, providing educators with a sustainability-contextualized container in which competencies can be acquired. This would allow students to move from 'competence literate and context lacking' to 'competence and context literate' by acquiring competencies in the shadow of a holistic sustainability understanding. If competencies are acquired without this robust understanding of sustainability, their implementation may result in action that affects in localized contexts but does not contribute towards a local or globally sustainable society. While many differing definitions of sustainability exist and could be utilised to provide this contextualisation, the robust, scientific and peer reviewed nature of the described principles mean they provide a strong option for universal understanding of sustainability. Furthermore, they can be adopted across any learning environment related to sustainability as a shared and cohesive language. Thus, if all learning and implementation of the competencies is carried out within the framing of the principles as boundary conditions of sustainability. Then a coherent and unified goal that promotes strategic sustainable development occurs. An outcome that means all actions towards sustainability are aligned and provide a shared and strategic direction in which the competencies can fulfil their potential as 'sustainability' competencies.

The facilitator as a guide

This said outcome suggests that the role and power of the facilitator or teacher's epistemology should be deeply considered by educators as they design learning environments. This is because the teacher's worldview will operate as the lens through which students experience and contextualise their learning. Thus, if the learning environment is framed by a teacher's relationship with sustainability or through their sustainability centric perspective, students are more likely to adopt this value and operate from a similar viewpoint. For example, the systems map can be used by students to sense-make the workings and dynamics of a community. But having a teacher who consistently reframes the mapping practice from the perspective of social-ecological impacts or alignments or misalignments with sustainability will provide a viewpoint that paints understanding from the perspective of sustainability. If we adopt the understanding

that educators design pedagogy based on competence acquisition, the consideration of how the epistemology and language of the learning environment influences student understanding remain important. If the competencies are not continually framed as a means to influence sustainability problem solving or from within sustainability perspectives, then students will not have the requisite understanding or motivation to use them for the purpose of implementing or achieving sustainability transitions.

Developing students' values through their experience with unsustainability

Furthermore, if educators consider how the visceral experience of students impacts their learning, the interaction of students with unsustainability, as part of pedagogies like study abroad programs, can play a significant role in shifting student understanding of sustainability. If the experience of engaging with unsustainability can potentially influence student worldviews and alter mental models towards a more personal relationship with sustainability, the experience of being exposed to unsustainability remains a potentially useful contextualisation and pedagogical tool. This suggestion considers the integral nature that an individual's relationship with sustainability plays on their motivation and potential to act. Student acquisition of competencies followed by an experience with unsustainability may be a unique and powerful combination that both contextualises their learning and serves as a motivational tool toward sustainability action by serving as an emancipatory experience. If this is so, then study abroad programs may provide an effective pedagogical model and the prospect of exposure to unsustainability would be something to consider for all ESD educators.

Contextualization to direct competencies towards sustainability outcomes

In Figure 2. we can see how implementing these three considerations can be used to direct competence acquisition towards sustainability outcomes. The use of a (A) science-based, unifying sustainability principles to define sustainability, (B) using sustainability epistemic teachers as 'guides' and (C) using the personal student experience with unsustainability to encourage and motivate sustainability awareness and action.

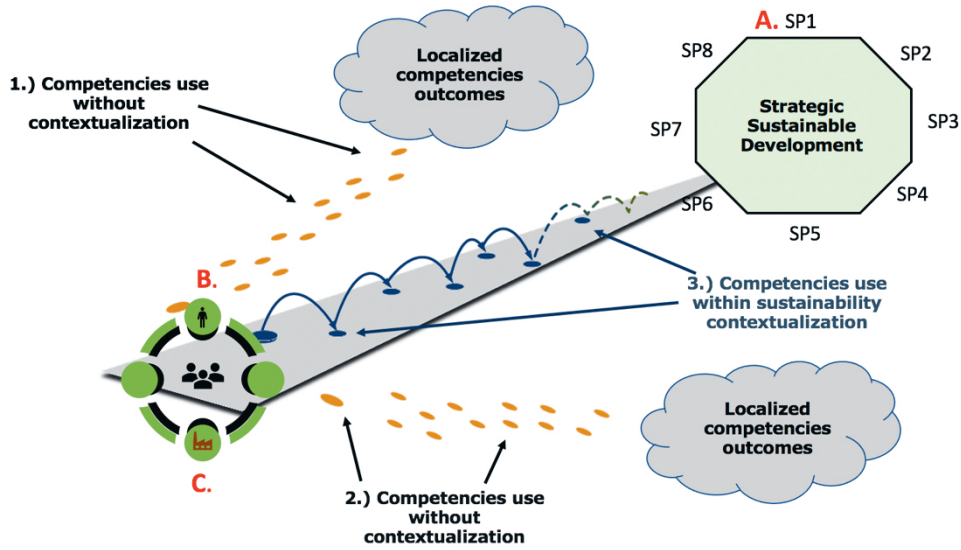

Figure 2. A 'contextualized' learning environment for sustainability.

The ongoing competencies discussion in ESD has often led to challenges with defining and outlining which competencies are required for sustainability. This has left the field considering how individual competencies will play a role in influencing sustainability outcomes. While the dialogue considering individual competencies is necessary, if educators are to create unified frameworks of understanding that guide design and teaching of educational programs, then they need to consider both the competencies and also the contexts in which they are taught. This research suggests that this debate must also be cognizant of the structures and scaffolds that surround the 'acquisition' of sustainability competencies. That is to say that the arena in which the competencies are learnt is potentially as important as defining the competencies themselves.

These findings offer a suggestion and provides a direction for educators to consider when designing learning environments. These findings include the understanding that structures surrounding competencies acquisition and their deliberate design can be used to impart significant contextual understanding of sustainability in students. This would lead to empowering the base on which the acquisition of sustainability competencies and their effective use can emerge.

5.2 Reflective Practices for Sustainability Require Structures to Guide Them (and are Difficult to Teach)

Further findings of this thesis stem from Paper B (Reflective Pedagogies) which suggest the potential of reflective capacities, individually and collectively, to be important elements of sustainability leadership and to be considered within its educational design. Especially for educators considering emancipatory approaches to ESD. The research also suggests that despite their potential, these capacities require a number of considerations to be effectively taught if they are to achieve outcomes in terms of sustainability and its leadership. Paper B contributes to this discussion by providing a case study analysis of pedagogies utilized in the MSLS program that promote reflective practices in students. It also suggests a number of tools and processes to achieve this. The research investigates and outlines how reflective pedagogies promote a number of significant traits in students as sustainability leaders. These include increased self-awareness, comfort with multiple perspectives and the 'other' and ongoing capacities for self-directed learning (Paper B). It also presents two pedagogical tools developed and utilized to encourage reflective outcomes, the Portfolio and Pod, and introduces the Leading in Complexity Skills Map (see Paper B) as a contribution to the ongoing ESD discussions. The outcomes of the paper discuss that if educators are to promote reflection in students then utilizing certain pedagogical structures to define the 'direction' in which students reflect remain integral to these pedagogies if they are to achieve ESD outcomes.

The Skills Map provides a structured filter through which student learning passes in order to ensure that reflection does not occur without the will to act (Scharmer 2009), thus resulting in the potential of reflective but passive students unable or unwilling to influence sustainability. This suggests a powerful point for sustainability educators, showing that reflective capacities are important but that if students are encouraged into reflection they must do so within the context of a defining structure or scaffold to guide sustainability focused reflection. Especially is this connection is to impact transformative learning experience. In this case the study suggests the Skills Map as a potential solution that can be used to ensure reflection practices work to provide context and benefit a larger sustainability perspective. This is an outcome that aligns with the notion of the need to contextualize competencies discussed in Section 5.1. Furthermore, in using structure to guide learning in the Portfolio and Pod, students are offered space in which they can decide, with agency and freedom of individual expression, *how* they choose to reflect, and which area of learning they want to develop. Yet this is done so within a purposeful sustainability direction.

Students supported this notion stating that the structures provided within these pedagogies were significantly helpful in developing personal outcomes. Evidence included 'I am so grateful that I have the chance to reflect on a skill I want to develop and become a better leader and better person,' and, 'I enjoyed formally reflecting and being in a routine from the start' while others suggested the LiC Skills Map used to frame reflections was a 'helpful outline to use as a basis for reflection.' Likewise, the Pod pedagogy, which promoted collective reflection and discussion using a facilitated group setting as a structure, was found to be an important tool that encouraged

students' comfort with 'multiple perspectives' and 'the other.' The diverse nature of the student cohort within MSLS provides a significant platform on which numerous cultural, religious and socio-economic backgrounds engage and listen to each other. The Pod provided a 'place to express one's own feelings and thoughts and to see how others feel and think.' These implications suggested that the structures used within the pedagogies (the LiC skills maps, weekly reflections) are found as useful by a significant proportion of students. In contrast to this, however, was the suggestion by a number of students that the pedagogical design did not work for them. Some challenges emerge for students whom the pedagogies did not suit as they were found to be constrictive to students or found the 'forcing' of reflection as difficult. This is discussed in further detail in Section 5.4 and remains a challenge in terms of the difficulties of using structures that support and cater for diverse needs of individual students.

The immense mental and emotional toll of reflective pedagogies on staff

A further significant finding of this study was the articulation by staff that hosting the reflective pedagogies placed an immense mental and emotional toll on them. Statements suggested that the responsibility of holding a 'safe space' in which students reflected, both individually or within groups could often become very difficult as students displayed stress, anxiety, trauma and discontent as part of the reflective learning experience. This was an issue that staff found difficult due to their experience being educators and 'not being a trained counselor.' Despite the difficulties that are faced by staff, their belief in the benefit of the pedagogies outweighs the challenges faced by them. Still the understanding that these pedagogies require unique considerations and distinct skillsets are significant factors when it comes to designing and constructing learning environments with a focus on sustainability leadership.

This point offers a suggestion to ESD research in that it considers the environments in which sustainability learning occurs and the unique requirements placed on staff as they facilitate emancipatory or transformative learning journeys. As ESD research discusses the competencies required by students, the suggestion that teachers also require sets of distinct competencies should be considered, especially as ESD moves towards the increased use of emancipatory and transformative learning techniques. The combination of teachers needing to teach both about and for sustainability asks them to be competent in regard to state of the art sustainability knowledge and content while also being emotionally aware, considerate of power and compassionate in their interactions with students as they undertake what are often difficult educational experiences. These potential difficulties tie into the considerations of Paper C and suggest the potential for investigation of personal and professional challenges faced by ESD educators should be discussed also.

The paper suggested that it is necessary but difficult to construct learning environments that promote reflection but that also they should have a structure and set of guidelines within which to frame reflective learning outcomes and direction. These findings have been summarized into recommendations for educators that guide design and implementation of reflective learning environments that promote significant outcomes for sustainability leadership education. They findings show that:

- Reflective pedagogies can be utilized to promote self-awareness and self-development of students in a way that promotes sustainability leadership development, but they should be considered within a suite of complimentary pedagogies (that promote group work) that support each other through interrelated entities.
- Leadership outcomes for sustainability should be defined by educators prior to development of reflective pedagogies in order to 'guide' reflective direction towards specific sustainability.
- Limitations to these pedagogies occur in their ability to satisfy the different needs and comfort levels of diverse student groups. Thus, structures should be made that allow both space for diverse personal learning journeys and that provide clear outcomes and place accountabilities on the students.
- Educators should speak directly to the notion of power in the classroom and specifically the tension that emerges with reflective pedagogies between the deep learning, empowerment, and the academic requirement aspects.
- Reflective pedagogies can place difficult mental and emotional loads on staff facilitating them and structures, support, and training should be considered for staff in the development and implementation of reflective pedagogies for sustainability leadership education (Paper B).

As discussed above, reflectivity is an important aspect of sustainability leadership and provides a number of beneficial outcomes for students. This thesis suggests that the reflective pedagogies studied produced these benefits by aligning learning outcomes with structures that guide reflective practices for students and at the same time help contextualize those practices towards sustainability. This continues to acknowledge an emerging theme in ESD research that is beginning to consider the importance of more 'internal' or 'personal' set of competencies (Glasser 2019; Brundiers et al. 2020). The implications suggest that while a normative set of sustainability competencies remain deeply important to the field of ESD, the potential for an increasing understanding of other potential competencies domains, such as reflective, remains important.

5.3 Students as (Future) Leaders Must Prepare for Unique Challenges

The challenges of sustainability leadership

The Unique Challenge of Sustainability Leadership (Paper C) introduces an emerging field of study into research regarding sustainability leadership. That theme is the consideration of the personal and professional challenges posed to sustainability leaders by the wicked issues of sustainability. The Paper attempts to define these challenges as unique and emergent as a result of the confluence of ecological degradation, social challenge and a technologically saturated global state in which sustainability leaders are required to operate. It suggests these challenges will manifest in increasingly difficult environments for leaders to operate in as the individual and societal pressures of the sustainability crisis take a toll on their personal wellbeing and professional

abilities. This is visualized by the closing of the funnel walls (see Figure 3) which shows that as decreasing ecosystem capacity combines with increasing leadership pressures as the need to act towards sustainability increases. Then leaders will be placed in increasingly stressful situations and environments as the sustainability challenge worsens and time to act lessens. The study also suggests that emerging leadership traits, associated with effective sustainability leadership, may play a role in determining the ongoing wellbeing of individuals and groups working on sustainability transitions. Some studies have emerged that considers the notion of wellbeing in sustainability advocacy. Yet, these works operate as practical responses to the difficulty of day-to-day sustainability work rather than creating a defined understanding of the unique challenge that is facing leadership focused on sustainability. The study (Paper C) aims to establish this articulation by using literature to establish a base understanding of the personal and professional challenge of being a sustainability leader. It provides an original contribution by outlining from literature four significant challenges faced by sustainability leaders. The four challenges are:

- The psychological burden of unsustainability.
- Achieving a 'nearly' impossible task.
- Being complicit to unsustainability, and
- Being the Messenger.

These challenges highlight four potential areas that have a significant impact on sustainability leadership. This research intends to provide some clarity around the personal impacts that potentially inhibit the efficacy and longevity of sustainability leaders. This clarity requires further empirical investigation (see Future research) and the study offers itself as an entry point to the conversation. Yet for ESD educators, the question of developing sustainability competencies that consider the personal wellbeing and resilience of leaders implementing sustainability is a pertinent one. A question that becomes especially prescient and pressing as the immense and urgent need for sustainability increases.

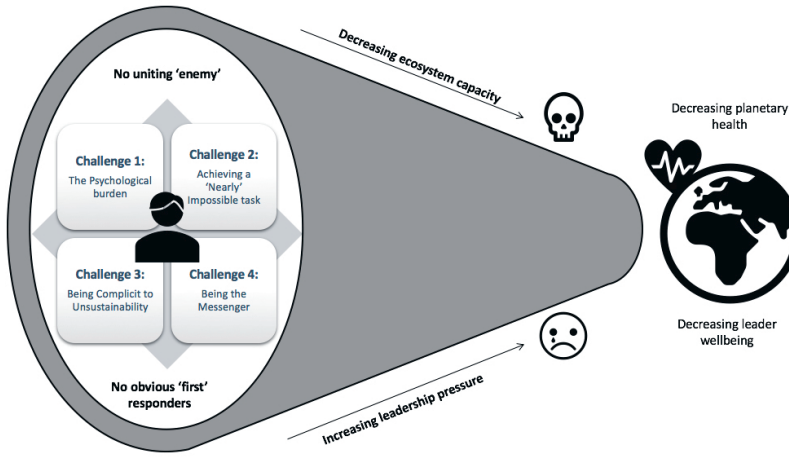

Figure 3. The unique challenges of sustainability leadership.

Responding to the challenges

Consideration of what these competencies could be and how to design learning environments that include them offers an insight into a new area of thought for ESD researchers and educators. The development of competencies or traits that consider the challenges described above and how to respond to them remains unexplored in academic research and constitute an area of potential. While a number of studies connect concepts of wellbeing with pro sustainability action (K. W. Brown and Kasser 2005; Venhoeven, Bolderdijk, and Steg 2013) there remains a distinct lack of research that considers the existential, philosophical or professional challenges of working withing sustainability. A number of studies investigate new concepts such as Albrecht's discussion of Solastalgia, (Albrecht 2005) eco-anxiety (Pihkala 2018) and ecological grief (Cunsolo and Ellis 2018) but these studies suggest that there is potentially a suffering that emerges from the domain of sustainability leadership without discussing significant avenues to overcome them.

Paper C articulates the consideration that responding to the challenges is possible. It does this by suggesting that five emerging characteristics found within sustainability leadership may play a role in helping to overcome the challenges if fostered through a number of distinct actions. The characteristics imply that by consciously adopting behaviors in each area, leaders can develop wellbeing and resilience to the challenges, the characteristics being:

- Acting and living responsibly.
- Employing scientific and systemic thinking.
- Leveraging collaborative and adaptive leadership,
- Being action and outcome-orientated, and
- Promoting inspiration and scale.

The five characteristics are offered as properties of sustainability leadership that when fostered as practices may provide pathways that promote resilient leadership. This is because they encourage individual and collective responses to the challenges. For example, adopting a collaborative model of leadership can potentially play a role in overcoming the challenge of 'being the messenger' by developing communities of practice that share values and responses to the difficulties of leadership and challenge of sustainability. Furthermore, the 'wicked' nature of the sustainability crisis can be countered if leaders adopt a 'scientific and systemic approach' to action. This is because they are provided with proactive process with which they can tackle sustainability challenges using a robust methodology and shared global language. These characteristics hold the potential to develop robust responses to the challenges of sustainability leadership and further examples are shown in the paper (see Paper C). These outcomes suggest that adding competencies and traits that help individuals and groups develop practices that respond to the challenges could be beneficial. Then sustainability as a field may have potential responses to the challenges, ensuring the possibility of resilient and effective leaders within a much-needed vocation. This is visualized in Figure 4. in the opening of the funnel walls that symbolizes how responding to the challenge can decrease pressure on leaders and provide more space for action as a result of increased wellbeing and resilience and successful sustainability actions.

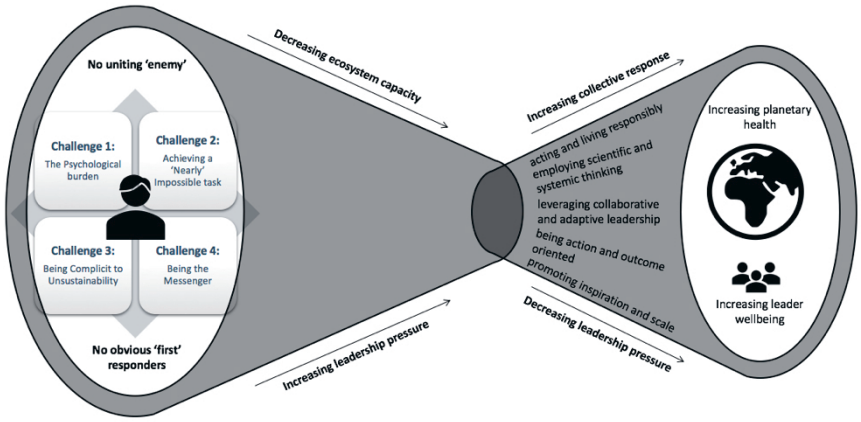

Figure 4. Responding to the unique challenges of sustainability.

As discussion regarding the design of learning environments for ESD continues to gather momentum, the lack of consideration of wellbeing within the vocation remains a critical and missing piece of leadership education. The adoption of sustainability as an epistemology and as a set of principles guiding individual or group virtue ethics can be both a liberating process of self-discovery and purpose, and a debilitating and difficult set of guidelines to exist within. Educating future leaders to be able to cope with this possibility remains lacking and likely to become more vital as increasing impacts of climate change and social disruption occur. Some authors have begun to consider these outcomes, for example the discussion of 'professional skillsets' and the consideration of 'preventative self-care' as well as the role of mindfulness (Brundiers and Wiek 2017; Wamsler and Brink 2018). However, they remain limited in comparison to the entire set of challenge or responses presented by Paper C which has attempted to categorize the distinctive challenge of sustainability and begun to consider the therapeutic responses that educators can consider in learning environment design.

Both the articulation of the challenge and the emergent characteristics of sustainability leadership require further study and validation before they can be considered to provide potential or specific competencies or traits. This research does, however, contribute to a novel discussion that currently lacks research within academia and has an intention of highlighting a potentially significant consideration for ESD educators. While a provision of a prognosis remains someway off, educators are becoming more required to consider the wellbeing of their students both during their studies, but also in consideration of creating learning environments that create long-term resilience as the immense nature of the sustainability crisis becomes clear. For further information regarding the intended next steps of this area of study, see the Future Research Section.

5.4 A Number of Central Questions Have Emerged for Educators (and Will Guide Further Research)

A number of important questions emerged from this thesis in line with the considerations of ESD learning environments and their design. They include:

The competencies dialogue is dynamic and requires flexibility

As educators consider how to design learning environments that promote the skills needed for sustainability, they are required to contemplate and engage with a wide range of information as new possibilities emerge from research and practice. This thesis does not definitively suggest specific competencies to be incorporated into current frameworks. It does however suggest a number of emerging areas that signal the dynamic nature of the competencies dialogue and can potentially impact its evolution. The consideration of reflective practices provides one example, as does the development of wellbeing and personal resilience measures as a necessary quality within sustainability leaders. These themes have emerged as suggestions by other authors in the field underlining their potential for consideration (Eaton et al. 2016; Wamsler 2020). These examples of new possibilities serve to highlight that the competencies discussion is likely to remain dynamic and that educators should consider how to maintain flexibility in their approaches as new information emerges. This idea of flexibility supports this thesis's articulation that contexts in which competencies are taught are of significant importance to educators and can perhaps provide stability as new competencies emerge and are debated. Using contextual structures to guide learning can allow for shifts within the competencies understanding to occur without the requirement for significant restructuring or redesign of learning environments. This also allows for flexibility in engaging with the external situation required by sustainability which may potentially ask educators to teach for differing competencies at differing times as external contexts and needs shift. This question of how to maintain flexible learning environments while achieving sustainability learning outcomes in a dynamic field remains a present question for educators as the field of ESD evolves.

The conflict between structure and freedom.

In a field that embraces emancipatory education it is difficult for educators to find the line that allows for freedom of individual expression, inclusion of voice and the encouragement of personal learning journeys while ensuring definitive outcomes towards sustainability. This research has suggested that the use of certain structures can potentially contextualize learning in a way that allows students to engage in personal learning while achieving sustainability outcomes. Paper A and B discuss this point in detail and highlight the potential to create flexible structures with a distinct definition of outcomes, for example by using the Skills Maps to frame personal learning choices. The shadow side to this is the difficulty educators face when it comes to placing defined pedagogical structures over emancipatory experiences or student-focused education. As shown in Paper B, some students struggled with the structures they felt had been forced on them, turning individual reflection on what is significant and often philosophical questions into a 'to do' activity stifled by time frames and assessment criteria. The question of how to balance

structures for outcomes, and freedom for personal learning that 'suits' individual students remains one that ESD educators must grapple with. This is especially true as the requirement for learning environments that deconstruct paradigms of unsustainability and replace them with mindsets and worldviews that promote sustainability occur. This question of structure and freedom remains a difficult proposition for educators and will guide the ongoing practice of educators as they aim to provide emancipatory learning experiences, considerate of the individual while also achieving significant sustainability outcomes.

The question of teaching students to deal with crisis

The present research aims to introduce a conversation regarding the challenging nature of sustainability leadership. It does this with the intention of laying a basis for educators to consider what competencies students will need to deal with these challenges and how they affect the design of learning environments for sustainability. To do this, educators must first recognize and articulate these challenges and Paper C is an attempt to do this. While the findings remain embryonic and now require empirical study (see Future Research), this thesis introduces a language for sustainability leaders that allows them to engage with the often profound personal and professional challenges born from facing the sustainability crisis. This then asks the question of educators, not only about how they can protect themselves from the challenges, but how they can begin to teach for them? The rationale is that learning environments for sustainability will require both the development of normative skills sets towards sustainability, but also demand of students the contemplation of moral and ethical dilemmas emerging from decision making within a complex space. This may mean educators will be asked to create spaces where students can engage in the suffering that surrounds their work, consider the potential of failure and engage the spiritual and psychic impacts that the existential questions of sustainability evoke. Educational discussion, especially within ESD, considers the notion of 'whole person education,' yet the therapeutical requirements of sustainability education remain hidden behind conversations of competencies and traits, of skills and knowledge, of life-cycle assessments and environmental management. Learning environments for sustainability will soon need to combine both, highlighting the rational and tangible with the metaphysical and emotional. While this study is yet to deeply discuss what that means, or even makes suggestions, the topic is emerging (Wamsler 2020; Eaton et al. 2016; Sterling, Dawson, and Warwick 2018). This thesis attempts to outline some foundations, with its discussions of students relationship with 'unsustainability' (Paper A), its desire to promote reflective practices and understanding of self (Paper B) and its discussion of the unique challenge of sustainability leadership faced by those working in the field (Paper C). Inchoate and at its beginning, these foundations seek to serve as the inspiration for further academic discussion and as the basis for the next stage of research attached to this work.

6. Limitations

The challenge of dual roles as research-practitioner

This thesis has a number of research limitations to be considered. Firstly, the role of the researcher in sustainability science means a conflict between taking an objective stance and creating deliberate transformation of the systems studied. This means asking the question of whether the researcher is a descriptive analyst or an activist is pertinent (Wittmayer and Schäpke 2014). Therefore, the ability to balance this dual role is a relevant consideration for this thesis as it adopts a researcher-practitioner position within the programs it studies (Paper A and B) and within the wider field of practice (Paper C). This means it is difficult to hold both closeness to the data and distance from it (Holian and Coghlan 2013) and should be a transparent consideration when readers examine the outcomes of this research. This thesis has attempted to acknowledge and overcome this issue by providing a clear and transparent message regarding its intention to promote the transformation of the systems it studies. It also aims to state that the researcher-practitioner perspective is justified by societies need to response to the pressing global issues of sustainability through educational improvements. Speaking to the 'role of the researcher' (Wittmayer and Schäpke 2014), this thesis has adopted positions that include the 'reflective scientist' which seeks a perspective closest to a traditional 'research' as observer point of view (Pohl et al. 2010). This role is used in the collection and analysis of information to handle the data from a perspective of objectivity without having predetermined notions of the outcomes of the study. Once this data has been collected and analyzed, the thesis adopts more of a 'knowledge broker' position as it seeks to promote critical reflection of the data in an attempt to utilize its findings to make sustainability relevant in different contexts, thus playing an active role in sustainability transitions (Wittmayer and Schäpke 2014). It is hoped that by clearly stating these positions, the biases are clear, and the research can be seen in relation to them.

Furthermore, in a study that situates itself close to concepts of transformational learning and personal change, questions of power and influence emerge and are highlighted by the personal and ethical dilemma of 'intervention legitimacy.' This issue requires consideration of Wittmayer and Schäpke's challenges to action research which include considerations of, 'ownership, sustainability, power and action,' four traits that require researchers to act in differing manners (Wittmayer and Schäpke 2014, 485). Responding to these challenges this thesis has aimed to address these issues through the transparent discussion of the macro perspective that rationalizes and justifies the use of sustainability as an epistemological viewpoint which talks to the points of sustainability and action using science as a lens to provide expertise and humility. It also attends to power and action through the open discussion of methodological limitations found within each paper. This includes considerations made by the researchers during the studies to promote the deliberate inclusion of perspective, acknowledge their epistemic positions and by clearly stating the methodological limitations of each study (see Limitations of the studies).

The limitations stated above are relevant considerations to this study and to sustainability science in general. This thesis has attempted to create a voice that transparently argues for the need to adopt further understanding and take further action towards sustainability through

research. It has also attempted to promote humility and openness in the explanation of its methods in order to be clear with its intentions and biases.

Limitations of the studies

There were a number of limitations in the methodologies of the individual studies themselves. The data used by Papers A and B was not explicitly designed to be collected for the studies and were rather collected as a response to the programs and used in hindsight. While this can be seen as a limitation, the infant nature of models for assessing competencies for sustainability has meant that many studies suffer from similar limitations and utilize 'regular coursework' assessment models that seek to retrospectively discover learning as a result of the programs as 'an afterthought' (Redman, Wiek, and Barth 2020). Furthermore, both Paper A and B utilize the subjective qualitative responses of students. The use of surveys and course feedback documents as data may hold limitations as the quality of answers provided by participant can be questioned and often not all students respond. This means that while the study utilizes data as an attempt to articulate participant viewpoints, not all perspectives are considered as the inclusion of all voices remains dependent on student decisions to respond. Finally, there are a number of limitations with Paper C that stem from the non-systematic approach it uses within its literature review. This highlights the potential for bias from the perspective of the researcher. For example, the use of a snowballing method to find literature may remove the critical viewpoint believed to be required to determine 'good' literature review while also resulting in the literature process lacking robustness and replicability (Savin-Baden, and Major 2013). The rational for adopting these methods for this study, despite their limitations, was due to the emerging nature of the field of study and the requirement for periodic synthesis of knowledge (Ferrari 2015). These limitations are acknowledged in the individual papers.

7. Conclusions

Developing competent, reflective and resilient leaders.

In synthesizing this thesis, the findings suggest three significant outcomes to be considered by educators. When placed together these outcomes articulate the potential ability of students to be effective sustainability leaders in a number of ways. Firstly, that individuals can acquire competencies but that in ensuring these competencies are used for sustainability, their learning must be aligned with the context of sustainability if the competencies 'sustainability' potential is to be fulfilled. Secondly, through the development of reflective practices, students as future leaders develop characteristics that serve them both in the individual realms (developing self-awareness) and professional realms (collaborative in nature through comfort with multiple perspectives). However, teaching these reflective practices require distinct structures to ensure reflection towards sustainability and remain challenging and difficult for staff to teach. Finally, by holding an understanding of the challenges faced in sustainability leadership, individuals can begin to develop themselves as robust and resilient leaders with an awareness of the importance of wellbeing for efficacy and longevity. The research has shown that each outcome independently may be seen as beneficial, but that together the outcomes begin to operate in connection, enhancing each other and providing an interesting contribution to the field of ESD and sustainability leadership specific education (See Figure 5).

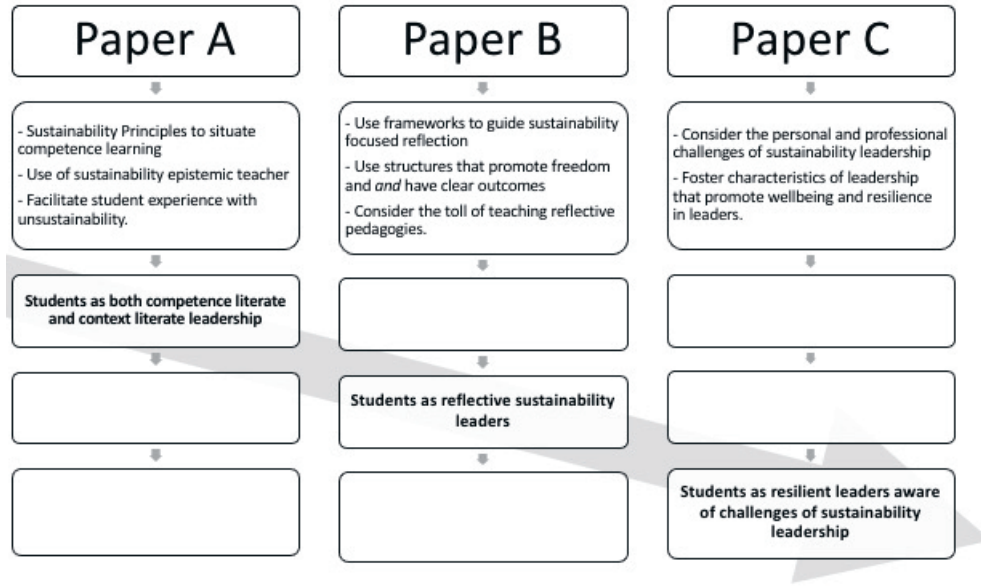

Figure 5. Developing competent, reflective and resilient leaders.

While each of these individual outcomes suggests an important consideration for educators and students of ESD. The connection of them results in a potentially greater influence, with each of these recommendations building upon and complementing the other. This suggestion provides some consideration for ESD educators as they engage in the design of learning environments for sustainability and develop students able to operate as competent and context driven individuals as well as are reflective and resilient sustainability leaders.

8. Future Research

The essential components of 'transformational learning' – An MSLS case study

Further to the investigation of reflective practices (Paper B) in the MSLS program, another study has been undertaken looking into the 'transformational' process that occurs in the program. A study of 215 MSLS alumni has highlighted that 91% of students describe the course as transformational. As a result of this, research has been conducted in which students have been asked to identify and categorize the elements of the program that they found to be transformational. The aim of this study is to contribute to the growing consideration of transformative learning environments for ESD. It will also attempt to map and describe the model of MSLS in order to better understand the mechanisms of transformation and to share these outcomes with other educators in light of the shifting environments of education for sustainability.

What form transforms? Outcomes of a transformational master's program

A companion piece to the above research, this forthcoming study aims to utilize and investigate the descriptive data received from MSLS alumni in order to answer the question 'what form transforms? With 91% of surveyed alumni describing the program as transformational, the question of 'what transformed' remains pertinent. The study aims to provide a descriptive understanding of which elements of the student transformed as a result of the educational process and situate this articulation within the robust conversation regarding transformative education and its role within sustainability.

Resilient sustainability leadership: Enhancing wellbeing

This study aims to provide a follow-up empirical research piece to the 'Unique Challenge of Sustainability Leadership' (Paper C) presented in this Licentiate thesis. It intends to interview sustainability leaders in order to test the hypothesis and definitions of the challenges of Paper C, adding rich, descriptive data to the information found in the literature. The study also aims to provide in further detail the responses of leaders to the vocational pressures of sustainability leadership in order to provide pathways of understanding for future and current leaders to ensure the wellbeing and resilience of the vocation as a whole. Through questions to leaders that both test the findings of Paper C and then attempt to collate practices employed by sustainability leaders, this study hopes to contribute to research regarding the ongoing wellbeing of sustainability leaders as they face increasing pressures.

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Paper A:

Competence Literate and Context Lacking? Investigating the Potential of Study Abroad Programs to Promote Sustainability Competence Acquisition in Students.

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Abstract

The examination of pedagogies that promote effective sustainability learning has led to vigorous academic discussion, as has research regarding the role of competence-based learning for sustainability. This paper investigates the role of a study abroad program, the Engineers without Borders Design Summit, in promoting the acquisition of sustainability competencies in its students. This study analyzed both content of the program pedagogy and the written learning reflections of 137 student participants to examine if the program resulted in sustainability competence acquisition. The study's findings suggested that students did acquire sustainability competencies during the program, but also that students may become competence-literate but context-lacking as they acquire competency skillsets without understanding their purpose for use as sustainability tools or to promote sustainability outcomes. Therefore, this study recommends that competence-based education for sustainability requires situation of competence acquisition within sustainability contextualization to ensure full competence potential is fulfilled. This study suggests that contextualization can occur in a number of ways, including the use of defined sustainability principles as boundary conditions to frame learning environments, the use of sustainability epistemic teachers as "guides" to connect learning to sustainability and the facilitation of student experiences with unsustainability to promote personally motivated action towards sustainability.

Keywords: sustainability; education; competencies; study abroad; pedagogy

Introduction

The Sustainability Challenge and Education for Sustainable Development

Higher education institutions are tasked with the important challenge of equipping graduates with the skills and knowledge to address grand challenges facing the world. The ecological and social crisis now manifests as numerous, interconnected issues that include water scarcity, climate change, air pollution, social segregation and many other complex challenges that threaten the viability and integrity of global societies [1,2]. The immense task of halting the decreasing ecosystem quality that risks tipping the biosphere into a state in which it would be difficult or impossible to maintain the human civilization in now underway [3].

Higher education systems, and specifically Education for Sustainable Development (ESD), hold a significant role in developing individuals skilled to implement sustainability transitions. The promotion of "knowledge, skills, attitudes and values that empower learners to make informed decisions and responsible actions" [4] (p. 4) remains an integral leverage point in developing sustainable futures. While no single pedagogy or program holds a panacea response to sustainable development, education that shapes young people's life direction, self-identity, and relationship to broader social and cultural values and ethics [5] remains important if a generation of graduates are to become active professionals able to influence sustainability transitions and construct healthy, if not flourishing, socio-ecological systems. Research exploring effective ways to engage in sustainability education remains an ongoing academic discussion, one that holds diverse perspectives and highlights the potential of differing pedagogies in addressing and overcoming the sustainability crisis. Despite this, there is a shortage of empirical evidence regarding the ways in which pedagogies are successful in developing students sustainability competencies [6], an area this study aims to contribute to.

The ESD Potential of Experiential Learning and Study Abroad

The requirement of ESD to experiment with effective learning environments for sustainability has led to the revision of previously underutilized pedagogies, innovation of new ones and experimentation with approaches including collaborative, community-based and service learning [7]. While no single pedagogy can claim to answer all ESD needs, consensus is emerging regarding the role of pedagogies aimed at creating emancipatory and transformative learning in which students transcend the given, the ordinary, and the routine ways of doing to create new dynamic and alternative ways of seeing and doing [7], thus freeing themselves from the constraints of traditional thinking and its associated mindsets of business as usual and unsustainability. One such example of a transformative pedagogy is experiential learning. Defined as education that can comprise "carefully chosen experiences supported by reflection, critical analysis, and synthesis' [8] (p. 44), experiential learning has been regarded as an effective tool for sustainability education [8,9,10]. Originally developed by David Kolb who built on 20th century scholars John Dewey, Kurt Lewin and Jean Piaget [10] experiential theory is grounded in three major beliefs: that learning is not an outcome but a process, that it is continually grounded in experience, and that

learning requires the resolution of conflicts dealing with opposing ways of dealing with the world [11].

One method of experiential learning is the concept of study abroad. While no singular understanding of study abroad suffices as a definition, an increasing array of international education programs have emerged recently that vary in length from one week to one-year [10] and usually incorporate international exchange. Study abroad education has increased in popularity in the last 25 years and aligns with experiential learning through its objective to stimulate the intellectual, social and emotional growth of the students [10]. By exposing participants to unique novel experiences, these programs encourage individuals to shift their current mindsets, beliefs and behaviors [12]. This outcome remains an important intervention point in leveraging mental shifts towards sustainability by breaking the bonds of unsustainable mindsets and behaviors and by encouraging critical context for understanding sustainability challenges. In this consideration, study abroad holds a significant potential in its ability to develop individuals able to guide sustainability transitions. Increasing interest in study abroad programs due to their reputation for positive international exchange has seen them grow in stature and use [5], and resulted in research that has highlighted benefits including development of world views, increased intercultural involvement and global understanding of participants [8], all outcomes that promote and align with holistic sustainability perspectives and the aims of Education for Sustainable Development. While the connection between study abroad pedagogy and sustainability learning is limited (and has concerns regarding the contradictory impacts of travel on the environment) the potential benefits for ESD provided by study abroad programs highlight a rationale for why they should be explored as an effective pedagogical tool within the field.

The Ongoing Competencies Conversation in ESD

An ongoing discussion in ESD research has centered around the use and value of competence-based learning for sustainability as an element to guide educational and pedagogical approaches considered by ESD educators and researchers. This discussion has been characterized by the sea of labels, terminological confusion and lack of consensus regarding what constitutes and defines a comprehensive set of sustainability competencies [13]. These issues have led to the slow progress of competence related outcomes in ESD research, teaching and learning. While difficulties with the development of tools for assessment and pedagogies for competence acquisition have also compounded the challenge [6]. Furthermore, some perspectives have examined competence development from the perspective of expertise, implying that competence development maintains instrumental approaches and limits the transmission of the depth of knowledge learners acquire [14]. These perspectives challenge a field interested in promoting emancipatory approaches that develop self-actualized learners as globalized citizens able to consider and deconstruct the systems of power that promote unsustainable practices [15]. These qualities rely on a deep, tacit understanding of the challenge and needed responses, of which competence acquisition's ability to provide has been questioned [14].

As the conversation regarding sustainability competencies has grown, their use has been proposed and developed by numerous authors in recent years [6,16,17,18]. Conducted literature reviews and workshop discussions have shown the desire of the field to explore the "critical role

of defining key competencies and specific learning outcomes in order to successfully design and teach in academic programs" [18] (p. 204). Sterling et al. conducted a critical inquiry into the role and state of competence potential for ESD, and suggested that their role could be critical as a vehicle for pedagogical change by developing transformative learning experiences and catalyzing institutional responses that promote values of sustainability education from a more emancipatory perspective [19].

This study also suggested that a systematic review by Wiek et al. played an important role in attempting to synthesize ongoing competence-related findings into a framework of five competencies designed to "benefit a range of institutional processes from designing and revising academic programs through teaching and learning evaluations" [18] (p. 204). These competence are articulated as Systems competence, Anticipatory competence, Normative competence, Strategic competence and Interpersonal competence [18].While the framework remains incomplete, it is seen to provide a "sufficient and promising foundation from which to develop complimentary, more robust, detailed and contextualized competencies" [20] (p. 128). Despite numerous competence lists having been developed to articulate iterations or competencies for specific areas [17,21] or as a compliment to Wiek et al.'s framework [20], the Framework has been highly supported by a variety of scholars [16] despite its limitations. For educators, while the question of competencies continues to emerge regarding framing and definitions, a number of authors believe that this initial development highlights a critical and useful entry point for pedagogical design, as educators consider what the knowledge and skill profiles of students expected to be future problem solvers, change agents and transition managers, require [6,16,19,20].

Despite the discussion around competencies continuing to evolve, challenges remain, with uncertainties emerging in the relationship between pedagogies, competence acquisition [17] and assessment [13]. The continued vigor regarding research for competencies-based learning for ESD has highlighted the field's desire to develop robust competence guidelines that contribute to the construction and development of current and future ESD programs. This study aims to contribute this area of research by utilizing a case study to assess the impact of an international study abroad program and pedagogy, the Engineers without Borders Design Summit, on the acquisition of sustainability competence in its program participants as they study human-centered design in real-world settings.

Methods

In order to determine if the Design Summit program promotes the acquisition of sustainability competence within its students, an instrumental case study approach [22] was undertaken incorporating two stages of research design:

- Mapping the presence of sustainability competencies (using their defined concepts and methodologies) in program content;
- Analyzing participant feedback forms to identify statements supporting the acquisition of competence (concepts and methodologies) during the program.

Case Study: The Humanitarian Design Summit Program

The Engineers without Borders Humanitarian Design Summit program is a 14-day immersive international study program that operates in six countries in the Indo-Pacific. The program participants have numbered 1200 first to fifth year Australian university students since 2015, conducted in partnership with 28 in country community organizations. Each individual program has between 28–48 students, hosted by 6–9 facilitators. The Summit program utilizes one week in the country teaching content and theory, and one week of immersive practice with local communities. Here, students are expected to identify and conceive a "potential" design solution to a challenge faced by the community.

The program outcomes aim to provide participant learning experience in:

- Humanitarian engineering skills and insights;
- Appropriate technology best-practice;
- Designing in resource constrained environments;
- Working with community and clients on needs analysis and problem definition;
- Evaluating solutions including maintenance, materials and cost;
- Rapid prototyping and development;
- Client engagement and communication;
- Cross-cultural engagement, teamwork and project management [23].

The program pedagogy has been designed by Engineers without Borders, utilizing content and theory from a number of sources. The topics taught include international development theory, human-centered design process [24], sustainable development, communication and cultural sensitivity knowledge and skills. A Design Summit Toolkit provides a pedagogical framework for program content, lesson plans, learning outcomes and facilitation techniques [25].

This program content is analyzed in Stage 1 of the research design in line with the Sustainability Competencies Framework (**Table 1**) and results are displayed in **Table 2**.

Table 1. Sustainability Competencies Framework [18].

Competence	Knowledge / Concepts	Method / Skill
Systems	Ability to understand how differing systems interact across differing domains and scales.	Ability to generate and interpret results showing how different systems interact across different domains and scales.
Anticipatory	Ability to understand differing future visions, states and impacts related to sustainability.	Ability to generate and interpret results showing differing future visions, states and impacts related to sustainability.
Normative	Ability to understand the (un)sustainability of current/future states and required values, ethics, principles, lifestyles etc.	Ability to generate and interpret results about the (un)sustainability of current/future states and required values, ethics, principles, lifestyles etc.
Strategic	Ability to understand the design and implementation of intervention and transformative governance strategies for sustainability.	Ability to generate change and evaluate the design and implementation of interventions and transformative governance strategies for sustainability.
Interpersonal	Ability to understand collaborative and participatory sustainability research and problem-solving.	Ability to facilitate collaborative and participatory sustainability research and problem-solving.

Table 2. Presence of competencies within content.

Session Content	Concept and Methodology Present	Competence(s) Outcome
Introduction into Culture (p. 34)	1B, 1C, 1E, 1G	Systems
	2A, 2D	Anticipatory
	3A, 3C, 3F	Normative
	4A, 4H, 4I,	Strategic
	5A, 5F	Interpersonal
Development 101 (p. 35),	1B, 1E, 1D	Systems
	2A, 2C, 2E, 2D	Anticipatory
	3C, 3F,	Normative
	4B, 4E, 4I	Strategic
Language Lesson (p. 38)	1E, 1I,1A	Systems
	5E	Interpersonal
Communication and Cultural Sensitivity (p. 39)	1E,	Systems
	3K,	Normative
	4H,	Strategic
	5A,	Interpersonal
Appropriate Technology & Human Centred Design (p. 40),	1C, 1E, 1I,	Systems
	2E	Anticipatory
	3C, 3F, 3K,	Normative
	4D, 4F, 4L,	Strategic

	5A	Interpersonal
Design 1: Human Centred Design (p. 41),	1B, 1I	Systems
	2J,	Anticipatory
	3F, 3J,	Normative
	4B, 4H, 4K, 4M	Strategic
	5A, 5B, 5E, 5F, 5G	Interpersonal

Sustainability Competencies Framework

This study has utilized the conceptual competence framework developed by Wiek et al., as it provides "a comprehensive framework of five key competencies emphasized by sustainability experts in academic programs in eight universities" [26] (p. 6) and displayed in Table 1. Furthermore, the construction of the framework stemmed from a systematic literature review that considered the relevant literature and created competence definitions using "representative concepts, methodologies, and peer-reviewed "classics" [18] to construct robust explanations of each of the five competencies. Although the framework does not offer a specific definition of what constitutes concepts or methodologies, this study sees them as the individual ideas and components that contribute to building and defining each competence boundary. A sixth competence, developed later as "Integrated Competence," [16], was excluded from the study due to the lack of a distinct and robust categorization of the concept and methodologies shared by the other competencies.

The Question of Competence Acquisition

Due to the practice of assessing student sustainability competencies being in its infancy, educators "lack the means to effectively assess whether they are successfully educating sustainability professionals through their courses and programs" [6] (p. 2). Thus, this study utilizes a form of regular course work assessment, in which student coursework is examined to demonstrate competence acquisition as educators search for evidence of competencies within student learning. Because of this, the study argues that competencies are defined as acquired by the subjective description of them within the student self-assessment [6] of the feedback forms. Thus, we highlight the acquisition of sustainability competence through self-described student learning, terming them as "mentions" and using these "mentions" as evidence of competence acquisition. This study acknowledges the challenge of assessing acquisition within the field and

aims to offer a method that provides development while acknowledging the need for an exploration of robust assessment and measurement mechanisms.

Coding the Competencies

Each competence was categorised from one to five (Systems = 1, Anticipatory = 2, Normative = 3, Strategic = 4, Interpersonal = 5). The concepts and methodologies that construct each competence were then categorised alphabetically. When examples of the concept or methodology were seen in the content or mentioned in feedback forms, they were identified and marked by their distinct value.

Stage 1: Mapping Presence of Competencies with Program Pedagogy

Using the Summit Toolkit and competence coding structure, the program content was then analyzed to examine the presence of competence concepts and methodologies within the pedagogical content. The program content was defined from the Design Summit Toolkit, a facilitator manual that maps all lesson plans of the program [25]. These lesson plan outlines were then mapped against the competence list in direct relation to the coding structure of Wiek's competencies framework [18] and all competencies present within a lesson plan were marked. For example, "Design 1," a session that introduces and teaches Human Centered Design is categorized 4C, as it involves teaching "*Strategies, action programs, (systemic) intervention, transformative governance*", and 5G for "*Teamwork methods*" among others, as it involves groupwork, highlighting the presences of "strategic and interpersonal competence".

Stage 2: Using Participant Feedback to Highlight Competence Acquisition

The Summit Program collects feedback forms for all students at the conclusion of each program. This study used a random sampling method in which participant data were used to map competence learning within the student participants. To date, 1200 students have attended the program in total. The research used 137 students, randomly selected from four complete Summit programs, and analyzed feedback forms, meaning an 11.42% sample size. Each program was categorised by country/month/year/participant prefix to identify and map specific responses, e.g., Nep0218_05 (Nepal, February 2018, Participant 5).

Coding Structure

Data were collected and then analyzed using the coding structure (**Appendix A**) developed from Wiek et al.'s (2011) competency framework to see if the presence of competence acquisition was demonstrated within student feedback. This was highlighted by participants in the form of statements, quotes or articulation of learning that related to the competencies as determined by their concepts or methodology. Statements matching the description of a competence through a concept or methodology were then marked within the feedback and noted as evidence of that concept or methodology, and thus that competence.

For example, feedback that stated:

"Interacting with different cultures was a significant part of my learning" would be noted down as 1E highlighting Systems competence, identified through the engagement with the concept of "People and Social Systems: values, preferences, needs, perceptions, (collective) actions, decisions, power, tactics, politics, law, institutions etc." Likewise, stating "the ability to empathize and centralize working with people" was noted as 5A for "Functions, Types and Dynamics of collaboration" highlighting Interpersonal competence. Each feedback form was entered into an Excel spreadsheet to map the competencies, concepts and methodologies that were occurring within the feedback. If individual students mentioned the same competence, concept or methodology multiple times within their feedback form, these were noted but counted as a single mention and categorized as such. Statements mentioning a competence concept or methodology were then collated as evidence of competence acquisition.

Results

Competence Presence in Program Content

The study began by comparing lesson plans of the program with the competence framework. This analysis highlighted that the program content utilizes and teaches a number of concepts and methodologies defined in the competencies. Below, these concepts and methodologies are mapped to the six main program sessions, as defined by the program toolkit. This analysis found that most sessions engage multiple competences.

In checking the content for competencies, results suggest the presence of all competencies within the taught program content. For example, the "Development 101" session [25] involves a one-hour interactive workshop that highlights the complex and interrelated nature of international and sustainable development. In doing so, it presents and asks participants to reflect and discuss the "*(Un)sustainability of current systems*," (developing Normative competence), "*Possible future scenarios*" (Anticipatory competence) and "*Concepts of justice, fairness, responsibility and safety*", over large time-scales and domains (Normative competence). The "Communication and Cultural Sensitivity" workshop [25] asks students to consider how to interact with local communities, as it utilizes conceptual discussions of "*People and social systems: values, preferences, needs, perceptions, (collective) actions, decisions, power, tactics, politics and institutions*" (Systems competence) and "*Functions, types and dynamics of collaboration*", as students engage with community (Interpersonal competence) and the design of "*Participatory anticipatory processes*" (Anticipatory competence).

The "Design 1" [25] (p. 39) workshop introduces and teaches Human-Centered Design (HCD) processes as a tool for community development. HCD is a concept built from numerous processes thus spanning a number of the competencies. For example, HCD utilizes both "*Participatory methods*," and "*Planning methodologies*" and also considers "*Ethical concepts*", thus highlighting student development of numerous competencies (Interpersonal, Strategic and Normative competencies) as they engage and practice with the concept.

Therefore, by examining the program pedagogy in alignment with the competencies framework, we can see the presence of the all five competencies of the framework within the content taught by the program and shown in **Table 2**.

Uncovering Significant Evidence of Competence Acquisition in Student Learning

Measuring student learning by analyzing feedback forms showed that there were 450 individual statements aligning with a specific competence concepts or methodologies by 137 students, indicating evidence of competence acquisition. A breakdown of each competence from most- to least-mentioned shows Interpersonal competence (166 mentions—37%), Strategic competence (124—27%) and Systems competence (85—19%) as the main areas of competence acquisition, while Normative (57—13%) and Anticipatory (18—4%) showed less acquisition.

In looking at the prevalence of specific concepts or methodologies (**Figure 1**), "*People and Social Systems*" (Systems competence) and "*Functions, types and dynamics of collaboration*" (Interpersonal competence) were the most prevalent (49 each), closely followed by "*Methods to Support Learning and Reflexivity*" (48 mentions). "*Teamwork Methods*" (Interpersonal) and "*Strategies Actions, programs*" (Strategic competence) were also highly mentioned (44 and 43). A number of the concepts and methods were not mentioned at all. These included "*Risk Analysis*" (Normative competence), "*Transition Support Methodologies*" (Strategic competence) and "*Scenario Methodology*" (Anticipatory competence). A table of concepts and methodologies by mentions is detailed below in **Figure 1**.

Figure 1. Competencies: Concepts and methodology by mention.

Two Emerging Results—Developed Self-Awareness and Improved Presentation Skills

Two significant themes emerging from the program data were not categorizable within the competence framework. These emerging themes are described as:

- Developing self-awareness and purpose;
- Improved communication skills.

Developed Self-Awareness and Purpose

Many statements (56) reflected learning around developing self-awareness and personal learning. These statements included that the program "*gives me inspiration and motivation to do what I do*" *(Nep0218_11)* and "*I hope to leave the summit slightly more aware of the outside world, with more compassion and understanding. I hope I will not settle into my old routines at home and try to be more proactive with how I spend my time*" *(Nep0218_16)*. While these statements do not reflect a single competence, concept or methodology, they suggest that a significant theme has occurred within a number of students. Further descriptions highlighted the sense of a unique personal change within students, including statements such as "*the summit has given me confidence to question the assumptions I have as well as to be more curious*" *(Nep0218_10)*, "*was totally eye opening, it made me question what was important in my life*" *(Nep0217_29)*, "*a humbling and grounding experience… I have a broader view on life*" *(Nep0218_31)* and "*a life changing experience that put everything into perspective*" *(Mal1807_05)*. These quotes reflect the presence of deep personal learning that does not relate to the current competencies framework, yet seems integral to the experience of the program and learning of the students and cannot currently be represented within the current model proposed by Wiek et al. [18].

Developed Communication Skills

The second emerging theme was improving communication skill in the form of confidence presenting and communicating of ideas. This theme consistently emerged as a significant outcome with student learning, occurring within 42 mentions by students. This rated higher than significant competencies such as "*participatory methods*" (29) and "*social learning*" (11), and highlighted the important notion that students felt they acquired increased communication competencies during the program, which developed from the process of presenting their work to diverse audiences and within teamwork. Despite this, the competencies framework in its current state does not identify a strong presentation or communication specific concept or methodology within its definitions, despite its requirement as an integral component of numerous competencies, specifically Interpersonal. This means that improvement of such skills is a significant educational outcome that currently lacks a distinct place of categorization within the competence framework.

High Competence Presence and Low "Sustainability" Mentions

An interesting outcome of the data was that, within the 450 mentions of the competencies by students in their reflection on learning, there were only twelve explicit mentions of

"sustainability" and two of "climate change". This highlights that, while students are often undergoing educational activities that help to acquire "sustainability" competencies, they are perhaps not connecting these with sustainability as a concept itself. This point will be explored more within the discussion section.

Discussion

The findings of this study indicate that students attending the Design Summit program do acquire sustainability competencies as defined by the sustainability competencies framework presented by Wiek et al. [18]. This is evidenced by the presence of the competencies in pedagogical content, and significantly in the number of concept and methodology mentions within student feedback. The students displayed various amounts of learning across 34 of the competence framework's 52 concepts and methodologies, with a focus on the Interpersonal and Strategic competencies. Interestingly, despite evidence of "sustainability" competence acquisitions, only twelve (of 450) explicit mentions of "sustainability" or "climate change" occurred in the data. Thus, these findings uncovered a number of interesting questions and outcomes for Education for Sustainable Development (ESD) pedagogy and competence-based sustainability learning. This is discussed below.

Implementing Processes Can Result in Efficient Multiple Competence Acquisition

The results reflect that utilizing Human-Centered Design (HCD) as the main theoretical content and learning outcome of the program promoted learning across a number of the competencies. As HCD is both a theory to learn and a process to implement, students can acquire competence across a range of the concepts and methodologies, as their participation engages both theoretical understanding *and* practical implementation. For example, by firstly teaching HCD as a theoretical concept to be understood, students engaged the concept as a "*Strategies, actions programs (systemic intervention), transformative governance*" (43 mentions), thus developing their Strategic competence, while the act of students specifically engaging with community as part of *practical* HCD implementation showed learning from the perspective of "*Functions, types and dynamics of collaboration*" (49 mentions), thus developing their Interpersonal competence. Furthermore, feedback that articulated increased student knowledge of the community from the practical implementation of HCD processes highlighted learning from "*People and social systems*" (49 mentions) perspective, developing their Systems competence. The implication of this finding is that designing a pedagogy that engages both theoretical and practical learning of a single piece of content may allow for a greater spread of competence acquisition. This supports the general idea that pedagogy utilizing both theory and practice together can be an effective tool for ESD educators in relation to sustainability competence acquisition [27]. This, in turn, supports research that advocates for problem-based and real-world pedagogies as efficient modes of sustainability learning and suggests a likely proficiency of those pedagogies for competence acquisition [26]. Despite this, methods that promote real-world and problem-based learning have so been underutilized as pedagogies to date [28], despite their emergence within ESD.

Can Students Become Competence Literate and Remain Context-Lacking?

An interesting result of the study was the lack of explicit mentions of sustainability or climate change (14 mentions) despite the evidence (450 mentions) of competence concepts and methodologies. This raises the question of dissonance between acquired competencies and individual understanding of their role *for* sustainability. While sustainability is not an explicit part of the taught content, it remains an underlying component and vocal consideration within the program. However, these results indicate that if competence-based learning environments are not contextualized with sustainability understanding, it seems that competencies can be acquired but remain uncoupled to "sustainability". For example, students may be able to display systems competence by constructing community asset maps [25], but this activity does not guarantee sustainability understanding or outcomes unless the action of mapping is consciously framed by and done for the *purpose* of sustainability. The latter, in turn, requires that students understand *what sustainability is*. Without such understanding, the competencies fail to function for systematic sustainable development. This point remains key to ongoing competence learning, as it suggests that ESD pedagogies must ensure they include or connect learning to a contextualized sustainability understanding and promote the transmission of the competencies *within* this sustainability understanding. That is, that the competencies are employed as tools to implement sustainability, not just as tools.

The Need to Contextualize the Competencies for "Strategic" Sustainability Outcomes

As discussed, the prevalence of competence acquisition evidenced in the data, contrasted by the lack of explicit "sustainability" reflections by students, suggests the need for competence learning to occur within explicit contextualization of sustainability. How can this occur? A number of pedagogical possibilities for this are discussed below.

Using Sustainability Principles to Frame Competence Acquisition

One suggestion is for educators is to frame competence learning from a scientific perspective that provides a robust understanding of socio-ecological sustainability that can be used as boundary conditions for sustainability contextualization. While the use of diverse knowledge sets and epistemological stances are important in contributing to sustainable transitions, leadership that promotes scientifically verifiable sustainable development [29] plays an integral role and provides a shared international language. The Sustainability Principles of the Framework for Strategic Sustainable Development (FSSD) [3] provide a scientific, peer-reviewed understanding of the boundary conditions of sustainability. These principles, which provide three ecological and five social definitions of sustainability (**Table 3**), aim to be necessary and sufficient for sustainability. That is, they define the exact boundary within which society complies with or violates sustainability. They also aim to be general, in order to facilitate cross-disciplinary and cross-sector collaboration, concrete, to actually guide innovation for sustainability, and non-overlapping, to facilitate the comprehension and development of indicators [3] and allow individuals acting towards sustainability to know whether they are contributing to the challenge

of sustainability or helping to overcome it by aligning their work within these boundaries. The principles are stated below, followed by a discussion of how they can be used in learning environments to facilitate competence acquisition (see **Figure 1**).

Table 3. Definition of ecologically and socially sustainable societies [3].

Ecological	Social
"In an ecologically sustainable society, nature is not subject to systematically increasing…	"In a socially sustainable society, people are not subject to structural obstacles to…
SP1…concentrations of substances extracted from the Earth's crust.	SP4…health.
SP2…concentrations of substances produced by society.	SP5…influence.
SP3…degradation by physical means".	SP6…competence.
	SP7…impartiality.
	SP8…meaning-making".

Using these sustainability principles to frame learning, educators can create a sustainability-contextualized container in which competencies are acquired. This would allow students to move from "*competence literate and context lacking*" to "*competence and context literate*" by developing their understanding of sustainability, and thus how the competencies can be implemented to achieve it. Furthermore, the study in **Figure 2** aims to illustrate that acquiring competencies with a scientific understanding of sustainability provided by the principles can help to guide implementation of the competencies in a unified direction. By implementing actions using the same understanding of sustainability, practitioners can utilize numerous competencies or knowledge flexibly while remaining coordinated towards sustainability, as long as initiatives operate within the boundaries the principles provide [3]. Simply put, if competencies are acquired without a robust understanding of sustainability, their implementation may result in competence implementations that works in localized contexts (1) and (2) does not contribute towards a globally sustainability society. If all implementation of the competencies is carried out within the framing of the principles, then acts utilizing the principles and competencies operate towards a coherent and unified goal. Thus, incorporating the principles of the FSSD into learning environments in which competencies are acquired has the potential to both contextualize initial competence learning for sustainability and align future implementation of the competencies in a long-term manner that promotes strategic sustainable development (3).

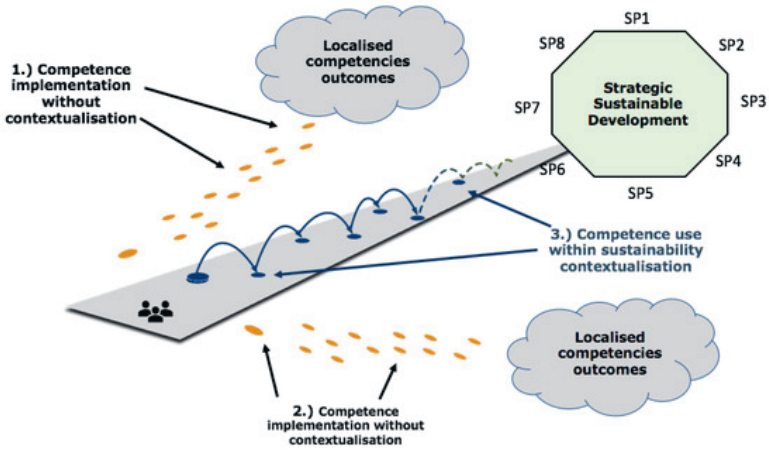

Figure 2. Scenarios of competence implementation for sustainability outcomes (**1**) competence implementation without sustainability contextualization = independent localized outcomes, (**2**) competence implementation without sustainability contextualization = independent localized outcomes and (**3**) competence implementation within robust sustainability principles as boundary conditions = unified sustainable development outcomes.

While the principles provide a robust understanding of sustainability, educators must also ensure that students are motivated to implement their acquired competencies for that purpose. Essentially, this means also inspiring students to act towards sustainability as a vocation. While a common mental model (the principles) may create inspiration in itself, the experiential aspects of study abroad pedagogies may provide an even more emotional, personal contextualization of sustainability to serve as further inspiration. We discuss those possibilities below.

The Facilitator as a "Sustainability" Guide

If educators aim to further contextualize competence learning within sustainability, the experience of study abroad pedagogies hold significant potential for doing so if the unique experience provided by the program is framed from a perspective of sustainability. Here, the role and power of the facilitator or teacher's epistemology as the lens through which students experience and contextualize their learning becomes integral. Interestingly, the Summit program pedagogy currently operates from a "design" epistemology and framing, promoting the notion that development can be addressed through design solutions. This framing is likely the reason for the 63 mentions of "design" terminology within the data and, of the mentions of "sustainability" (12) or "climate change" (2) found within the data, nine were made by students led by a facilitator who primarily worked as a sustainability lecturer. These students reported statements such as "*I would definitely like to research more on development and sustainability. The summit increased my interest in those areas a lot.*" (IND1801_07) and "*I have lots of reading and research to do about Human Centered Design, sustainability, leadership and development.*" (IND1801_01) and an interest in "*learning more about career options around sustainability*" (IND1801_04).

This highlights how impactful the role and perspective of the "teacher" is, a notion supported by Lidar et al., who argues that "what students are supposed to observe is something that they have to learn, and the teacher is of decisive importance for this learning" [30] (p. 160). From this perspective, as educators design pedagogy based on competence acquisition, they should consider how the epistemology and language of the learning environment, as influenced by the teacher or program, influences student understanding If the competencies are not continually framed as means for sustainability problem solving or within sustainability perspectives, then students will not be motivated to use them as such.

Creating Student Sustainability Values by Experiencing "Unsustainability"

A second study abroad contextualization and motivational tool considers the impact of student experience with "unsustainability" during the program. Engaging with the community around issues of climate change, drought and poverty remains a common experience. Comments including "*the opportunity to gain a more sophisticated insight into poverty and the issues that feed into poverty*" (Nep0218_05) and undergoing experiences that lead to "*challenging our perceptions about poverty*" (Nep0218_04) highlight sustainability-related questions raised by students as a result of their experience with study abroad. Furthermore, these experiences led to individuals "*dealing with being outside of (my) comfort zone in unfamiliar environments*" (Nep0218_14). By experiencing unsustainability and communities affected by it, students may have an experience suggestive of the "disorientating dilemma" of Transformational Learning [21] processes, one that results in a shift in the student's frame of reference and worldview [22], resulting in a greater awareness of sustainability issues and increased motivation to act.

By considering the visceral experience of students with unsustainability on study abroad programs, educators can consider how the experience can intervene in student worldviews and serve to shift mental models in students towards a holistic, personal understanding of sustainability. The high indication of "developed self-awareness" that emerged from the data (56 mentions) highlights that a significant experience is occurring within the students. Perhaps harnessing this experience and the disorientation of unsustainability in study abroad students can encourage the development of a robust set of sustainability values that scaffold their future actions and leadership. Wiek et al. suggest the need for diverse and rich cross cultural and real-world learning experiences that are critical to developing competencies [21] and this study supports that claim, showing that the acquisition of competencies occurs even in a program not explicitly teaching them. Glasser also suggests that the competencies framework could evolve into a living typology of skills rooted in values of sustainability, commitment and understanding, based on (1) commitment to the common good, (2) care and interest for others, and (3) care for self [31]. Research supports the notion that experiential learning has the ability to empower, engage and motivate students [32], while Sipos argues for a "Head, Heart, Hands" approach to learning, in which action learning encourages students to questions their assumptions and beliefs in a way that promotes personal paradigm shifts [12]. These suggestions highlight the integral nature of individuals' relationships with sustainability as a result of their active participation with it. If they are to act on and successfully implement acquired competencies towards sustainability, then study abroad programs may provide an effective pedagogical model to achieve that.

Three Outcomes to Activate Sustainability Competencies

Based on this study, we suggest that educators consider three elements to situate competence acquisition within sustainability, as shown in **Figure 3**. They are (A) using science-based, unifying sustainability principles to define sustainability, (B) using sustainability epistemic teachers as "guides" and (C) using the personal student experience with unsustainability to encourage and motivate sustainability awareness and action. These outcomes have implications for ESD pedagogies regardless of their nature, as learning environments can implement and consider these variables in their design.

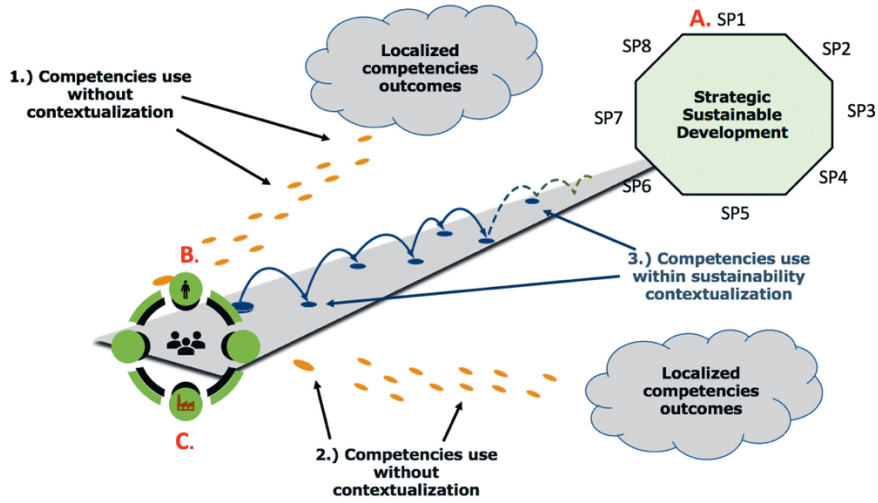

Figure 3. Learning Environment utilizing the three contextualization's (**A**) sustainability principles to situate competence implementation in strategic sustainable development, (**B**) use of sustainability epistemic teacher as "guide", and (**C**) facilitating student experience with unsustainability.

"Activated" Competencies to Promote Strategic Sustainability Outcomes

The sustainability principles unify and direct future work. Sustainability epistemic teachers and the development of the student's personal relationship with unsustainability promote understanding and motivation to act towards sustainability. Combined, this study suggests that these elements make the competencies "activated" towards sustainability. We argue that without these considerations, the competencies can be acquired but not efficiently or coherently used to move society towards sustainability.

Limitations and Future Research

The study has a number of limitations. Firstly, the data collected were not specifically designed to test for the acquisition of competencies as defined by Wiek et al., As discussed earlier, the study adopts a "regular coursework" assessment model that seeks to discover learning as a

result of the program by retrospectively looking for engagement with competencies [6]. The subjective nature of the student commentary implies a weakness, as the study cannot definitely state that the competencies are being acquired. This is a general limitation for similar studies, one that has provoked ongoing considerations of how to assess sustainability learning or acquisition of sustainability competencies [6] as there remains a lack of empirical evidence as to how certain pedagogies result in successful acquisition of sustainability competencies. This study sufferers from those challenges, as well as the difficulty of developing an assessment tool "as an afterthought" [6] (p. 12). Despite this, investigating a program that "assumed" sustainability learning implicitly, despite lacking a model to comprehensively assess this, remains worthwhile and contributes both to the development of the pedagogy as a tool for sustainability learning and the ongoing discussion of competence research within ESD through its finding and suggestions.

Finally, the study has a number of challenges from situating competencies when coding student responses. It often becomes difficult to determine or allocate which competencies are being described in the data and when. For example, was Human Centred Design process, which was prevalent in the data, to be treated as a "*Participatory Systems Approach*" in which it would be describe Systems competence, or was it "*Strategies, action program (systemic intervention)*" or a "*Planning Methodology*" in which case it would be described as a "Strategic competence"? Likewise, empathy, which was mentioned by a high number of students, could be allocated as an "*Ethical concept*" (Normative competence), "*Social learning*" (Strategic competence) or "*Concept of solidarity and ethnocentrism*" (Interpersonal competence). In this case, the description was coded in line with the context of the statement as best as possible.

Discussing the difficulty of differentiating between competency allocation is not meant to be a criticism of the competencies framework and supports the notion that assessing students "assignments are rarely well suited for assessing competence" [6] (p. 2). It also highlights the interconnected and overlapping nature of the competencies. These findings support the notion that, currently, the competencies work as guides that can be used in the pedagogical design of learning environments [31], while the discussion of pedagogies and competence relationship develops.

Conclusions

This study aimed to investigate whether the Design Summit program results in the acquisition of sustainability competencies within its students. The study resulted in the belief that students acquire competencies as defined by Wiek et al. [18], as a result of the program, but that competencies' acquisition and competencies' acquisition *for* sustainability require further consideration. Firstly, for the competencies to fulfil their potential as leverage points for sustainability, they need to be situated within "sustainability" knowledge rather than just as process tools. Secondly, educators should consider the role of a sustainability epistemic teacher as a guide, to further contextualize competence learning, and student experience with "unsustainability" may play a role in further contextualization and, importantly, the motivation of students to act towards sustainability as they develop a personal value set regarding sustainability.

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Paper B:

The Use of Reflective Pedagogies in Sustainability Leadership Education – A Case Study.

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Abstract

This study aims to examine the use of reflective pedagogies in sustainability leadership education by investigating two specific pedagogical tools—the Portfolio and Pod—employed by the Master's in Strategic Leadership towards Sustainability (MSLS) program at Blekinge Institute of Technology in Karlskrona, Sweden. The study analyzed data gathered from student surveys, teacher interviews, and staff reflections to determine the benefits and challenges faced by students and staff in implementing and engaging with these pedagogical tools. Benefits include the provision of distinct structures to guide student reflection towards individual skill development and the use of collective reflection to encourage generative dialogue between students and staff. This holds benefits for collaboration, self-awareness, understanding of multiple perspectives, and creating self-directed graduates. Staff and students also, however, suggest a number of challenges. These include the 'constrictive' nature of guided reflection and the emotional and mental load faced by staff in hosting and holding students through often challenging personal reflective processes. For the potential of reflective pedagogies to be truly realized for Education for Sustainable Development in higher education institutions need to develop an understanding of the impacts that reflective pedagogies have on students and teachers and create institutional structures to support them.

Keywords: Sustainability, pedagogy, reflective learning, higher education, leadership

1. Introduction

1.1. Towards Transformational Education Approaches

As the consequences of our unsustainable lifestyle become apparent, active professionals who want to change human systems, break conventions, start new initiatives, and take responsibility for solving our problems are increasing (Heiskanen et al., 2016). If Higher Education is to play a significant role in developing graduates as sustainability leaders, then educational programs guided by values of Education for Sustainable Development (ESD) and driven by a focus to develop sustainability knowledge and skills are required (Heiskanen et al., 2016). In addition, these programs need to educate both *about* sustainability and prepare students to implement and lead solutions *for* sustainability (Papenfuss et al., 2019). This means focusing not only on 'what' is learnt, but also 'how', considering which pedagogies are most suitable for sustainability outcomes (Barth, 2015; Lozano, 2006; Wiek et al., 2013).

Research indicates methods of learning that are based purely on traditional instrumental approaches that treat students as passive recipients of information require transformation. Instead, the adoption of pedagogical approaches that encourage learners to critically consider and reflect on traditional worldviews, practices, and behaviors is needed (Ives et al., 2020; Missimer & Connell, 2012). This requires engaging students in a praxis of dialogue and action that help them deconstruct themselves and the world they live in (Wamsler, 2020), transgressing boundaries and creating pathways to participation and shared meaning making (Heiskanen et al., 2016) towards global futures. Creating environments for this kind of learning implies designing spaces in which students and educators are encouraged to be present as human beings and join in holistic learning experiences (Bodinet, 2016; Wamsler, 2020) with co-owned objectives, shared meanings, and a joint, self-determined plan of action (Bodinet, 2016) between teacher and learner.

1.2. Reflective Learning As A Key Approach

A key pedagogical strategy for transformational learning is the utilization of reflection. The practice of reflective learning is widely accepted in educational circles as a mean to cultivate deep and lifelong learning, as well as professional practices (Howlett et al., 2016; Ryan & Ryan, 2012; Sipos et al., 2008; Tillmanns, 2019). Furthermore, outcomes such as critical thinking, self-determination, and development of reflective capacities mean reflection is considered an important element of both learning processes and pedagogical design. Yet, the adoption of active reflective- and contemplative-specific pedagogy in the classroom remains emerging and experimental (Eaton et al., 2016; Ives et al., 2020). Described as the process of internally examining an issue, triggered by an experience which creates and clarifies meaning in terms of self and that results in a changed conceptual experience (Wamsler, 2020; Wamsler & Brink, 2018), reflection offers a pathway to transformational approaches through its ability to shift participant perspective. Practices such as journaling, discussion, art, meditation, or dialogue with a mentor or group are common reflective practices (Burns et al., 2015) and use tools such as written portfolios, incidental, and anecdotal professional reflection to encourage learning. These help promote important learning outcomes by increasing relationships between theory and practice, developing coping skills for practical situations, and providing better understanding of new information(Fernsten & Fernsten, 2005; Fullana et al., 2016; Guthrie & McCracken, 2010).

1.3. The Importance of Reflective Learning for Sustainability Leadership Education

The importance of improving reflective capacity in sustainability leaders emanates from the belief that reflection imparts a number of useful capacities to sustainability leadership(Ralph, 2015). These include skills of self-awareness and critical thought that are crucial to sustainability leadership development (Guthrie & McCracken, 2010). Reflective practices are seen as a means to foster awareness, empathy, collaboration, deep listening, engagement with diverse perspectives, and improved and creative responses towards sustainability (Eaton et al., 2016). Through reflection, individuals can learn to consider and then change habits and expectations, enhancing their decision-making capacity as they develop accurate perceptions, avoid premature cognitive commitments, utilize greater flexibility and creativity, and extract learning from practical experience (Guthrie & McCracken, 2010; Sipos et al., 2008). These are qualities that make graduates capable of engaging in the ongoing debate, discussion, and deliberation regarding sustainability transformations (Bendell et al., 2017a) and also promote needed qualities of disruption, resistance, and desire for tangible social change (Papenfuss et al., 2019). Developing personal awareness in ones relationship with sustainability challenges and being able to critically consider how to respond to complex challenges is often seen as a prerequisite for sustainability leadership, especially when sustainability students do not often graduate into ideal sustainability jobs in supportive organizations or institutions, but rather must design and lead the work towards sustainability transitions (Bendell et al., 2017a; Thomas et al., 2020; Wiek et al., 2011).

Furthermore, influential educators such as Paolo Freire argue that reflective practice is the precedent from which tangible social action occurs, arguing that it is the combination of reflection and action on the world that transform it (David Kolb, 1984). For sustainability educators, the challenge of creating leaders means they must not only implant new ideas but modify or dispose of the old ones. By engaging in reflective practices as part of ongoing pedagogical practice, educators may contribute to this important outcome (David Kolb, 1984; Eaton et al., 2016).

However, despite a growing body of research describing innovative pedagogies for ESD, one area that has lacked research has been the investigation of pedagogies that promote and encourage reflective practices distinctly *for* sustainability (Eaton et al., 2016). The consideration of how to ensure reflective pedagogies can support effective decision making in future leaders requires experimentation and consideration by ESD practitioners in order to consider its ongoing potential (Colomer et al., 2020; Eaton et al., 2016). This paper aims to contribute to this discussion.

The authors have been part of a sustainability program that has successfully utilized various reflective approaches within its pedagogical approach over a number of years. Thus, this paper presents a case study of two significant pedagogical tools that embrace reflective learning within a master's level sustainability leadership course. It aims to consider the value and impact of reflective pedagogies of sustainability graduates as future leaders. The following section describes the background of the case study, as well as how data were collected and analyzed. The Results section gives perspective from both the student and the staff side, which is examined and then discussed within this paper.

2. Research Methods

This study was carried out by researchers and program staff of the Master's in Strategic Leadership towards Sustainability (MSLS) program, who are also researchers in the field of leadership education for sustainability. It adopted a qualitative case study approach that aimed to investigate the 'worthwhileness' of the described pedagogies (Bassey, 1999) and aims to describe the benefits and challenges encountered by students and staff in engaging with these pedagogies. Case study methodologies are seen as a strong research approach to investigate ESD, yet this study aims to consider some of the critique such approaches have faced. These are that case studies should consider the explicit role of the authors, promote a critical analysis of the case, include all people impacted by the study, and have the potential of contributing the improvement of the field of sustainability in higher education (Corcoran et al., 2004).

2.1. The Case Study

This study focuses on two specific, but related pedagogical tools used within the *Leadership for Complexity* course of the MSLS program of Blekinge Institute of Technology (BTH) in Karlskrona, Sweden. The two main tools considered by this study are titled the *Portfolio* and *Pod.*

In 2004, BTH launched the international, transdisciplinary MSLS program. MSLS is a 10-month transformational program situated in Karlskrona, Sweden, that focuses on advancing students' knowledge, skills, and global networks, in order to build their capacity to be strategic leaders in the co-creation of thriving, sustainable societies. Each program has a cohort of 40–50 students from 15–20 countries and is conducted in person on campus. The program is open to anyone with a bachelor's degree with required English skills and intentionally invites all academic and professional backgrounds so as to bring diversity of experiences and perspectives into a transdisciplinary classroom. Student ages range from 20 to 63, with a concentration in the late 20s to early 30s. A recent survey of program alumni revealed that 93% of the 217 respondents categorized the program as a transformational experience for them and identified awareness of self and others, confidence to navigate complexity, an expanded worldview, and finding hope and inspiration as key elements of their experience. Many named the reflective exercises and the diversity engaged in the community as being key to their transformation (Manuscript in progress Bryant, et al., 2020).

The program is designed around two key pillars of learning—Strategic Sustainable Development (SSD) and Leading in Complexity (LiC). The purpose of the LiC course is for students to (1) develop deepened knowledge about and understanding of theoretical foundations for leadership in complexity, specifically related to transformative change for sustainability and (2) develop skill required to work effectively with complex challenges, including the ability to critically reflect on various approaches in the field. While a separate, distinct course, the LiC journey is intricately interlinked with all other parts of the program through, for example, providing process tools for group work, which takes place in other courses, or time for reflection and making sense of the content of other courses. The course uses as its basis a skills map (see Table 1.) to guide learning outcomes. The map has been developed over several years by the program through a combination of theoretical understanding (Missimer & Connell, 2012) and practical experience. The skill map consists of four domains that sustainability change agents need

to develop skills or capacities in. Building on the understanding of different kinds of complexities that define our world, namely dynamic, social, and generative complexity (Adam Kahane, 2007), from here the domains of systemic, participatory and innovative solutions were derived. Based on program experience, underlying all of this is what has been called the personal domain, which relates to the internal capacities of the change agent as leader. While the domains map well to Wiek et al.´s highly cited competencies (Wiek et al., 2011), they were derived independently. Each domain comes with underlying theories and concepts, as well as a general ability and specific tasks student should be able to do. For example, in the systemic domain, one general ability is to map systems and one specific skill within that is to map relevant stakeholder and relational dynamics. Another skill, in the participatory domain and under the heading of working well in diverse teams, is to give and receive feedback. The course´s and even the whole program´s content is then mapped to these skills to show the students which course/program moment (lecture, workshop, or other learning activity) is aimed to support the development of which skill.

Table 1. Leading in Complexity skills map.

		Underpinning Theoretical Models
		Systems Thinking (Capra & Luisi, 2014; P. M. Senge, 1990), Nested Systems Capra in (Stone & Barlow, 2005), Complex Adaptive Systems (Missimer et al., 2017), Cynefin Framework (Snowden & Boone, 2007), Definition of Success to Guide Systems Boundary, (G. I. Broman & Robèrt, 2017), Transition Theory (Geels, 2011), Berkana Two-Loop Model (Stilger, 2017; Wheatley & Frieze, 2007), Leverage Points (Meadows, 1999).
	General ability	**Specific task students should be able to do**
Systemic	Map systems	Draw nested system model for given system domain
		Organize information relative to systems into appropriate categories
		Map external political, economic, social, technological, environmental, and legal system dynamic relevant to given organization
		Map relevant stakeholders and relational dynamics
		Map material flows within an organization
	Analyze systems against success	Evaluate organizational sustainability performance
		Identify organizational Strengths, Weaknesses, Opportunities, Threats
	Select appropriate response	Reflect on characteristics of challenge at hand and select appropriate intervention approach

	to different types of challenge	

	Underpinning Theoretical Models	
	Team Processes, (Tuckman, 1965), Creative Tension (P. M. Senge, 1990), Participatory Decision Making (Kaner & Lind, 2007), Theory U Process (Scharmer, 2009).	
	General ability	Specific task students should be able to do
Participatory	Work well in diverse teams	Create shared clarity of purpose, task, role, process Select and use appropriate team decision making process Plan, execute and reflect on tasks at hand Map relational dynamics underpinning conflict Give and receive feedback Understand and work with different personality styles Navigate team processes successfully to achieve task
	Develop & inspire shared vision	Create and frame clear vision, purpose, and value statements
	Stakeholder engagement & motivation	Present and speak to an audience in a clear and engaging manner Map and tailor communication to stakeholders with multiple worldviews Gamify challenges to create motivation and engagement Empower others to act
	Work with participatory processes	Design appropriate participatory processes Host and facilitate participatory processes Harvest and strategically visualize processes

	Underpinning theoretical models	
	Critical Thinking (Glaser, 1941), Prototyping (Kelley, 2010), Backcasting (G. I. Broman & Robèrt, 2017; Robinson, 1990)	
Innovative	General ability	Specific task students should be able to do
	Question current situation	Ask critical questions
		Assess current challenges
	Propose and test new solutions	Creative problem solving in quick iteration
		Guide thinking by what may be appropriate in the future rather than now
		Employ a strategic approach when selecting next steps

	Underpinning Theoretical Models	
	Developmental Psychology (Keegan & Lahey Laskow, 1983), Theory U (Scharmer, 2009), Humble Inquiry (E. Schein, 2013)	
Personal	General ability	Specific task students should be able to do
	Connecting to Others	Foster one´s own empathy and compassion
		Listen, initiate, and participate in dialogue
	Self-authored Learner	Continuously and intentionally learn and develop
		Manage own time and priorities
		Strive for self- awareness and engage in critical self-reflection
	Personal resilience	Develop mechanisms to dealing with complexity and uncertainty on a personal level
		Develop clarity of your own potential roles in society´s transition
		Constantly renew one´s energy and take care of oneself
	Attitude	Develop an inspirational and can-do-attitude
		Develop courage to challenge the status quo

Act as a role model to others (walk the talk)

The course utilizes two main reflective tools, the Portfolio with three separate deliverables and Pod; these two pedagogies within the LiC course are the focus and boundary of this case study and are described below in Table 2. As mentioned above, the Portfolio and Pod interlink with the LiC course content, as well as content of other courses within the MSLS program, and as such serves as the container for formal reflection and collective reflection through dialogue. All learning activities in all courses employ informal, mostly group discussion and reflection.

Table 2. Case study description—Portfolio and Pod pedagogies.

Description	Pedagogical Intention
Portfolio-Skill Assessment and Development	
This involves an initial self-assessment based on the LiC Leadership Skills Framework (Table 1) as a rating (0–5) as well as a qualitative description giving evidence for the rating. Students then create a development plan. Based on their own assessment, students pick one or two skills from the map that they would like to improve and commit to practicing during the learning period and create a plan for developing that skill. At the end of the learning period, they conduct a written assessment and reflection on the development of the skill selected. Guiding questions include: • What are some fundamental elements to keep in mind when applying this skill, which you have learned through your practice? • Was there a work/life situation over the last few weeks when having practiced this skill came in useful for you? If so, how was it useful? • Having reflected on your practice over the past weeks, how would you now assess the following criteria for the skill you have been practicing: 1. Skill Competence 2. Skill Confidence 3. Progression towards goals set for skill 4. Personal adherence to development plan • Do you have any reflections on the assessment above? • How might continuing to develop this skill support you in your work over the next months/years? • If you were to draw your learning curve for this skill to show your development over time, what would it look like in terms of goal attainment and confidence?	The aim of this piece is for students to become self-directed learners by setting their own goals and structures for accountability. To do so well necessitates the ability to reflect on one´s own strength and weaknesses both in terms of skills but also learning process design. The guiding questions are intended to help students develop their reflective muscles and learn about themselves in terms of learning process.

• What worked well during the time you were practicing this skill and why? • What challenges came up while you were practicing this skill? • What lessons can you take away about your own learning process? • What could you improve in your learning process and how? • What are your next steps? • Three loops of this activity occur during the year.	
Portfolio–Theme Summaries and Reflection	
This requires students to engage and reflect on delivered weekly lecture or workshop content of the LiC course (readings/lectures and workshops). Students are asked to provide a one-page written content summary and one-page personal reflection on given questions for each theme: • Did any personal insights or "aha´s" arise for me while learning about this theme? • What are the critical questions I have about this theme? • Did I find any particular ideas under this theme challenging and on what grounds would I challenge them? • What practical relevance or implications does this theme have for leadership when addressing complex challenges within society? • How might I apply what I am learning within this theme in my own leadership practice – at MSLS or in the future? • What questions does this theme create for me that I want to work further with? • What else do I notice or find interesting under this theme?	The aim of this piece is critical and personal reflection regarding content learning. Students are asked to build their reflective muscles in engaging with sustainability leadership content.
Portfolio–Individual Reflection Essay	
Students are asked to write a personal reflection essay at the end of each learning period answering a question posed by the staff in relation to a leadership topic, e.g., what they are learning about working in teams and about themselves in relationship to this theme?	The aim of this piece is reflective practice regarding their personal leadership journey, tying together insights from the two above. The reflection essays are commented on by staff, most

	often with questions to further reflection and deepened learning.
Pod	
Pods are smaller groups of 8–12 students that meet on a monthly basis with a staff member as a process of collective reflection. Students sit in a circle and share insights, challenges, and learnings as regards their learning journey. The Pod leader (a faculty member) facilitates the session with a number of key questions, usually using a talking piece and letting each student speak when they feel ready. An example of questions may be: • How are you feeling about your first few weeks at MSLS? • Where have you been growing and where would you like to focus your growth for the next few months? While the staff member begins the facilitation with a question, students are encouraged to co-create sessions towards their needs individually and as a group and bring in their own questions as well as help each other explore.	This piece aims to bring a collective reflection and meaning making aspect to the above. Sharing individual reflections in group and reflecting together in groups enables group building as well as perspective awareness on an individual basis due to the diversity of viewpoints in the group.

2.2. Participants and Data

This study utilizes two main participant groups as data sources, they are students who attended the course in 2016–2020 and staff who taught the course in 2016–2020. Data for this study were gathered from students' surveys, teacher interviews, and teacher/researcher reflections.

1) **Students**: Gathered through course evaluation surveys collected between the cohort years 2016-2017 and 2019-2020. The course evaluations are gathered through online forms, which are shared with all course participants; there is usually a 10-day window to answer the evaluation form. The evaluation is conducted anonymously, and students are asked to provide quantitative and qualitative feedback and reflections on all parts of the LiC course. For this study, only the questions relating to Portfolio and Pod as well as general feedback on the course that touches on these pedagogies have been considered. The questions ask whether each pedagogy was supportive for the students learning and why, and as such do not take an explicitly reflective learning approach as this is not the only pedagogical approach employed in this course. These surveys provide a dataset of 65 students (2016/17–22, 2017/18–24, 2018/19–5, 2019/20–14). Since the data is collected anonymously, it is not possible to gather to determine demographic data on participants besides indicating the general demographics of the cohort (see above). While a quantitative response regarding the supportiveness of each of the pedagogies is not available for all years, it is provided for the first year (2016/17) and the most recent year (2019/20). The numerical value is presented as an indication of student sentiment, but it not the main focus of this qualitative study as the qualitative statements from the students provide more of the nuance relevant for this discussion. Themes from this data serve as the studies basis of evaluation from a student perspective.

2) **Staff:** All but one staff member involved in the delivery of the course between 2016–2020 was interviewed: This included one individual and one group interview with four former and current staff of the program. The collective interview adopted a focus group style in order to provide informal discussions regarding the phenomena and the experience of the teachers. All interviews were conducted in person or via internet conference.

2.3. Data Analysis

Student feedback forms and staff comments were themed from statements within the feedback into '*benefits of*' or '*challenges of*' engaging with the pedagogical tools within each of the three sub-components of the Portfolio: (a) The Skill Assessment and Development Plan; b) Theme Summaries and Reflections; and c) Individual Reflection Essay- and the Pod.

Staff feedback is presented, summarizing the key themes that emerged from the questions to the staff about the Portfolio and Pod pedagogies: What are the *benefits,* what was *challenging for students from a staff perspective,* and what was *challenging for staff*?

While student responses were analyzed and presented as responses to each pedagogical tool and their subcomponents, the staff responses are presented as a more integrated assessment. This is because staff as the designers of the pedagogy inevitably see them more as an interconnected whole, while the students are both surveyed on each component but also may not necessarily understand them as an interconnected whole

Self-reflection of authors: The three authors also being staff members, including the program director, included our own reflection of the experience of the process in this case study given our deeper knowledge of the topic area from a research perspective and that one author—the program director (on staff for 12 years)—was also one of the creators of the pedagogical tools. With this reflexivity comes the intention to contribute to the improvement of the field of sustainability in higher education and acknowledges the role of authors within the program (Corcoran et al., 2004).

3. Results

3.1. Student Feedback

The results below present the insights on the two pedagogical tools and their components from the student evaluations. The section focuses on the benefits and challenges perceived by students and summarized in Table 3.

Table 3. Summarized student feedback within Portfolio and Pod pedagogies.

	Benefits	Challenges
Portfolio		
Skill Assessment and Development Plan	• Space for intentional leadership development • Structure • Self-directed learning	• Structure • Time pressure • Ineffective
Theme Summaries and Reflections	• Structured reflection leads to deeper learning	• Forced reflection • Time pressure
Individual Reflection Essays	• Deepening Learning	• Focus on the personal • Time pressure • Purpose
Pod	• Creating connection and gaining perspective	• Feeling challenged by others form of expression • Building enough trust

Portfolio: Skill Assessment and Development Plan

This plan asks the students to reflect on their own capacities and set a program to develop further "Leadership Capacities" utilizing the LiC Skills Map (See Table 1.) as a guiding structure. In a scale ranging from highly positive, positive, neutral, negative to highly negative, 77.2% (2017) and 71.4% (2020) of students consider *Skill Assessment and Development Plan* as a positive or highly positive part of their learning experience.

Benefits:

Space for intentional leadership development: The positive rating is supported by statements such as: 'I am so grateful that I have the chance to reflect on a skill I want to develop to become a better leader and a better person. I love this time for constructive reflection.' Some linked it specifically to a much-needed piece of leadership development, namely that '... it gives people a chance to dive into personal development...'.

- **Structure:** Many students responded positively to the structures provided by the Skill Assessment and Development Plan with most of them referring to the structure as providing a good 'guideline' for their reflection. One student stated, *'I will always make a skills rating from now on, this is such a good tool'.*

- **Self-directed learning:** Furthermore, personal autonomy was useful for some students, *'I like the idea of self-awareness being taking personal responsibility of developing personal skill in addition to monitoring personal progression along the way.'*

Challenges:

- **Structure:** Whilst a number of students enjoyed the structed elements of reflection, others found a number of challenges with this: *'The way it was structured does not work for me at all. To detail orientated for me… hence I only filled in what was required and then ignored it'* and *'the very structured, break it down approach to the skill development felt unnatural, forced'* highlight some of the main challenges students faced.

- **Time Pressure:** Other statements indicated further challenge with time or lack of personal growth as a result of the pedagogy, *'I left it for the last minute, it was nice as well, but felt frustrated by the little time I had to dedicate,'*

- **Ineffective**: Lastly, some students reported that the tool simply did not support their learning. *'I appreciate the beautiful thought behind it, however I don't feel it is much good for me because it did not help me at all'* or *'trying to quantify personal development is not working for me'* (referring to the numerical rating and sequenced development plan).

3.2. Portfolio: Theme Summaries and Reflections

This component comprises students writing a one-page summary of weekly readings and class content and one page of reflection on the content. There are generally 5–6 different themes to reflect upon per Portfolio submission. Examples of the themes include: Working with Conflict, Team Building, and Social Labs methodology. When it comes to the *Theme Summaries and Reflections,* 77.2% (2017) and 92.8% (2020) consider it a positive or highly positive piece of their learning.

Benefits:

- **Structured reflection leads to deeper learning**: A number of students articulated the useful nature of having the structured reflection promoted by the Theme Summaries and Reflection, which offered a defined process, *'I enjoyed formally reflecting and being in a routine from the start definitely helped,' and 'Very helpful outline to use as a basis for reflection'.* Others also reflected that summarizing content themes and combining that with reflection provided a strong process: *'It was highly positive for me to have the space to summarize the reading as a way to consolidate the knowledge'* and *'the reflection as a way to deepen the personal intuitive thinking by linking learning and real-life reflection.'* Another student stated: *'These were incredibly helpful in helping me process what I had learnt'* and another simply described this as a *'learning accelerator!'. Another student reflected: 'At the very beginning, I didn't like the reflections because I don't really like to write. In the end, I felt how*

those reflections helped me in my learning process and how they played a fundamental role.' This deepening and integration of the learning experience echoes themes that surfaced in feedback in the Individual Reflection Essay also (see below).

Challenges:

- **Forced reflection:** Several students found the forced reflection within this structure to be challenging with several stating their discomfort with this process and the lack of usefulness in the learning. '*This was not my favorite. I think there were too many reflection questions and it wasn't necessarily questions that were meaningful to me'*. Another stated *'the summaries are something I feel like I'm doing because I have too. It is not helpful for me.'*

- **Time pressure:** Other students, however, also indicated that while there were some challenges with the structures provided by the pedagogy, they could see the value in it, but often remained impacted by time pressure, *'Although it was annoying at times. It helped me a lot better to remember the content and to digest it'* and it *'forced me to review what I learnt. I would have loved to do it nicely if I had more time.'* Issues with time pressure and the 'forced' reflection are themes that emerged in the Individual Reflection Essay feedback also.

3.3. Portfolio: Individual Reflection Essays

This is a two-page personal reflection essay that asks students to reflect on their learnings three times over the course of the year. The essay is based on an invitation to reflect on lessons learnt by asking, for example: "what did you learn about yourself with regards to teamwork?" or "what would you identify as key areas where you personally have grown or developed through your MSLS experience and why?" and "when during MSLS have you led? What did you learn from this experience?" The *Individual Reflection Essay* was deemed by 68% (2017) and 92.8% (2020) as positive or highly positive in the quantitative feedback collected.

Benefits:

- **Deepening Learning:** The Individual Reflection Essays also received a variety of statements articulating the positive aspects of this pedagogy through deepening and integrating the learning experience; *'this was definitely one of the best parts of class, it enabled me to lay down my thoughts and come up with more learnings than I had imagined,'*. Another comment echoed the positive experience, '*...the reflection essay gave me the space to address some of the issues that had no other space...*' and '*... it allowed me to create my own idea about the learning process and take time to reflect on that.'* A number of comments acknowledged the *'stream of consciousness style of writing'* being helpful for processing of thoughts. The structure of the essay was also found to be beneficial for many, *'it was really helpful for me to sort out my thoughts'* and *'it helped me to take a moment of reflection, otherwise I would not have done so.'*

Challenges:

- **Focus on the personal:** Several students, however, criticized the 'personal' nature of the reflection, preferring for a more 'content' orientated focus. It *'would be nice for the reflection essay to be more related to the readings'*.

- **Time pressure***: A* number again also highlighted the time pressure that they experienced. *'I kind of rushed through this one, I found it less useful to have this one big one (essay) at the end.'*

- **Purpose:** Other students highlighted challenges with its purpose, stating, *'I did not see the purpose for the essay, so I didn't invest too much time'* and *'I wasn't sure this added too much beyond my weekly reflections.'*

3.4. The Pod

The Pod is the group dialogue with 8–12 students and one staff member that meets on average once a month throughout the year for 2 h, for conversation, collective reflection, and dialogue. Of the students who responded, 72.7% (2017) and 92.8% (2020) consider Pod as positive or highly positive support for their learning.

Benefits:

- **Creating connection and gaining perspective:** Many students enjoyed the collective reflection of Pod with sharing appreciation of the *'very nice and safe space to talk about things happening*'. Other statements suggested the power of the Pod pedagogy included answering questions, providing support, and creating connection through conversation. Statements included, *'Yes! I really love this space for sharing whatever wants to be shared. It gives me a lot of support to hear about the struggles and thoughts of others and makes me feel more connected to my classmates.*' And another, *'Pod meetings is one of the most interesting things I have experienced and think I would carry this experience with me to the workplace, it was a place to express one's own feelings and thoughts and to see how others feel and think as well.'* Some of the positive feedback requested for there to be more Pod meetings with some suggesting *'every two weeks*' and another *'every week'*.

Challenges:

- **Feeling challenged by others' form of expression:** These statements were contradicted by a minority of students who felt that collective reflection was not enjoyable or beneficial for their learning, *'each meeting we had brought me down. There were too many complaints and disturbing issues brought up in my group–which would not bother me otherwise, but I tended to adopt the mood*'. Others said, *'some were good, some felt like festivals of whining whereby we took it in turn to moan to the staff. I didn't get much values out of listening to others moan for two hours.'*

- **Building enough trust:** Another statement spoke to the difficulties with trust in spaces of collective reflection. Referring to an agreement that is made at the beginning of each year, a student stated, *'I do have concerns about it being a space where what's shared doesn't leave the room, I think maybe signing an agreement might reinforce this.*'

4. Staff Evaluation

Staff evaluation of the two pedagogies centered around three core themes-*Benefits,* what was *Challenging for students* from a staff perspective and what was *Challenging for staff*. Where direct quotes are used, they are italicized. The overview is seen in Table 4.

Table 4. Summarized staff reflections of Portfolio and Pod pedagogies.

Benefits	Challenges for Students	Challenges for Staff
• Learning • Structure • Creating a constructive container	• How to reflect • Motivation	• Policing • Hosting Uncertainty • Resources

4.1. Benefits

- **Learning:** The Portfolio in itself is seen as a great resource for future content reference for students. The process of weekly themes + reflections and Pod allow for a deeper critical engagement with the content than might be the case without reflective practices and in the process, students learn how to have deep and generative conversations and about themselves. *'Learning about different ways of being in conversation... for some it is massively uncomfortable sitting in a circle'* but then they get used to it and start talking about their perceptions and feelings. The Portfolio and specifically its self-determined skills assessment promote the *'important leadership skill to be self-directed*… and promotes *'self-designed accountability systems in the context of an academic program'* that will benefit students in their careers and personal growth.

- **Structure**: The structure of Portfolio and Pod is an opportunity for staff to regularly check in with students and focus on their leadership development via written and dialogic structures and allows for students to practice *'flexing the muscle of reflection.'* The structures also keep students accountable in terms of delivery, although challenges with this accountability are noted below.

- **Creating a constructive container:** The process *'holds a space of breathing for students'*, by providing moments of reflection, which are necessary for transformational learning. Students are invited to '*show up fully'*, even in the messiness of their development and are supported in moving through it in a generative way. Through this they build stronger relationships, a better learning community, and support network for their future work.

4.2. Challenges for Students

- **How to reflect?** Many students experience the idea of reflective and self-directed learning as novel and do not know how to do so; many want/need much more guidance than staff can provide and also find the structure of support in its current form challenging. Others find slowing down and reflecting difficult as this is not something they are used to practicing, especially if they are used to an academic context that is more transmissive.

- **Motivation:** The reflective practices employed do not suit all students. Not finding a way that suits them, for many undermines the motivation to engage in reflection at all. (Some) students also struggle with the balance between the extrinsic vs. intrinsic motivation of

engaging in the activities and therefore also struggle with delivery and accountability. E.g., *'moving from 'grades' to reflection can be challenging'* for some.

4.3. Challenges for Staff

- **'Policing':** As students struggle to engage in the process with full commitment and accountability, the role of 'policing' falls on staff (since deadlines and assessment needs to be enforced), which can make the role feel more authoritarian than coach or guide. The encouragement of personal learning journeys can also mean it is difficult to force students to reflect 'on time' (for the deadline)

- **Hosting uncertainty:** Hosting the reflective process is significantly demanding as students often end up confronting fears or traumas from the past. This requires that staff are equipped with both coaching and mentoring skills as well as the ability to stay centered themselves in situations where they might be personally challenged or feel underqualified e.g., *'dealing with students' emotion, anger and trauma',* while '*not being a trained counsellor.*' or *'balancing the life tragedy in a group needs the rights skills and handling and can be harmful if not done well.'*

- **Resources:** Supporting the above-described reflection and transformation processes for 8–12 students is an intense process, both emotionally and from a time perspective, which is in conflict with the lean approach of university management of courses. It results in challenges in which the processes *'don't have enough hours'* in the official time planning or the time planning is not flexible enough to deal with the dynamic nature of these processes and staff use their personal time to support in challenging times.

5. Key Findings

5.1. Affordances and Limitations of the Case Study Pedagogies

As highlighted in the introduction, sustainability leadership education outcomes include increasing self-awareness and personal transformation towards new habits; the development of empathy for and comfort in engaging with multiple perspectives; the development of critical thought for enhanced decision making and practical social action. Examining the case study from this perspective, we can see that the Portfolio and Pod pedagogical tools investigated provide some positive results to these four outcomes, while also suggesting the need for further support and innovations. Key findings for these sustainability outcomes are introduced below with further exploration of innovations and recommendations for educators in the discussion section.

5.2. Development of Self-Awareness and Personal Growth

A number of the students reported the further development of self-awareness as a result of the pedagogies, articulating that the Portfolio helped them *'deepen the personal intuitive reflection by linking learning and real-life reflection'* and that increased personal awareness led to more agency, for example by *'taking personal responsibility of developing personal skill.'* This developing sense of self-awareness is often evidenced by student ability to engage more constructively in group work over the course of the program and through the increasing 'wholeness' with which staff see students

bring to the Pod over the course of the program. In other research, 93% of alumni reported that the program was a transformational experience for them, inferring that the student sense of self had grown and shifted during MSLS. The pedagogies of the case study remain the place where distinct practice and process regarding reflection and relationship with self, through the Portfolio and within the group, through Pod, occur. Furthermore, interaction during Pod enabled a developed self-awareness in relation to other individuals through collective reflection, as students *'share (…) thoughts and feelings, support other people and be supported'*. Another student indicated that the successful implementation of reflective behaviors had resulted in transformed behavior with the intention that they would *'always make use of a skills rating from now on, this is such a good tool'* and that the pedagogies provide a process that *'gives people the chance to dive into personal development that is so needed (in general and not only amongst leaders.'* This suggestion by students of personal growth highlight the role the pedagogies play a providing a place to practice both understanding of self and deliberate, intentional personal development and transformation as a needed characteristic of sustainability leadership.

5.3. Increased Empathy and Comfort with Multiple Perspectives

Furthermore, students articulated the outcome of collective reflection, specifically the Pod, as a place where empathy and comfort with multiple perspectives developed, *'yes! I really love this space for sharing whatever wants to be shared. It gives me a lot of support to hear about the struggles and thoughts of others and makes me feel more connected to my classmates.'* While another suggested these pedagogies provide a place *'to see how others feel and think as well"* and that the pedagogies are *'important to create trust between students and staff.'* One staff member suggested that while it can be challenging for some students, an outcome of collective reflection involved *'learning about different ways of being in conversation,'* an important aspect of engaging across diverse perspectives and understanding, and a significant skillset used in engaging diverse stakeholders on sustainability issues and solutions.

5.4. Development of Critical Thought and Reflective Decision Making

A number of statements support the notion that students practiced critical thought through the pedagogies and as a result of their reflective experience. For example, the Portfolio and its' reflection essays often became the space where critical outcomes and questions with content or collective engagement were shared, '*the reflection essay gave me the space to address some of the issues that had no other space to discuss.'* Another student articulated that they *'love this time for constructive reflection',* which supported deliberate consideration of their experience as facilitated by the pedagogies; one that allowed them to critically examine their experience to uncover learning by questioning their response, positive or negative, to content taught within the LiC course. These questions were often then raised and discussed within Pod meetings. The Portfolio structure required students to critically consider questions that arise within this content and promotes student responses *'which allow space for creativity and the reflections for critical engagement,'* as students critically consider themselves and *'reflect on a skill I want to develop to become a better leader and a better person.'* Staff suggested that the pedagogies support a *'space of breathing for students',* which was beneficial because it models reflective practices that avoid reactive decision making without consideration or reflection. These statements support the notion that students develop and share critical thought and practice as a result of the pedagogies, a notion that enhances the depth in which they consider

their personal experience of learning and provides tools that help inform decision making by students in that moment and importantly in future contexts.

5.5. Enabling Future Social Action and Sustainability Solutions

One outcome to consider was whether the reflective pedagogies result in practical outcomes towards sustainability. Results from the student surveys do not support the direct correlation between reflective pedagogies and sustainability outcomes as they did not ask any outcome or action-related questions. The pedagogies are designed to develop 'leadership' qualities described in the LiC skills framework that promote learning to allow for future social action, 'it will allow me to come back to those learnings and reconnect with them in the future.' Results of the study suggest that rather than the pedagogies inspiring solutions to sustainability challenges themselves, they enable students to achieve in other more practical elements and courses of the MSLS program and after, as graduates by providing distinct learning and characteristics. Although a number of students suggested that the behaviors and processes learnt through the pedagogies, specifically the pod, will be utilized in future work, 'I think I would carry this experience with me into the workplace' findings suggest the tangible outcome of sustainability action is intended to occur later using the skills developed in the pedagogies.

5.6. Imperfect and Sometimes Unsuited Pedagogies

Despite the suggestion that a number of positive outcomes emerge from the pedagogies articulated by both the student data and the teacher reflection, a number of critiques of the pedagogies emerged. The results show that the pedagogies remain fallible in a number of ways. The main evidence of this is highlighted in a number of critical statements from students who suggested that elements of the pedagogies did not work for them, *'this was not my favorite. Having the necessary information to complete the assignment in different places was maddening.'* Meanwhile, others suggested, *'I felt very blocked, and I had the feeling I had to deliver something specific or I needed certain insights and critical questions'* or *'trying to quantify personal development is not working for me.'* These statements show that despite the intention of the pedagogies as a whole, there is definitive push back and hesitation from a number of students who displayed discomfort with either the process or the content of the Portfolio and Pod pedagogies, an outcome that undermines their effectiveness in helping the students learn and develop as a result of their experience with the pedagogy.

These results suggest that reflective pedagogies can play an important role as pedagogies in education for sustainability leadership, but also that they require a suite of complementary pedagogies and that certain considerations need to be taken within their design. These will be elaborated upon in the discussion below.

6. Discussion

6.1. Reflexive Practices a Necessary Skillset for Future Sustainability Work

In a field that considers lifelong and self-motivated learning an essential trait of leadership due to the complex nature of sustainability solutions and the absence of 'absolute' answers or stable environments (Barth, 2015; Brundiers & Wiek, 2017; Heiskanen et al., 2016) being reflective and able to learn independently remains a paramount and powerful skill in students as future sustainability leaders. The construction of reflective practices may provide the student with a process to consider and learn from during challenging content, topics, and interactions. This is a worthwhile, and perhaps crucial, element of leadership education as they develop higher cognitive processes and focus on individual actions directed towards problem solving and outcomes (Wiek et al., 2015) while providing structure and grounding as students pass through the 'disorientating dilemma' phase of transformation. Student answers also, to a degree, evidenced an understanding of the importance of reflection, self-directed, and life-long learning as they reported the intention to utilize the practices in the future. '*I will always make a skills rating from now on, this is such a good tool*' and '*I think I would carry this experience (Pod) into the workplace.*'

Yet, for some students, the difficulties in comprehending how to structure, measure, and assess either content or personal development for skill development leaves them struggling for direction and discontent with the pedagogies and with reflective processes. One suggested outcome for educators is to reinforce the notion that reflective processes also encourage depth of learning regarding content and are not only utilized for the 'self-development' of students from a personal perspective. The Portfolio is an attempt to do this, as it is a pedagogy that explicitly asks students to reflect on their response and opinion to content about sustainability. From this perspective, the Portfolio allows educators the possibility to combine important instrumental and content-based learning with reflective processes that shifts learning from recollection and moves it into the realm of a critical and applied understanding of content and the student undergoes learning in the model of Kolb's Learning Cycle (David Kolb, 1984) and develops deeper understanding of needed qualities.

Furthermore, student articulation that the pedagogies, specifically the Portfolio, helped them *'better remember the content and digest it'* and *'forced me to review what I learnt'* evidenced benefits to student learning, albeit in a more instrumental fashion. While this could be seen as a limitation of the pedagogies in terms of transformative personal outcomes, some outcomes desired by sustainability education remain in this realm and are required as a base from which robust and potentially transformative student discussions can emerge. For some students at the beginning of their 'sustainability leadership' journey, the need to develop understanding of basic content before moving into personal transformation is understandable. This potentially requires educators to provide even more flexibility in reflective pedagogies depending on the level of student knowledge, development, and intended learning outcomes.

By introducing reflective pedagogies as tangible tools and structures for students, educators promote the ongoing development of students once they have finished formal education. However, not all students grasp the importance of reflection, especially when it comes to more than content reflection. This is captured in the quote: *'I did not see the purpose for the essay, so I didn't*

invest too much time'. While the staff team at MSLS spends significant time explaining both the what and the why of the reflective pedagogy, not all students understand the purpose or approach and some disagree with it, either at an abstract level or when it comes to the personal practice of it. This is not a criticism of the students as much as it is an acknowledgement that it is challenging to help all students understand and engage in meaningful reflective and self-directed practice and create structures that enable them to do so. A container can be set to invite reflection but there is no guarantee that students will embrace or use it as a stepping stone to co-create their own learning structures that will continue to benefit them in their future sustainability work.

6.2. Pedagogy Design that Promotes Collaboration and Comfort with 'Others'

The Pod pedagogy provides a mechanism for collaborative reflection; one that highlights and promotes the diversity of the MSLS student cohort. While collaborative reflection is, of course, also a part of other classroom activities, Pod is unique in that it intentionally focuses on deep personal reflection, not course content reflection. Both the Portfolio and Pod create unique spaces for new forms of conversation to emerge, one from a written relationship between student and teacher and the other within peer group dialogue. These approaches aim to create a form of Generative dialogue, "a more comprehensive, purposeful and integrated practice of conversation" that helps to create a "collective new learning space" as well as "new knowledge" and supports processes of transformational learning (Gunnlaugson, 2006; Petta et al., 2019).

With the intent of learning from the experience of others, the Pod provides a space of participation and listening that allows students to engage alternative views openly, beginning the work of understanding the complexities of different perspectives (Eaton et al., 2016). This means that students deepen their level of inquiry through questioning, connections, and honoring multiple perspectives (Fullana et al., 2016). The diverse nature of the program's cohort means numerous cultural, religious, and socio-economic backgrounds engage and a multitude of perspectives are seen and heard during the process of Pod. This is both a powerful experience and a tangible learning outcome as collaboration and participatory processes remain integral to sustainability solutions and build on true understanding and honoring of personal differences. The Pod pedagogy of collective reflection embodies an example of hooks call for classroom communities that have the capacity to generate excitement by deeply affecting our interest in one another, by hearing one another's voices and in recognizing one another's presence (hooks, 1994), thus providing significant outcomes within a field that calls for collaborative, inclusive, and participatory solutions.

Difficulties can, however, emerge as this diversity amplifies the diversity of needs and students' levels of comfort with the open nature of conversation and practice of collective reflection. For example, where one student describes Pod as *'a place to express one's own feelings and thoughts and to see how others feel and think'* another can experience them as a *'festival of whinging'* or a place where *'there were too many complaints and disturbing issues brought up in my group.'* While it is also the staff´s experience that some students do (initially) use the time to focus on staff or program performance and only slowly shift to focusing the reflection on themselves and their own learning, these statements by students also show the challenge of accepting expressions of reflections in different forms. Another limitation of the Pod pedagogy in this regard is that a small number of students choose not to attend at all, meaning the collective nature of the group may

remain incomplete as students have different program experiences depending on whether they attend the Pod or not. Furthermore, these more critical statements highlight that for some students, the 'comfort with other' or willingness to engage in open groups processes remains challenging to the point where they avoid the pedagogy. This again shows issues with the challenge of pedagogies that aim to promote collective reflection in groups as individuals needs and desires may be in conflict with each other. However, our experience with Pod highlights a pedagogical attempt to support student comfort with the messiness of collective processes and provides a strong pedagogical tool to explore and develop those traits within students. It also shows the difficulties with approaching and designing transformational education environments that are able to hold and host *all* students in their personal learning journeys. Despite this, the study shows that pedagogies like Pod promote qualities desired in sustainability leaders such as awareness as well as inviting students to sit quietly together in with uncomfortable facts and emotions counters academic abstraction and generates the insight, resolve, hope, and empowerment (Eaton et al., 2016) that are desired outcomes of ESD programs and seen as beneficial by the majority of students. The positive student response to Pod suggests that deliberate design of pedagogy utilizing collective reflection can play a significant role in developing skills and values promoted by ESD.

6.3. Reflection for Sustainability Needs a Direction and Outcome—Utilizing the LiC Skills Map

A question for reflective pedagogies within ESD is how to ensure they promote sustainability learning and do not result in 'endless reflection without the will to act' (Scharmer, 2008). LiC attempts to do this within the Portfolio and Pod pedagogies by the incorporating its skill framework as a mechanism and container to ensure reflection in a 'direction' and for the purpose of sustainability. By utilizing an explicit and transparent framework that provides distinct definitions of sustainability leadership skills and their desired outcomes, students can frame their reflection towards sustainability learning. Thus, ensuring reflective 'growth' in areas that promote qualities of sustainability leadership. By suggesting that students acquire competences ranging from both 'systemic thinking' and 'project management' to 'increased personal resilience' and 'developing courage to challenge the status quo', the LiC framework caters for a high degree of flexibility for the learner, allowing them to choose whichever skill suits their personal learning journey but always within the contextualization of sustainability leadership. This point is supported by the work of Gardiner and Rieckmann whose study on reflective practices and sustainability competence acquisition suggested 'that a certain body of knowledge is required to serve as a framework guide' in order for students to develop sustainability relevant qualities (Gardiner et al., 2015).

The use of guided reflection with determined skills outcome is supported by other studies that suggest sustainability leadership development requires the combination of reflective pedagogies combined with practical wisdom in the form of 'development of leadership skills through deliberate practice' (Ralph, 2015). This framing of deliberate practice was highly appreciated by some students as it *'Gave me a clear focus and guideline and was very helpful to me in my process* and provided students a clear target to aim for with their Portfolio outcomes. Others argued that the definitive structure was overwhelming and meant that the reflection was not thoroughly engaged with, *'The way it was structured does not work for me at all. To detailed orientated for me… hence I*

only filled in what is required and then ignore it'. Another quote, *'trying to quantify personal development is not working for me,'* also articulates the challenge of putting structure on an unquantifiable reflective process. Other students lamented the 'personal' nature of the reflection, preferring instead for *'the reflection essay to be more related to the readings.'* This attitude highlights some students' preference for content-based, rather than personal reflection and leadership development and suggests that educators may need to justify the notion of personal development to students who are more used to or comfortable with a content-based memorization and recall style of learning. Perhaps within this case study, these results indicate a lack of adequate framing or justification on part of the staff or understanding on behalf of the student regarding the purpose of the LiC Framework in combining both content based and personal aspects of learning and how their relationship together relates to sustainability 'leadership' development. More research remains to be done to find a 'the lightest possible' structure to allow for individual agency within reflective processes that work towards clearly defined ESD outcomes. This study offers the LiC Framework as an initial suggestion.

6.4. A Challenge for Teachers—the Mental and Emotional Load of Reflective Pedagogies

One major discussion point was the heavy load reported by staff regarding the teaching and facilitating requirements of reflective pedagogies. While often admired and supported by the students for their work, staff reported that holding reflective learning environments can be a difficult, tiring, and emotionally challenging role. Providing the 'open, safe and supportive' conditions in which students feel comfortable and able to reflect openly, either individually through the portfolios or collectively through Pod, is a profoundly important element of pedagogy (Blake et al., 2013; Wamsler, 2020). However, holding this space highlights the demanding nature of teaching as students display stress, anxiety, trauma, and discontent as part of the reflective learning. The responsibility of hosting the Pod pedagogy was reported to uncover trepidation in staff as challenging topics emerged and students often shared significant personal challenges or conflicts. The ability to navigate the fine line between what can and should be shared within the group was seen as a difficult one to facilitate. One staff member framed the challenge as difficult due to *'not being a trained counsellor.'* This is supported by Griffith and Frieden who suggest personal growth experience within education can lead to the uncovering of buried personal trauma, meaning educators must be sensitive to the learner's experience of loss and feelings of disorientation and anxiety (Griffith & Frieden, 2000).

Finding constructive dialogic responses to these reflections and situation can itself be challenging as facilitators move from expectations of them as 'assessors' to 'guides and role models' while also having an emotional life of their own. Time taken to analyze and appropriately respond is also seen as a weakness of reflective practices in terms of teaching process (Gardiner et al., 2015); furthermore, staff are often required to negotiate with students as they underestimate the time and effort needed to complete 'good' reflective practices. There are strong arguments that advocate for the use of reflective pedagogies within sustainability education (Eaton et al., 2016; Gardiner et al., 2015; Ralph, 2015) and staff also reported that they benefitted from these exchanges. Despite this, the toll on educators to facilitate these pedagogies can be immense and poses a significant challenge to the pedagogy's delivery as the issue of teacher wellbeing emerges. Furthermore, these pedagogies and their teaching requisites remains misunderstood by

bureaucratic structures of higher education, which generalize and homogenize teaching requirements and considerations when designing courses and allocating teaching hours.

6.5. Pedagogical Limitations and Ongoing Challenges

Despite the results of this study suggesting a number of positive outcomes in terms of sustainability and leadership development as a result of distinctive reflective pedagogies for ESD, a critical analysis of the pedagogies show that challenges remain. The finding that the pedagogies did not work for numerous students remains of essential importance because it means that they are not optimally supported to develop the skills required of sustainability leaders. Further experimentation with other reflective pedagogies is required to find ones that might work for more students who are currently struggling while also, for academic fairness reasons, being comparable in effort and outcome to others.

A critical analysis of the Pod and Portfolio suggests the potential for these pedagogies to utilize power over the student experience of learning and reflection by imparting structures and requirements on them. While this is the case in most pedagogies and assessed learning outcomes, it remains tricky when wanting to empower students to become sustainability leaders. Furthermore, the dilemma of the relationship and power of staff over students in guiding and directing their reflection (whatever their intention) also needs to be considered. As feedback is offered and students evolve to reflect in line with that feedback, it may stifle the honest, personal responses that emancipatory education calls for. This question of power and influence is not specific to this study or these pedagogies but remains important in asking whether it is possible to create structed learning experiences in consideration of personal learning journeys that empower towards sustainability leadership. The answer to this critique perhaps lies in the adoption of transparent intentions and pedagogical explanations on behalf of the staff at the introduction of the pedagogies, seeking to acknowledge this as a challenge within these pedagogies and in wider sustainability education. Thus, educators can attempt to acknowledge the 'dilemmas' of 'power' and 'content' as suggested by Adler (Adler, 2003) and place openly the question of power, as an inherent part of classrooms, between the student and teachers. For a field attempting to create a personalized and emancipatory experience that requires reflection, questions on how best to do this remain, and the findings of this study suggest that despite many positive outcomes an ongoing critical examination of the Pod and Portfolio is needed.

7. Recommendations for Educators

The investigation has uncovered a number of considerations for reflective pedagogies to be utilized as part of education that promotes sustainability leadership. As educators and pedagogues engaged within this case study, we offer a number of recommendations as a result of our study.

1.) Reflective pedagogies can be utilized to promote self-awareness and self-development of students in a way that promotes sustainability leadership development, but they should be situated within a suite of pedagogies promoting sustainability learning in numerous ways.

2.) Leadership development for sustainability should be defined by educators prior to development of reflective pedagogies in order to 'guide' reflective direction towards specific sustainability outcomes.

3.) Limitations to these pedagogies occur in their ability to satisfy the different needs and comfort levels of diverse student groups. Thus, structures should be made that allow both space for diverse personal learning journeys and that provide clear outcomes and place accountabilities on the students.

4.) Educators should speak directly to the notion of power in the classroom and specifically the tension that emerges with reflective pedagogies between the deep learning, empowerment, and the academic requirement aspects.

5.) Reflective pedagogies can place difficult mental and emotional loads on staff facilitating them and structures, support, and training should be considered for staff in the development and implementation of reflective pedagogies for sustainability leadership education.

Limitations of the Study

The study comes with some limitations, namely that the student datasets, specifically the qualitative datasets, were small and were re-used and re-analyzed with a different frame, namely that of reflective learning. This, however, is a common practice in ESD as the infant nature and challenge of assessing and measuring sustainability outcomes remains commonplace across the field and there is a tendency for the development of assessment tools as an apparent afterthought (Redman et al., 2020). Future studies on this topic should adopt a more direct inquiry with a distinct reflective and assessing frame in order to cultivate sharper results. Course evaluations usually also come with the limitation that not everyone answers them, so one cannot discern a complete picture of the student experience and some student responses offer only surface level and vague descriptions of their experiences despite the opportunity for open ended and detailed responses. This results in difficulties with developing richer layers of analysis on behalf of the researchers. Future studies should consider follow up interviews with students to create more thorough descriptions of their experience with reflective pedagogies their benefits and their challenges with regards to sustainability education.

8. Conclusions

This study aims to provide an examination of two reflective pedagogies within a sustainability leadership program in a higher education institution and highlights the experience from both a student and staff perspective. It suggests that both students and staff found the pedagogies beneficial for learning and supported the pedagogical design, but that some challenges and critique also emerged. Benefits included the distinct role of reflective structures to guide student reflection towards individual skill development and the use of collective reflection to encourage generative dialogue and relationships between students and staff that aided collaboration, self-awareness, understanding of multiple perspectives and creating self-directed graduates. Staff and students also, however, suggested a number of challenges posed by teaching and engaging with reflective pedagogies, these include the 'constrictive' nature of guided reflection and emotional and mental challenges faced by staff in hosting and holding students through often challenging personal reflective processes. For the potential of reflective pedagogies to be truly realized for ESD in higher education, institutions will need to develop an understanding of the requirements that reflective, whole-person pedagogies have on students and

teachers and create planning processes to accommodate this. This study aims to contribute to the progression of that discussion by highlighting the outcomes and designs of two unique pedagogies. Future research could thus investigate how a deeper understand of reflective pedagogies could be achieved, and also further prototype what kinds of structures reflective pedagogies need to work for as many students as possible and strike a balance between guidance and constriction and staff come to terms with the nature of reflective teaching

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Paper C:

The Unique Challenge of Sustainability Leadership

Ayers, J.; Callaghan, E. The Unique Challenge of Sustainability Leadership. *Submitted to journal.*

Abstract

Society is faced with a narrowing window of opportunity to halt the unsustainable behavior that has led to extreme global ecological and societal degradation. In order to transition to a sustainable society, leadership for sustainability is needed. This theoretical paper argues that the contemporary sustainability crisis is unprecedented in human history, and thus sustainability leaders face a set challenges unique to this time and vocation. These challenges, categorized into four main themes, threaten to handicap sustainability leaders, undermining their wellbeing, inhibiting their leadership and contributing to personal suffering. It is predicted that the urgency of the sustainability crisis will intensify. Thus, it is likely that these challenges will increase in intensity, making it more difficult for sustainability leaders to operate and for prospective leaders to join. By identifying the challenges that impact sustainability leaders, the vocation can develop practices that ensure leader wellbeing and ongoing resilience. We suggest that a number of distinct characteristics have emerged from sustainability leadership that, when fostered, may contribute to addressing and perhaps overcoming these challenges. By creating a model in which we understand the challenges of sustainability leadership and the characteristics that may help address them, we theorize that it is possible to increase the intrinsic wellbeing of sustainability leaders and ensure the resilience of a unique and indispensable vocation.

Keywords: sustainability, leadership, challenges, climate change, wellbeing, resilience

The Unique Challenge of Sustainability Leadership

Humanity is faced with a narrowing window of opportunity in which to address global sustainability crisis (van der Leeuw et al., 2012). A unified approach towards sustainability utilizing collaborative efforts that link local behavior to global impact and promote an accelerated transition towards sustainable society is required (G. Broman et al., 2017; Case, 2015). At the forefront of this transition is a growing number of individuals, across sectors, disciplines, and perspectives that have taken action and responsibility in guiding the global transition towards a sustainable future. These individuals have adopted the vocation of sustainability leadership.

In this theoretical paper, we propose a model that illustrates the unique set of challenges faced by sustainability leaders due to the specific nature of the sustainability crisis. If not acknowledged and addressed, we suggest that these challenges could impair the wellbeing and ultimate effectiveness of these leaders. We further argue that people who occupy this vocation tend to exhibit a particular set of characteristics that may help them to better manage these challenges. Of course, effectively addressing challenges is not possible without first identifying them. By identifying and beginning to understand the challenges, we aim to contribute to a discussion that guides effective, resilient sustainability leadership.

A contemporary crisis with no precedent

Narratives in both academic research and mainstream media indicate that we are in the midst of global ecological and societal unravelling. The last 50 years has seen the most rapid transformation of the human relationship with the natural world in human history (Steffen, Broadgate, et al., 2015). In 2005, the Millennium Ecosystem Assessment concluded that 60% (15 out of 24) of the ecosystem services they evaluated were being degraded or used unsustainability (Millennium Ecosystem Assessment, 2005). The report further argued that while these changes to ecosystems have led to net gains for human well-being, they also led to the exacerbation of poverty for some groups of people, and in the longer term, reduce the likelihood that achieving the United Nation's Sustainable Development Goals can be achieved. Since 2005, however, we have seen little to no reduction in our negative impact on ecosystem services. A few indicators of continued decline include: continued narrowing of biodiversity around the world (Diaz et al., 2019), oceans and water ways are polluted and warming (Lindsey & Dahlman, 2020; United Nations Environment Programme, 2019). Although the need for a steep decline in GHG emissions is required our economy continues to rely on GHG intensive fuel systems (UNEP, 2019), (United Nations Environment Programme, 2019) even global consulting firm McKinsey acknowledges that the socio-economic impacts of climate change will likely be nonlinear as system threshold are breached and have knock-on effects (Woetzal et al., 2020). As decline in ecosystem health continues, so to do the conditions that support a global ecological state in which humanity can be expected to operate safely (Steffen, Richardson, et al., 2015). For the first time

in history, a human crisis is contextualized by the increasing fragility of the ecological scaffold that supports and nourishes it.

Of course, throughout history humanity has faced immense social crises. World wars, epidemics, financial crises, and the like, have all caused great suffering and required significant acts of extraordinary leadership. These crises of the past have tended to engender leadership personalities that were of the "extraordinary leader" or "great person" archetype. This is based on notions that the charismatic leader archetype (think Winston Churchill, Adolph Hitler, Elon Musk) (Hunt et al., 1999; Probert & Turnbull James, 2011), excels in periods of uncertainty and confusion, or in forging new terrain of innovation by creating a vision around which people can coalesce and a structure that through clear lines of order and responsibility (Klann, 2003). While dominant leader types will certainly find utility in forms of collaboration, their overall style of management tends toward competitive and hierarchical (Empson, 2020; Van Vugt & Smith, 2019). The crisis we now face, however, is fundamentally different from crises of the past (or even our current COVID-19 crisis), in that compounding increasing fragility of our ecological base, there is no distinct and separate "enemy" to provide a focal point for action and no set of 'first responders' specifically tasked with engaging the issue.

Instead sustainability leaders, and those they lead, are embedded within the system they are trying to influence, and elements of the crisis are diffused throughout. The absence of a distinct and persistent 'enemy' toward which people can focus their energy and efforts enhances both the opportunities for obfuscation of the crisis, and the likelihood that people perceive the problem as distal, perhaps someone else's problem and/or responsibility. Also, contemporary lifestyles and the infrastructure that support modern humanity discourages behavior that could directly address the crisis, and instead promotes active participation in it.[1] With no clear and distinct enemy to mobilize against, humanity is put in the uncomfortable position of pointing the figure at itself, and the structures we have built to support our contemporary 'westernized' lifestyle.

The complexity of the crisis leads sustainability advocates to view hierarchical leadership and decision making as ineffective for sustainability contexts (Parkin, 2010). As noted by Polk (2014) the 'current socio-environmental problems connected to sustainability transcend spatial, temporal, sector and disciplinary boundaries' (Polk, 2014 p. 439), thus they remain elusive to siloed decision making and problem solving techniques. For this novel type of crisis, we have no precedent for leaders to follow, no globally accepted norms of leadership, and no contemporarily grounded framework of ethics or virtues to help guide and support our leaders in navigating away from crisis and towards a sustainable future (G. Broman et al., 2017; Jordan & Kristjánsson, 2017; Shannon Vallor, 2016).

[1] We can see the truth of this, all-be-it in reverse, as we currently move through the COVID-19 crisis. Scientists are noting a reduction of pollutants being released into our biosphere, and smog in cities is clearing as people are required to stay home and isolate, and our economic engine rapidly winds down.

In the next section, we highlight a set of four distinct challenges faced by sustainability leaders that emerge from the contemporary context of ecological and social unraveling, and the absence of a distinct opponent to unite against. These challenges have been discussed in scholarly literature, but to our knowledge, no attempt has yet been made to explore them as a comprehensive set. After identifying the challenges, we will turn our attention to characteristics of sustainability leaders that may create resilience toward these challenges.

The Four Challenges of Sustainability Leadership

Through our review of scholarship related to human stressors that emerge from ecological unsustainability four distinct challenges for sustainability leaders were clearly identifiable. Together, they create a set of challenges that could potentially undermine sustainability leaders' ability to be effective in their vocation and maintain mental and physical wellbeing.

Challenge 1: The Psychological Burden of Unsustainability.

Environmental philosopher, Glenn Albrecht, observed that individuals experience a sense of disease or distress when loved environments are transformed. Identifying this experience as solastalgia, his initial research centered on communities' undergoing dramatic and significant ecological degradation and the suffering that resulted in mining and indigenous communities as their landscapes become degraded and transformed (Albrecht, 2005). Solastalgia, 'exists when there is lived experience of the physical desolation of home' (Albrecht et al., 2007, p. 96) this desolation could be caused by drought, fire and flood, as well as war, terrorism, land clearing and mining (Albrecht, 2005). The concept has been articulated as an 'earth-related mental illness where people's mental wellbeing (psyche), was negatively impacted' (Albrecht et al., 2007, p. 95). Research of affected communities highlighted the importance of solace received from the relationship between people, nature, and the landscape of home. Home is identified as a place that spawned internal peace and security for communities and individuals (Dagenhart, 2016). It was also the place from which one's wellbeing emerged, a wellbeing that suffered in correlation to its degradation (Albrecht et al., 2007, p. 96; Askland & Bunn, 2018). For sustainability leaders, whose vocation requires a globalized perspective, the particular and specific 'place' of concern is the planet, 'home' for them occupies both a localized space and an existence within the biosphere. It is now possible, Albrecht argues, that for;

> *'people who strongly empathize with the idea that the earth is their home, witnessing events destroying any place on earth are personally distressing' (Albrecht, 2005, p. 49).*

The ongoing awareness of the global nature of the sustainability crisis required by sustainability leaders to ignite a solastalgic response that, if not attended to, may deeply affect their wellbeing as they experience 'distress in the face of lived experience of profound environmental change' (Albrecht et al., 2007, p. 96) at a planetary level.

The relationship between sustainability and mental health has also been examined in broader contexts. Ecological grief and eco anxiety have emerged as terms to describe the specific suffering that results from both awareness of current ecological degradation, and anticipated ecological losses, such as species, landscape, and eco-system loss (Cunsolo & Ellis, 2018; Pihkala, 2018; Searle & Gow, 2010). The growing appreciation for the seriousness and impacts of climate change at an existential level have shown to have significant impacts on the wellbeing and mental health of the global community at large (Lehtonen et al., 2018; Searle & Gow, 2010). As climate impacts increase in frequency and scope, research examining specific events, such as droughts, or other extreme weather events has been found to trigger post-traumatic stress disorder (PTSD), major depressive disorder anxiety, depression, grief, survivor guilt, vicarious trauma, recovery fatigue, sub- stance abuse, and suicidal ideation (Berry et al., 2018; Hayes et al., 2018; Vins et al., 2015). Such evidence of the potential seriousness of this type of distress and impact on mental wellbeing led the American Psychological Association to outline steps to address mental health challenges related to climate change (APA, 2010). Other institutions are following with the Australian Government allocating 76 million dollars in mental health specific aid to individuals and communities affected by the 2019-2020 bushfires (Laschon, 2020) highlighting the growing recognition of psychological challenges being faced by individuals impacted at the front line of sustainability.

Challenge 2: Achieving a 'Nearly' Impossible Task

The second challenge faced by sustainability leaders is the immense difficulty of achieving sustainability itself. Often regarded as a 'wicked problem' (Rittel & Webber, 1973), the sustainability crisis is multidimensional, volatile and unpredictable. The entwined nature of people as problem solvers as problem creators, and the fact that unsustainable behavior is institutionalized across our social and economic systems, leads to an intractability of the problem (Levin et al., 2012; Termeer et al., 2016). This volatility means the task of sustainability transitions requests management of unmanageable issues by leaders as problems transcend traditional solutions and problem-solving mechanisms (Anderson et al., 2018; Palsson et al., 2013).

Further, sustainability action must be addressed at both local and global levels. Sustainability action is often, 'bounded by local norms, values and perceptions' which mean that rationale and motivation for sustainability action are often as 'varied and distinctive as the histories of local beliefs, languages, priorities, competencies and fortunes' (G. Broman et al., 2017, p. 2). Thus, significant energy, effort and collaboration is required by leadership aimed at influencing and guiding diverse groups towards global transitions. The task of uniting competing and conflicting groups to find common meaning, shared language and a work towards a common future remains a difficult task. That sustainability offers no universal methodology for success and holds few

examples of effective global collaboration at the scale needed to drive global sustainability transitions highlights the immensely difficult nature of determining sustainable solutions.

The impossible nature of solving the sustainability crisis also engages leaders in important and unprecedented ethical issues. As the degradation of the environment leads to fundamental human suffering (Geddes et al., 2012; Leviston et al., 2018) decision making and action have profound existential and generational ethical consequences (Kibert et al., 2012). Sustainability leaders are asked to project likely future consequences of current actions and decisions in a complex and ever-changing environment. Decisions made in light of these projections and consideration must 'ensure distributive justice to both proximal and distant generations' (Vasconcellos Oliveira, 2018, p. 15). In a society that lacks a universal and collective virtue ethic to frame ongoing decision making (Shannon Vallor, 2016), the consideration of *how* to make decisions for future human beings may cause significant anxiety for decision makers as they consider the (urgent) requirement of balancing and planning for the wellbeing of both current and future generations.

These factors and others contribute to the immensity of this nearly impossible situation. When faced with excessive and unrelenting challenge, the temptation to acquiesce to a seemingly dire future can be strong. This is not, however, a luxury that sustainability leaders have. The impossibility of absolute 'solutions,' and the distinctly ethical challenge of sustainability become the material with which sustainability leaders must work.

Challenge 3: Being Complicit to Unsustainability

The third challenge of sustainability leadership is the recognition by leaders of their complicity with unsustainable systems. For leaders, awareness of how actions and behaviors impact and perpetuate the sustainability crisis remains integrally tied to the work. By living in unsustainable systems and being aware of the potential personal ecological and social impacts of their actions, sustainability leaders are asked to operate in a state of personal paradox and contradiction.

The adoption of sustainability thinking requires reflection on one's personal role within the system (Fullan, 2004) a point that *can* carry a sense of empowerment, inspiring individual agency and the adoption of behaviors consistent with sustainability. Research demonstrates a positive correlation between ecologically responsible behavior and 'subjective well-being' (K. W. Brown & Kasser, 2005; Venhoeven et al., 2013). The trade off to sustainability thinking however, is that individuals recognize themselves as responsible actors in the sustainability crisis as interaction within society provokes ecological and social impact. It is this awareness that may lead to psychological distress and wellbeing issues in individual leaders as complicit actors within the system (Venhoeven et al., 2013). Understanding socio-ecological impacts and attempting to minimize individual footprints can be paramount to living a value driven and satisfied life as a sustainability leader, yet the failure to do so has shown to detrimentally impact individual wellbeing (Ibid.) However to act in a sustainable manner can be a challenging activity in world that begets complicity and dissonance to sustainability. Not only is the desire to tread lightly individually confronted by systemic issues of sustainability, the question of how much difference

an individual impact makes in a global atmosphere of consumption and fossil fuel driven institutions can be paralyzing. For sustainability leaders, the consideration of one's sustainability footprint becomes an unignorable companion that permeates every facet of decision making and makes for a difficult set of principles in which to abide.

Indeed, the role of individual footprints and impacts on the world has led to increasingly dramatic actions by individuals and communities. Social movements such as 'Birthstrike' attempt to minimize individual footprints and advocate for greater action on sustainability through the decision not to have children.

> *'We, the undersigned, declare our decision not to bear children due to the severity of the ecological crisis and the current inaction of the governing forces in the face of this threat' (#BirthStrike, n.d.).*

Recent research highlights having one less child as the most effective individual action taken to minimize environmental impacts, along with living car free and minimizing intercontinental flights (Wynes & Nicholas, 2017). Yet, it is a difficult psychic, moral conundrum for individuals to bear as they weigh their right or desire to have children in consideration of ecological impacts and the future of unborn generations. For sustainability leaders, facing these questions as they pursue ecological balance and minimize impact, promotes the high likelihood of ongoing distress that reverberates from such difficult personal considerations.

Challenge 4: Being the Messenger

Being the bearer of bad news is not a position welcomed by most people. In relation to climate change and the sustainability crisis this is especially challenging. The 'social organization of denial,' describes the collective human distancing from awkward or uncomfortable information and highlights a rationale for the paralysis and dissonance shown by individuals and communities with respect to the sustainability crisis (Gifford, 2011; Norgaard, 2006, p. 374). For groups and individuals working towards sustainability while dealing with perceived inaction, the notion of apathy and inaction is frustrating and disempowering, a professional and personal challenge that may manifest itself in a collective loneliness, separation from social norms, frustration and burnout within sustainability leaders as (urgent) messages remains ignored, trigger societal denial or even result in social ostracization if deemed to challenging by the audience. Similar to the concept of social ostracization is idea of professional side-lining or suppression (Martin, 1992; Martin Brian, 1984) an issue for which environmentalism has been a target. Conservative politics has framed resistance to sustainability upon the notion that, 'environmentalists now represent a significant and sinister threat to the western way of life' (Hoffarth et al, 2016 p. 46). For sustainability leaders, the difficulty to influence has become part and parcel of the territory of operating in professional sustainability contexts, from manufacturing, business, hospital, or information technology, in which expressing concerns may challenge, or at least be perceived as challenging, the prevailing conventional wisdom. An issue leading to the possibly undesirable position of being identified as "the sustainability person," a title that may limit career aspirations or impact individual wellbeing.

Whistleblower literature provides some comparison here. Studies have shown that voicing strong and public disagreement with institutional actions, or exposing ethical misconduct, can be met with swift and intense retribution, such as vandalism, threats, and harassment (McIntosh et al., 2019, Andrade, 2011). Research on whistleblowing in the health industry highlighted the extensive and enduring nature of the emotional harm as participants reported experiencing a level of emotional distress that negatively influenced their health, professional and private lives (Peters et al., 2011). It can be reasoned that sustainability leaders are the whistleblowers for our contemporary unsustainable society. Sustainability author and activist James Hansen has spoken of death threats, and being warned of dire consequences as a results of their communicating his work (Revkin, 2006) while mainstream media has recently reported on the campaign and language used to describe teenage climate activist Greta Thunberg as 'levels of vitriol that are disturbingly common' (Julian Baggini, 2019).

Finally, and perhaps most disturbing form of ostracization of sustainability is physical violence perpetrated towards sustainability leaders that results in death. Between 2002 and 2017, 1,558 people from 50 countries where killed for defending their environments and lands (Butt et al., 2019). International NGO Global Witness reported that 164 environmentalists were killed during 2018 for their work defending the environment (Global Witness, 2019), 'people are dying to protect their livelihoods, along with the forests, lands and ecosystems that are essential for all our futures' (Butt et al., 2019, p. 744). While the number remains small in comparison to the vast number of individuals and groups working in sustainability leadership, the price remains absolute and the cost final. As most disputes and violence perpetrated on environmentalist centers on issues of natural resources, it is difficult to imagine decreasing trends of violence in areas exacerbated by resource conflict and ongoing degradation. It is this, the most disturbing of issues for sustainability leaders that provides a sobering reminder of the challenge asked on some fronts, and of the price leaders are willing to pay for their belief in a sustainable future.

The challenges as increasing vocational pressures of sustainability leadership.

Effective sustainability leaders work to transform current social, political and ecological realities (Burns et al., 2015; Case, 2015). We argue that the set of challenges experienced by sustainability leaders inhibits and ultimately undermines their capacity. If as predicted, the urgency of the sustainability crisis continues to intensify, it seems likely that these and other challenges will further pressurize the environment in which leaders operate. Identifying the vocational challenges and how they impact sustainability leaders provides important insight into barriers that impede effective leadership and inhibit sustainability transitions. Responses that effectively create individual and systemic scaffolds to promote leadership resilience are needed. Without this support, the vocation of sustainability leadership risks becoming untenable for individuals, as they succumb to the personal consequences of the challenges above.

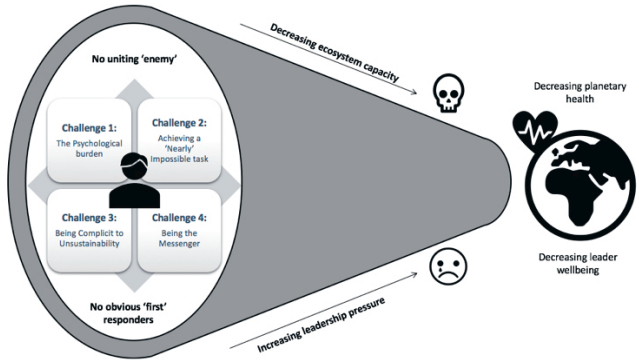

Figure 1 The Unique Challenge of Sustainability Leadership

An emerging leadership form

This growing social ecological crisis has led scholars to explore characteristics and definitions of leadership for sustainability. Academic and mainstream literature highlight the presence of sustainability leadership as both an academic concept (Bendell & Little, 2015; Burns et al., 2015; Ferdig, 2007; Polk, 2014; Visser & Courtice, 2011) and a vocational practice (G. Broman et al., 2017; B. C. Brown, 2011; Parkin, 2010; Paul Hawken, 2007). A single definition of sustainability leadership remains elusive. However, a number of generalized qualities or *characteristics* of sustainability leadership have emerged from literature which can be described in *the practice of* leadership as follows:

- acting and living responsibly,
- employing scientific and systemic thinking,
- leveraging collaborative and adaptive leadership,
- being action and outcome oriented, and
- promoting inspiration and scale.

In terms of defining sustainability leadership, we must 'navigate the plurality of possibilities' meaning a single understanding of sustainability leadership remains unlikely. Rather the ongoing discussion considers numerous models of leadership, beyond the traditional individualistic 'leadership' narratives (Bendell et al., 2017b, p. 421). None-the-less, identifying general characteristics that may be useful to sustainability leaders across various models of leadership could be useful in our attempt to mitigate negative impacts of the challenges to leadership outlined above. Each characteristic is described below.

Acting and living responsibly

Sustainability leaders generally strive to cultivate a way of being and acting that is grounded on values and connected by feelings of empathy and connection with other humans and the natural world (Burns et al., 2015; Ferdig, 2007; S. Schein, 2015). As we move through life, it is impossible, to have *no* negative ecological (or social) impact. Consistent eco-perfection is daunting and likely unobtainable within our current societal systems; thus, some tradeoffs will need to occur in daily life. These tradeoffs, however, can be made in the spirit of minimizing avoidable impact, taking personal responsibility for unavoidable impact, and accepting, while also working to change, the systems around us that guide our behavior. This last point, acceptance of what is while also mobilizing for change, is critical for sustainability leaders to live well and productively within our current societal context, while also remaining consistent with their core values.

Adopting a scientific and systemic approach

The complex and wicked nature of the sustainability crisis requires an approach that is systemic in nature and grounded in scientific understanding (G. Broman et al., 2017). The sustainability movement has adopted science as its *lingua franca* and political decisions traditionally remain reliant on scientific inquiry to inform policy and create institutional change. Systemic thinking has become a widely valued tool for sustainability that allows leaders to see the larger system and its interconnections (Metcalf & Benn, 2013) thus promoting the move from reactive problem solving to long term outcomes that consider the health of the whole (P. Senge et al., 2015). The complexity of the sustainability crisis requires the ability to reflect and uncover effective leverage points, the capacity for scientific knowledge and systemic thinking provide a lens and language for this to occur.

Leveraging collaborative and adaptive leadership

With no obvious set of first responders to respond to a distinctly identifiable enemy, sustainability leaders emerge across many sectors of society (Case, 2015). A distributive, relational approach to sustainability promotes local, contextualized solutions and allow for collective meaning making towards sustainability to occur, highlighting shared ownership and collaboration between individuals and groups (Bendell et al., 2017a; Kurucz et al., 2014). Furthermore, emerging social movements that inspire large populations (e.g. Fridays for the Future, Extinction Rebellion and 350.org) have been shown to have impact without the reliance on individual leadership models, instead relying on practice and strategy defined by communities of individuals with shared values and purpose (Hardt, Michael. & Negri, Antonio., 2017). Leveraging adaptive and well networked collaborative leadership allows for nimble and participatory responses in crisis situations (Hayashi & Soo, 2020), and the ability to reach across disparate sectors, geographic regions, and levels of society for both influence and support.

Being action and outcome orientated

Because of the imperative nature of the challenge, sustainability leaders are required to focus on actions that lead to tangible positive societal and ecological outcomes (Visser & Courtice, 2011). In this context, the presence of philosophical debate and discussion is necessary, but not sufficient (Etzion et al., 2017) for the outcomes required to reach sustainability. While the complexity of relationships between drivers of the crisis and impacts ensures that there is no simple or single solution, ensuring actions that move toward sustainability through identified outcomes and achievement provides a motivational presence and a marker of success. For leaders to reach goals moves society towards sustainability *and* promotes hope (Ojala, 2017) and motivation. The adoption of an action orientated mindset and the practical achievement of outcomes through distinct and tangible accomplishments remains integral to addressing the sustainability crisis and motivating greater action.

Promoting inspiration and scale

The global nature of the sustainability crisis, and the fact that *all* systems, ecological (oceans, atmosphere, forests, etc.) and social (health, economy, culture) are negatively impacted by current unsustainable human behavior highlights the requirement of large-scale action from individual to institutional levels (Steffen, Richardson, et al., 2015). Thus, actions that lead to impact and outcome, which inspire non actors and can scale-up quickly to push the transition forward are necessary. Collective action, by inspiring and mobilizing individuals to take ownership of the challenge (Bendell et al., 2017a, p. 433), and adopt leadership roles in their households, and communities was used effectively during other crises. In World War II efforts to 'enlist' women to help with rationing food and other precious commodities were very successful (Goldin, 1991) and pointed to the effective nature of shared purpose and collaboration as a model that can be utilized by sustainability leaders and their communities as a potent tool for sustainability transitions.

Table 1 Characteristics of Sustainability Leadership

Characteristic	Summary	Authors:
Acting and living responsibly	• adopting ecological and social worldviews and actions.	(Burns et al., 2015; Ferdig, 2007; S. Schein, 2015)
Adopting a scientific and systemic approach	• using science as a methodology and language for sustainability.	(G. Broman et al., 2017; Metcalf & Benn, 2013; P. Senge et al., 2015)
leveraging collaborative and adaptive leadership	• creating shared leadership models and collective approaches.	(Bendell et al., 2017b; Hardt, Michael. & Negri, Antonio., 2017; Kurucz et al., 2014; Parkin, 2010; Pelenc et al., 2015; Polk, 2014)

Being action and outcome orientated	• applying tangible outcomes and action rather than theoretical discussion.	(Etzion et al., 2017; Visser & Courtice, 2011)
Promoting inspiration and scale	• inviting others to join and expanding communities of practice.	(Etzion et al., 2017; Mazutis & Abolina, 2019)

These five characteristics emerged from literature to create a set that, if embodied, may help to articulate effective sustainability leadership across diverse contexts. This paper does not suggest that embodiment of these characteristics is easily done, or that if embodied, resolution of the crisis in ensured. However, their articulation may contribute to the ongoing narrative around sustainability leadership and provide some influence on the challenge's leaders face, a notion discussed below.

Fostering resilient leaders – pathways to addressing the challenges.

If as we suggest, sustainability leaders encounter a specific set of challenges, then a possible pathway to resilient leadership lies in fostering and engaging the particular characteristics of sustainability leadership described above (Table 2). This discussion examines the potential of a number of these characteristics of sustainability leadership to provide beneficial responses to the challenges. We also discuss potential pitfalls and the possible shadow side of such practices.

Acting and living responsibly – creating personal agency and wellbeing

For sustainability leaders, to 'act and live responsibly' may provide intrinsic wellbeing that complements internal value systems and fosters personal agency. Evidence suggests that adopting activities such as minimized travel, and ethical consumption can positively impact the psychological wellbeing of individuals (Corral-Verdugo et al., 2011; Leviston et al., 2018; Venhoeven et al., 2013). Wellbeing also emerges through an increase in personal agency as the *choice* to live sustainably means people are empowered when they exercise enhanced decision making and influence strategic life-choices, choices that help to overcome barriers to agency and wellbeing freedom (Ojala, 2017; Pelenc et al., 2015, p. 230). Through the practice of acting and living responsibly we believe it is possible for the first (Psychological Burden), second (Impossible Task) and third (Being complicit) challenges to be addressed.

Cultivating one's relationship with nature can also address impacts of the first challenge as activities such as 'forest bathing,' produce beneficial nervous system responses and reduce levels of anxiety and heighten sensations of relaxation (Wen et al., 2019). Research suggests that 'seeing'

nature from your home or living near green spaces bolsters happiness and wellbeing (Cloutier & Pfeiffer, 2015, p. 318). Albrecht argues that positive responses to solastalgia involve the protection, rehabilitation and restoration of natural environments (Albrecht et al., 2007) promoting the positive aspects of engaging with nature. Furthermore, if restoration through collective responses occurs, wellbeing is increased as shared values and collective visions are developed. As communities of practice grow (Author, 2019), the potential for social apathy and ostracization are reduced (McPhearson et al., 2016; Pelenc et al., 2015). The vulnerability created by challenge 4 (Being the Messenger) may be reduced as movements such as Fridays for the Future and Extinction Rebellion find influence and engagement with large populations. Joining such large-scale collective action may enhance individual wellbeing by instigating 'positive reappraisal' as the framing of issues toward hope occurs (Ojala, 2012, p. 628), an outcome that addresses challenge 2 (Impossible Task) and challenge 4 (Being the Messenger).

Science as a roadmap for change – finding a pathway for action

The fostering of scientific and systemic approaches to sustainability as a leadership practice may address the second challenge (Impossible Task) as science provides a common language and methodologies to guide sustainable transitions. Scientific methodologies that create clarity within complexity support proactive approaches towards sustainability. This has been shown to aid organizations in taking a strategic and comprehensive approach to sustainability (G. I. Broman & Robèrt, 2017). Fostering scientific practices through formal and informal educational responses stimulates hope, tangible action and mobilizes involvement in a wider scientific community as 'understanding and acting on something important together can be highlight inspirational' (Broman et al, 2017 p.4), thus addressing challenges 1 (Psychological Burden, 2 (Impossible Task) and 4 (Being the Messenger). Mechanisms such as citizen science have also shown to increase wellbeing among participants and encourage interaction with nature (Church et al, 2019) addressing the challenge 1 and challenge 4 (Being the Messenger).

Achieving Outcomes – creating light at the end of the tunnel

If leaders are to inspire success and address the 'impossible' framing of sustainability, adopting 'action and outcome oriented' leadership that shows tangible progression and positive examples of change through achievement is needed. The relative success of the Divestment movement which, 'has had impressive impact on both the level and content of public discourse about climate change mitigation,' (Ayling & Gunningham, 2017, pp. 131–132) provides an example of a successful action. Successful outcomes promote wellbeing through goal achievement (Ojala, 2017; Venhoeven et al., 2013) and engagement in positive visions and shared purpose (McPhearson et al., 2016) towards sustainability, addressing all challenges. Likewise the sheer number of individuals involved in Fridays for the Future movements, (Wahlstrom et al., 2019) provides examples of distinct narrative shifts, hat may prove themselves vital tools in inspiring social tipping points and increasing engagement in sustainability action. The achievement of milestones at varying scopes may also be inspirational and alleviate challenge 4

(Being the Messenger) as successful movements build and communities adopt positive reframing of sustainability issues towards hope (Ojala, 2017) a significant prospect in a narrative that is often dominated by negative messages of missing goals and societal inaction.

Table 2 Practices to Address Challenges of Sustainability Leadership

Leadership Practice	Leader Benefits	Leadership Challenges Addressed
Leadership Characteristic: Acting and Living Responsibly		
Interacting with nature: • *Forest Bathing* • *'Green living'*	- Anxiety Reduction (Wen et al., 2019) - Increased personal Happiness (Cloutier & Pfeiffer, 2015)	Psychological Burden (1)
Minimizing personal footprint.: • *plant based* • *travel minimization carless* • *use renewable energy* • *sustainable consumption*	- Wellbeing through ecological Impacts (Brown and Kasser, 2005; Venhoeven et al., 2013) - Personal agency (Pelenc et al., 2015, p. 230) - Happiness (Corral-Verdugo et al., 2011) - Hope from personal agency (Ojala, 2012) - Wellbeing through altruistic action (Kerret et al., 2014, p. 84)	Impossible Task (2) Being Complicit (3)
Adopting Pro Environmental Behavior: • *Tree planting* • *Biodiversity Conservation* Adopting Plentitude (Schor, 2011): • *Working less* • *Increased community participation* • *Less consumption*	- Subjective wellbeing increase (Koger, 2013, p. 3006) - Active engagement as source of hope (Ojala, 2017) - Wellbeing through ecological Impacts (Brown and Kasser, 2005; Venhoeven et al., 2013) Wellbeing through personal agency (Pelenc et al., 2015) - Solastalgia minimization (Albrecht, 2005, p. 35) - Wellbeing through altruistic action (Kerret et al., 2014, p. 84)	Psychological Burden (1) Impossible Task (2) Being Complicit (3) Being the Messenger (4)
Engaging Mindfulness	- Wellbeing through lower materialism (K. W. Brown & Kasser, 2005, p. 362) - Increased well-being, values activation (Wamsler et al., 2018)	Psychological Burden (1) Impossible Task (2)
Leadership Characteristic: Adopting a Scientific and Systemic Approach		
Pursing Education: • *Environmental Education* • *University degree* • *PhD* • *Peer learning* • *Informal Course*	- Increased subjective wellbeing through environmental education (Kerret et al., 2014) - Greater methodological knowledge (G. Broman et al., 2017) - Wellbeing through trust in other actors (Ojala, 2012)	Psychological Burden (1) Impossible Task (2) Being the Messenger (4)

Engaging in Scientific Processes: • *Community Participatory Processes* • *Citizen Science* • *Transdisciplinarity*	- Wellbeing through trust in other actors (Ojala, 2012) - Active engagement as source of hope (Ojala, 2017) - Intrinsic wellbeing from citizen science (Church et al., 2019, p. 319)	Impossible Task (2) Being Complicit (3)
Leadership Characteristic: Leveraging collaborative and adaptive leadership		
Joining sustainability organizations, groups: • *Community sustainability impacts* • *Global movements, marches* • *Join energy cooperative* • *Citizen Science*	- Wellbeing through trust in other actors (Ojala, 2012) - Join community benefits of agency in development (Cowell et al., 2011) - Wellbeing through altruistic action (Kerret et al., 2014, p. 84) - Intrinsic wellbeing from Citizen Science (Church et al., 2019, p. 319) - Wellbeing through engaging shared values and preferences (Pelenc et al., 2015, p. 229) - Wellbeing through perceived agency (Pelenc et al., 2015, p. 227)	Psychological Burden (1) Impossible Task (2) Being the Messenger (4)
Communicating positive messages: • *Create websites* • *Newsletters* • *Campaigns* • *Political Advocacy*	- Wellbeing through engaging shared values and preferences (Pelenc et al., 2015, p. 229) - Increased wellbeing through perceived hope (Kerret et al., 2014; Ojala, 2017)	Psychological Burden (1) Impossible Task (2) Bearing the Message (4)
Leadership Characteristic: Focused on action and outcome orientated		
Partaking in sustainability action: • *Marches* • *Groups* • *Direct Action*	- Increased wellbeing through perceived hope (Kerret et al., 2014; Ojala, 2017) - Increased hope through 'Positive reappraisal' (Ojala, 2012) - Wellbeing through engaging shared values and preferences (Pelenc et al., 2015, p. 229) - Wellbeing through positive visions, shared purpose (McPhearson et al., 2016, p. 38). - Wellbeing through goal achievement (Ojala, 2017, p. 80; Venhoeven et al., 2013, p. 1375)	Psychological Burden (1) Impossible Task (2) Being Complicit (3) Being the Messenger (4)
Celebrating Success: • *Personal milestones* • *Transdisciplinary Projects* • *Natural Conservation efforts*	- Relieving solastalgia (Albrecht et al., 2007) - Increased wellbeing through knowledge production and action (Evans, 2015) - Increased hope through 'Positive reappraisal' (Ojala, 2012, p. 628)	Psychological Burden (1) Impossible Task (2)

Leadership Characteristics: Promoting inspiration and scale		
Sharing positive narratives towards sustainability: • *Public speaking* • *Community events* • *Create positive visions*	- Wellbeing through community building, shared purpose (McPhearson et al., 2016, p. 38) - Increased wellbeing through hope (Kerret et al., 2014) - Increased hope through 'Positive reappraisal' (Ojala, 2012, p. 628) - Community benefits of agency in development (Ojala, 2012, p. 628)	Psychological Burden (1) Impossible Task (2) Being the Messenger (4)
Role Modelling sustainable behavior • *Pro environmental behavior* Articulating positive narratives	- Increased hope through 'Positive reappraisal' (Ojala, 2012) - Increased subjective wellbeing through behavior (Koger, 2013, p. 3007) - Happiness through increased ecological behavior (Corral-Verdugo et al., 2011) - Hope from personal agency (Ojala, 2017, 2017) - Wellbeing through altruistic action (Kerret et al., 2014, p. 84)	Psychological Burden (1) Impossible Task (2) Being Complicit (3) Being the Messenger (4)

This paper argues that the fostering of these characteristics can play a role in addressing and responding to the challenges faced by sustainability leaders. By understanding the challenges and adopting certain responses, we believe that the pressure on sustainability leaders can be lessened. Resulting in increased leadership wellbeing and resilience, and greater socio-ecological impact as the sustainability crisis is addressed with effective leadership.

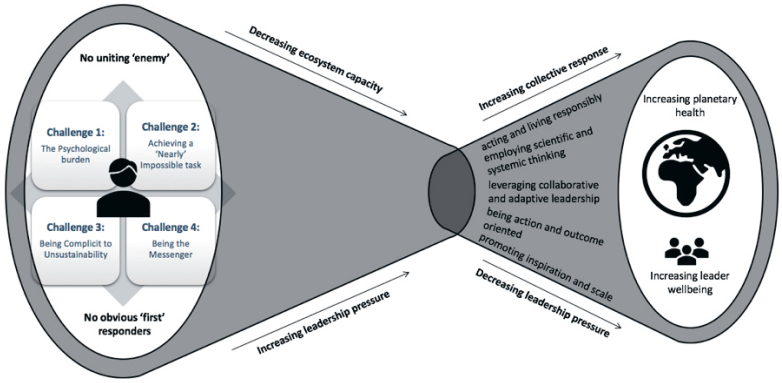

Figure 2 Addressing the challenges of sustainability leadership

The shadow side of new leadership practices

The development of leaderships practices highlights a proactive approach that can be used to address and perhaps lessen the severity of challenges to sustainability leadership. Yet despite the potential, this does not *guarantee* leader wellbeing as the practices provide some potential, but do not offer a zero-sum solution to the challenges faced in sustainability leadership. In fact, they may be more difficult to implement in reality and this implementation itself offers a number of challenges or tradeoffs. We seek to explore some of those barriers here.

Hitting systemic barriers to living responsibly

The difficulty of living responsibly in the shadow of systemic barriers remains present. Being *unable* to live one's values, in the face of systemic, structural unsustainability, may have detrimental effects on challenge 1 (Psychological burden) and challenge 3 (Being complicit). Feelings of nihilism and apathy may emerge should the belief that 'one is too small to make a difference' be felt. Challenges two (Impossible Task) and four (Being the Messenger) remain present if a narrative of 'acting and living responsibly' is seen as a waste of time, based on the belief that individualistic, token responses to sustainability have no effect on systemic issues. As global fossil fuel subsidies reached 5.2 trillion dollars in 2017 (Coady et al., 2019) the narrative of failing systemic action may overcome an individual's sense of agency in their choice to no longer fly. The weight of the global sustainability crisis nullifies belief in the power of individual action leaving leaders feeling helpless to impact sustainable futures and acting as a negative feedback loop to the empowering aspect of personal action.

Dealing with the exclusivity of science

A possible pitfall of adopting a systemic and scientific approach is the often-exclusive nature of scientific inquiry and the technical language of science. Scientific approaches, while powerful, may exclude numerous populations through its use of distinct language and the education required to understand and implement both scientific diagnosis in techno-social futures. The methods and skills required may lead to top down responses reliant on specialized knowledge and potentially imparting a sense of superiority to nonscientific populations (Polk, 2014, p. 450). If leaders cannot be understood, or fail to make themselves accessible, conditions that increase social apathy and impact community building occur. In some cases, this may even result in factions that promote ostracization and impact challenge 4 (Being the messenger) as ethical struggles over who is included in the right to envision desired futures are questioned. Therefore, while the characteristic of scientific and systemic sustainability leadership remains a powerful tool it must ensure inclusive and accessible methods that address the challenges of sustainability leadership. If not, it risks exacerbating the challenges and creating more problematic leadership environments.

Risking failed actions and missed outcomes

If positive outcomes are not reached, then the challenge faced by sustainability leaders is exacerbated as a narrative of failure emerges. Frustration caused by 'incongruous politics, active disinterest and deliberately fostered confusion' (G. Broman et al., 2017, p. 2) and slow-moving political landscapes act as barriers to action orientated leadership and outcome driven inspiration. If the achievement of sustainability goals, as symbols for progression, remain integral to movement health and inspiration, then not achieving them highlights pathways to distrust and apathy increasing negative impacts of challenge 1 (Psychological burden) and 4 (Being the messenger). Zeynep Tufekci argues that to be effective, social movements require impacts in one or more of the areas of, 'narrative capacity, disruptive capacity and electoral and/or institutional capacity,' (Tufekci, 2017, p. 192). Without outcomes like these, movements and individual leaders will have difficulty maintaining motivation of participants. The failure to achieve change exacerbates narratives promoting challenge 2 (Impossible task) and leads the abandonment of ideas and actions, a cause of greater personal distress as seen in challenge 1 (Psychological burden) as the toll of failing leadership takes place.

Conclusion

The ongoing sustainability crisis requires effective leadership to overcome global sustainability challenges. This paper argues that a number of unique challenges to leadership result from the contemporary sustainability crisis and threaten to undermine effectiveness of sustainability leaders. Our hope is that this initial contribution to the discussion of the wellbeing of sustainability leaders encourages consideration of the impacts of sustainability leadership and the requirement that measures to promote resilience can be taken. Of course, empirical research that further investigates these challenges is needed, as is an ongoing articulation of sustainability leadership and its role. However, by fostering the distinct characteristics of sustainability leadership through certain practices, we suggest that individuals may be able to proactively and positively address the leadership challenges and as a result have greater impact on the individual, institutional and systemic change needed to create a sustainable future.

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ABSTRACT

The ongoing sustainability crisis offer numerous, multifaced societal challenges as a result of the ongoing degradation of socio-ecological systems by human activity causing massive ecological damage and human suffering. Overcoming these difficulties begs for the rapid transition of society towards sustainability. This desire for urgent action has been hindered by the lack of coordinated global leadership focused on addressing these challenges and implementing a transition towards a sustainable future. The sustainability crisis and its manifestations, which include for example climate change, air and water pollution, deforestation and social segregation, are interconnected and volatile issues whose parts influence and impact each other causing the crisis to worsen. The earth system is pushed towards tipping points from beyond which it may become impossible to maintain the human civilization. The failure of leadership to address the wicked nature of these crises means humanity has been left ill-equipped to deal with the complex problems posed by sustainability.

This thesis considers the role of Education for Sustainable Development (ESD) in overcoming these issues and operating as a leverage point towards sustainability. It focuses on investigating how the development of sustainability leadership education in Higher Education can contribute to addressing the sustainability crisis. It looks at the role that educators can play in designing learning environments that ensure leaders and leadership capable of addressing wicked problems posed by global unsustainability. The aim of this research is to investigate what educators should consider when designing learning environments that promote the qualities needed for leading in complexity towards sustainability. It does this by examining a number of ESD programs as case studies to investigate the efficacy of those programs at creating sustainability outcomes within their students. It also undertakes a literature review to describe and articulate the unique challenges faced by sustainability leaders from a personal and professional perspective. The study is situated closely to the ongoing ESD discussion regarding competencies-based learning for sustainability and the research aims to provide some contribution to that dialogue. It does this through the investigation of competencies acquisition and the discussion of emerging areas of leadership that hold beneficial outcomes for the development and practice of sustainability leaders.

The results of the thesis suggest a number of outcomes for consideration by educators and include a number of main findings. Firstly, educational programs can be capable of achieving the acquisition of 'sustainability' competencies within their students, but if these competencies are not taught within a larger sustainability contextualization, then students can fail to see the purpose of the competencies 'for' sustainability. Secondly, reflective practices, developed as the result of reflective pedagogies, can provide beneficial qualities in students as future sustainability leaders and require distinct pedagogical structures in order to guide reflective practices towards sustainability outcomes. Finally, a number of unique personal and professional challenges to sustainability leadership exist and need to be overcome if the domain of sustainability is to ensure the ongoing resilience and wellbeing of individuals and groups acting as sustainability leaders.

This research suggests a novel contribution to a number of areas within ESD research, including creating knowledge within the competencies discussion regarding emerging areas of study that may influence the future of defined sustainability competencies. It also highlights the need for educators to consider the role of wellbeing and resilience in current and future sustainability leaders.

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