

SUSTAINABILITY LITERACY AND WORLDVIEW CHANGE
IN EDUCATIONAL TRAVEL

by

SIMON TAO SUAN LING

(Under the Direction of Michael A. Tarrant)

ABSTRACT

Considering human relationships with their environment at multiple economic, and societal scales is imperative given the global nature of contemporary and predicted environmental challenges. Institutions of higher education have answered this challenge in part through mandates for sustainability education in curricula. However, little is known of the efficacy of different types of higher education courses in delivering desirable sustainability education outcomes. This study uses quasi-experimental designs to compare the effect of different types of courses on sustainability literacy and environmental beliefs. Furthermore, regression model building techniques are employed to identify important predictors of environmental beliefs, and their relationship to changes in environmental belief in response to sustainability educational travel programs.

INDEX WORDS: Sustainability Education, Sustainability Literacy, New Ecological Paradigm, Educational Travel, Study Abroad, Quasi-Experiment.

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CHAPTER 1

Introduction and Literature Review

Institutions of higher education in the United States are increasingly concerned with producing graduates with the knowledge and skills necessary to engage with social, economic, ethical, and environmental challenges at local, regional, and global scales. Sustainability education has emerged as an important part of processes by which students are exposed to modern concepts of sustainability, such as the triple-bottom-line approach encompassing social, economic, ethical and environmental perspectives (TBL; Elkington, 1994).

Concurrently, research into the processes by which students best acquire or develop knowledge and skills has seen higher education institutions increasingly emphasize experiential learning as a core pedagogy. In this respect, study abroad offers unique opportunities for engaging with the multiple threads from which sustainability concepts are woven. The exposure to societies, economies, and environments in other parts of the world offers opportunities to broaden awareness of the different perspectives societies have on sustainability and to reframe issues at a range of social and geographical scales.

Educational travel, a subset of study abroad, is perhaps even better positioned to deliver on this opportunity, with its ability to engage students through content delivered via a range of learning experiences, including traditional lectures, outdoor education, experiential education and role-playing. The combination of multiple modes of content delivery, physical engagement with environments (i.e., field work), opportunities for social learning contexts, comparative

study, service learning, real-world research experiences, and reflective processes and practices are a high-potential crucible within which to forge learning experiences.

The *first paper in this thesis* explores the effect educational travel has on student sustainability literacy through a composite survey instrument (derived from the literature) intended to assess literacy in the individual components of the TBL and the synthesis thereof. The *second paper* focuses on student environmental beliefs. What demographic factors relate to environmental beliefs? Do sustainability educational travel programs affect environmental beliefs and, if so, what factors are related to the nature of such change?

The exploration of these two topics was undertaken first to elucidate the effect sustainability education travel courses have on the acquisition of sustainability knowledge and sustainability perspectives, in contrast to other types of higher education courses, using a quasi-experimental design. Second, the same comparative process was applied to sustainability perspectives at a more fundamental level; that of beliefs. If sustainability educational travel is demonstrably related to changes in sustainability literacy (and to changes in the environmental beliefs that are arguably a determinant of sustainability perspectives) there are implications and opportunities for curriculum design and implementation in courses across higher education whose intent is to foster similar change.

Sustainability Education

Across the span of human history, societal recognition of the need to balance well-being and quality of life while managing finite resources derived from complex, interrelated natural systems has a somewhat checkered past (Diamond, 2005). In the mid-20th Century, writers such as Leopold and Carson drew attention to our place within nature and catalyzed the modern

environmental movement with works such as ‘A Sand County Almanac’ (Leopold, 1949) and ‘Silent Spring’ (Carson, 1962), among others. In the sphere of education, international cooperation on recognition of environmental education goes back at least as far as 1977, with the first intergovernmental conference on the topic in Tbilisi, Georgia. Work commenced in 1984 by the World Commission on Environment and Development, culminated in the release of the Brundtland Report (WCED, 1987) calling for a major recalibration of institutional approaches at multiple socio-political levels, including education, in order to promote development capable of sustaining human societies at local, national, and global scales.

In 1990, a global meeting of university presidents and chancellors occurred in France, leading to the Talloires Declaration defining key actions higher education institutions must implement to work towards a sustainable future (Wright, 2002). Currently, the declaration has over 500 signatories (ULSF, 2015). The United Nations declared the years from 2005-2014 as the Decade of Education for Sustainable Development (DESD), in recognition of education’s pivotal role in shifting societies towards more sustainable states of being (Wals, 2014).

Individually, institutions have answered this call by increasing the sustainability of campus management and operations, through community outreach program development, and through incorporation of sustainability education into curricula (Chase & Barlett, 2013). Progress has been made on the collective front as well. For example, in 2005 the Association for the Advancement of Sustainability in Higher Education (AASHE) was formed and by 2013 had over 1,100 memberships consisting of higher education institutions, businesses, and organizations located across the world.

Not unexpectedly, for a concept as multi-faceted as sustainability, definitions are variable within the literature. However, Stephens *et al.* (2008) note that the central theme in

definitions of sustainability is time; regardless of how societies choose to establish relationships with other societies, with their environments, and between their citizens, to be sustainable those relationships must be able to ‘persist, sustain, and endure’. The Brundtland Report broadly defines sustainability as an idealized state of human-environment relationship whereby the welfare needs of current and future societies are met without eroding the natural capital that supports them while also enabling citizens to realize basic rights (WCED, 1987). This approach has been popularized as the ‘three-legged-stool’ or ‘triple-bottom-line’ of society, economy, and environment (Barnard & Elliott, 2015). Later work expanded the TBL to incorporate ethics, becoming the quadruple bottom line (QBL). These perspectives that have been criticized as overly simplified (see Dawe & Ryan, 2003) but at least have value as a base from which to work.

Incorporating sustainability education into curricula is challenging, not only due to the inherent interdisciplinary nature of the topic but also due to the potentially significant changes in beliefs and attitudes it may require of students, aside from the more obvious acquisition of knowledge and/or skills pertaining to it. Engendering knowledge and/or skill gains in higher education students is challenge enough, what then of engendering a paradigm shift?

Assessments of student learning outcomes related to declarative sustainability *knowledge* is progressing but work on sustainability education in the *affective* domain lags behind (Harraway *et al.*, 2012; Shephard, 2007). This thesis explores aspects of the cognitive domain in sustainability education learning outcomes, and the affective domain in environmental worldview, within the context of educational travel programs whose curricula draws heavily from experiential learning pedagogies.

Theories of Experiential Learning

Experiential learning theory (ELT) is a somewhat contentious term. It is most commonly used to describe an approach conceptualized by Kolb (1984), based on the work of Dewey, Piaget, and others. However, some argue ELT resides within a much broader range of conceptualizations of learning that incorporate human experience (Fenwick, 2000). For the purposes of this paper, we use ELT in its restrictive sense, i.e. the theory presented by Kolb (1984) and present other relevant theories of experiential learning alongside.

Kolb's popular approach sees personal reflection take center stage as the primary process by which individuals construct knowledge, consisting of expressible, transferable concepts, capable of being applied to, and adapted for, other situations/experiences (Mezirow, 1990). This influential conceptualization falls firmly within the constructivist school of thought, whereby an individual's knowledge is 'built' through personal reflection on their interactions with the world around them. Piaget and others' ideas on the antagonistic nature of knowledge construction have also been foundational to constructivist conceptualizations, whereby knowledge constructs are constantly confirmed, altered, or reconstructed depending on their resonance/dissonance with subsequent experiences (Mezirow, 1990; Piaget, 1947).

Some critics of Kolb's conceptualization of ELT point towards its reductionist approach as too simplistic (Sawada, 1991). Others call into question the usefulness of conceiving of a mind isolated in rational, controlled reflection when, demonstrably, that mind is generated by biological processes in a body operating within external social and environmental contexts outside of which mind might be somewhat meaningless (Fenwick, 2000).

Transformational learning theory also has critical reflection and discourse at its heart (Kitchenham, 2008; Mezirow, 1990). Furthermore, TLT draws from the constructivist camp and

sees resonance/dissonance as part of the process of learning. However, TLT commences from a disturbing problem that challenges the way one sees the world as not entirely true (Baumgartner, 2001). Learning occurs as critical reflection and/or self-reflection leads to a reframing of the way one sees the world, and also the way one must live in it.

Situated learning theory (SLT) sees no abstraction in reflective learning processes, conceptualizing knowledge as ‘...fundamentally a co-production of the mind and the world, which... need each other to produce texture and to complete an otherwise incoherent practice’ (Brown *et al.*, 1988). In contrast to ELT, SLT sees the abstraction and isolation of knowledge as a potential *impediment* to transferability rather than as a facilitator thereof (Cobb & Bowers, 2014). SLT experience design is underpinned by four central premises (Anderson *et al.*, 1996; Stein, 1998);

1. Learning occurs in the performance of real-life situations.
2. Knowledge is contextualized situationally and only transfers to similar situations.
3. In addition to declarative and procedural knowledge, learning is a social process involving a variety of patterns of thought, perspectives, problem resolution processes, and interactions.
4. Learning is inseparable from the physical, social and procedural context within which it occurs.

Stein (1998) summarizes SLT’s practical implementation with reference to ELT’s reflexive theme by noting that, in addition to reflecting on prior experiences and the implications thereof, situated learning occurs in and with the experience itself.

SLT’s critics point out that not all knowledge is created equal in terms of context dependency (Anderson *et al.*, 1996) - the transferability of knowledge between contexts depends

on the type of knowledge, and the context of the moderating experience. Furthermore, they argue abstract knowledge transfer between disparate contexts can be learned as a skill, and what should be under examination is the cognitive process an individual invokes in response to a problem rather than the setting that caused the response.

Critical cultural pedagogy (CCP) is concerned with examining learning and knowledge from the perspective that politics is central to cognition in humans (Fenwick, 2000; Giroux & McLaren, 1989). Many different power structures are examined under this banner (including gender, race, and economic). Despite the breadth of the field, critical cultural pedagogues are united in their belief that meaning, identity, activity and the processes that modify them must be politically framed. At different social scales they may ask, ‘What cultural capital is afforded dominance and what group is most invested therein?’ for the processes by which knowledge is created or mediated should be viewed in this context. Learners critically examine their own and others’ socio-political contexts and patterns of investment, thereby opening opportunities to alter their investment if they so desire.

The role of the educator in CCP experiences is disproportionately influential. Critics note that if learning experiences are simplistically framed or socio-political biases are allowed to insinuate themselves into processes then learners may alter their understanding in ways that prove socio-politically inappropriate – or at the very least, ill-informed. Scrupulous attention to these issues must be paid in development of content and pedagogy (Fenwick, 2000).

The preceding theories all contribute something to our understanding of the processes that may be at work in experiential learning processes. Readers will, no doubt, already have noted some of the synergies that exist between the few theories outlined here. For instance, reflection, the central theme in ELT, is also an important component in SLT and CCP but

learning experiences in the later are contextualized in a different manner. Many other approaches exist and nothing is implied by their omission from this summary other than that the author saw them as less relevant to the pedagogy of sustainability educational travel programs as they are defined here.

Sustainability Educational Travel

The sustainability educational travel (SET) courses under examination in this research were study abroad programs from a large, public university in the south-east U.S.A. to destinations largely in the South Pacific including Hawaii, New Zealand, Australia, and Fiji. These programs follow an ‘island’ study abroad model, whereby faculty from the home campus accompany the students abroad and the group travels as a unit – living, exploring, studying, eating, and travelling together. Course content is delivered using a mix of home campus faculty, in-country faculty, and in-country field guides. Some, but not all, programs incorporate home stays and service-learning experiences, and the duration of SET programs ranges from a few weeks to a full semester. ‘Sustainability Educational Travel *sensu stricto*’ (SET_{ss}) will be used to refer to these specific programs forthwith and ‘Sustainability Educational Travel *sensu lato*’ (SET_{sl}) will refer to the overarching category of sustainability educational travel programs.

The over-arching theme of the programs is the sustainability of societies and their environments and the primary course is inter-disciplinary. However, others offered alongside cover a range of subjects including international affairs, ecology, geography and anthropology. Faculty and students move regularly, rarely spending more than three days in any specific locale. Some content, primarily delivered by home-campus faculty, is delivered in traditional lecture settings with varying degrees of experiential learning practices incorporated. However, the

majority of credit hours for courses occurs in the field with content primarily delivered by in-country guides overseen by home-campus faculty. A dedicated text-book, written by the program Director, is used by all programs as their primary source of information, which goes some way towards alleviating program to program variations in content delivered by in-country faculty and field guides.

Field content, the in-country guides, and the experiences they facilitate, are diverse. A substantial number of student learning experiences resonate strongly within one or more of the theories of learning under the experiential umbrella. A module-based approach to learning is employed. At each location students are provided with interdisciplinary content from the program textbook, which is expanded upon through engagement with in-country field guides/faculty, and through participation in socio-scientific issues (SSI) and debates. Knowledge is tested discretely through quizzes, application of knowledge is tested through essays questions requiring synthesis of knowledge, and reflection occurs through participation in SSIs and debates.

In Hawaii, students hike a dormant volcano and stargaze from the mountain side after dark, learning about the cultural significance of the geological features they recently explored and discuss the tension between western desires to increase development of astronomy research facilities and traditional objection to increasing developmental footprints of facilities that have, from some indigenous perspectives, been placed on top of the physical manifestation of an important spiritual ancestor.

In Australia, students participate in coral monitoring research on the southern Great Barrier Reef that feeds back into an international database helping scientists to track changes in reefs around the world. As part of that process, they are exposed to data from years past and have

the opportunity to truly grasp the magnitude of changes that have already greatly diminished the health of the extraordinary natural system within which they find themselves. This is further compounded by discussions of the global nature of the underlying causes science believes responsible for such changes and the role they, their parents, and grandparents have had in the creation of today's environmental reality on the reef.

In one of the most remote parts of New Zealand, students research and play socio-political, real-world roles of citizen groups, politicians, government agencies, and business leaders to argue the merits of a proposed tourism development in a World Heritage Area after having met, in the course of their field work, a substantial number of people working or participating in the categories of interest. Socio-scientific issues (SSI) such as this are utilized in multiple modules throughout New Zealand and Australia.

Even this cursory overview of one implementation of SETss programming shows that reflection on experience is fostered, that consideration of the social nature of meaning construction is evident, and that opportunities exist to examine the power structures present in the determination of a socio-political outcome. Substantial portions of formal learning activities in SETss programs are rooted in ELT, SLT and CCP learning concepts. *The question is, does this make a difference and, if so, to what?*

In terms of the undergraduate experience, many aspects of SETss curricula resonate with known high-impact practices in higher education outlined by Kuh and others over and above the fact that study abroad is identified as a high-impact practice (Kuh, 2008; Kuh *et al.*, 2006). First, it is possible that travelling in close quarters with faculty and field guides has an effect similar to a first-year seminar and the 'quality time' with academic minds those seminars represent. Second, SETss programs incorporate collaborative learning projects, some of which feature

meaningful real-world research techniques feeding back into basic observation science used to monitor change. Third, the learning experiences in SETss are inter-disciplinary by nature, with geography, anthropology, ecology, economics, and international affairs content inter-woven through the exploration of the sustainability of societies and environments.

Kuh and colleagues identify these kinds of experiences as factors known to be associated with greater student engagement and success over the course of undergraduate degrees. This research seeks to understand changes in student knowledge and belief at the time scale of SETss programs (from a few weeks to a semester) within the context of high-impact practices.

The Research Project

This study explores the influence of SETss programs on sustainability learning outcomes in the cognitive and affective domains. In Chapter 2, a measure of sustainability literacy is utilized to examine changes in sustainability knowledge in response to different course pedagogies and Chapter 3 examines changes in environmental worldview in response to different course pedagogies. Furthermore, the effect of demographic traits identified as influential from the literature on environmental worldview are explored as well as their relationship to change in response to SETss programs. The results are discussed in the context of theories relevant to experiential learning, and implications drawn for sustainability education pedagogy in higher education institutions (Chapter 4).

CHAPTER 2
SUSTAINABILITY LITERACY: COURSE CONTENT AND PEDAGOGY¹

¹ Ling, S., Landon, A., Tarrant, M, and Rubin, D.L.To be submitted to *Journal of Sustainable Tourism*.

Abstract

As human environmental impacts have increased, so has the need to move towards sustainable practices in multiple dimensions and at multiple scales. In this context, sustainability literacy has become a desirable outcome of higher education, driving the advance of sustainability as a core component of higher education institutions' missions at local, regional, and global scales. However, little is known about the efficacy of different types of higher education courses in delivering desired outcomes of sustainability education. This study employed a quasi-experimental design to explore the relative influence of different course types (study abroad/ home campus and sustainability/non-sustainability) on growth of sustainability literacy among university students. Within each course setting (study abroad or home campus) studying sustainability was associated with higher sustainability literacy scores than studying non-sustainability. However, studying non-sustainability courses abroad showed comparable growth in students' sustainability literacy scores compared to studying sustainability on home campus. These results support not only the idea that sustainability can be taught but also that study abroad, regardless of course content, may be at least as effective at increasing sustainability literacy as home campus sustainability courses.

Introduction

The social, economic, and environmental challenges facing humanity are global in scope (Steffen *et al.*, 2007; Röckstrom *et al.*, 2009). Climate change, biodiversity loss, and water scarcity threaten the sustainability of both human and natural systems (MEA, 2005). Rising to meet these challenges as a society may be facilitated by a populace informed of the global

consequences of their consumer choices, as well as the role that they play within the broader system of social and economic production (Nassauer, 2011; Schultz, 2011).

For example, with the acquisition of sustainability literacy, individuals may be better equipped to engage in environmental citizenship. While sustainability literacy and knowledge do not necessarily have a direct influence on behavior, they may augment attitudes and behavioral intentions towards related issues. Hungerford and Volk (1989) suggest that environmental citizenship behaviors (pro-environmental) are a function of intent, personal empowerment variables including in-depth knowledge of issues and personal investment, and more distal dimensions of ecological knowledge, values and worldviews. Thus, if actors are uninformed about the tenets of sustainability, they will likely struggle to achieve it, even if they possess altruistic values and positive attitudes toward sustainability. Scholars have termed this paradox the value-action gap (Kollmus and Agyeman, 2002).

Sustainability education has a role to play in closing the value-action gap by providing students with the in-depth knowledge needed to act constructively on positive attitudes and intent toward issues of social, environmental, and economic concern (Chaplin and Wyton, 2014; Hungerford and Volk, 1990; Hungerford *et al.*, 1980). This raises the possibility that sustainability literacy may act as a moderator in the attitude-behavior relationship (Fishbein and Ajzen, 2010).

Sustainability education is global in nature because environmental problems and solutions are often unrestricted by national boundaries. Thus, there is an inherent connection between global citizenship and sustainability education, i.e., the greater literacy an individual possesses with respect to sustainability, the more likely they are to possess attributes characteristic of the prototypical “global citizen”. A global citizen is someone for whom the

issues of justice, environment, and civic obligations are key determinants of citizenship (Dobson, 2003). The environmental consciousness and dedication to social justice that are found in sustainability echo these criteria for global citizenship.

The definition of sustainability literacy remains nebulous, perhaps because of the breadth of the term ‘sustainability’. Stibbe and Luna’s (2009) broad approach regards a sustainability literate person as possessing the ‘skills, attitudes, competences, dispositions and values’ required to implement a sustainable world. Parkin *et al.*’s (2004) narrower view characterizes sustainability literacy as the ‘knowledge, skills and understanding required to fashion a more sustainable future’. However, two core elements emerge from the various definitions. Firstly, sustainability literate individuals possess the knowledge and understanding to differentiate sustainable practices from the unsustainable. Secondly, they also have the skills and competencies required to implement sustainable practices (Stibbe and Luana, 2009; Winter and Cotton, 2012). Individuals literate in sustainability should be able to negotiate life in a manner that reduces the unsustainable impacts their decisions may have on human and non-human others in the present, in the future, and at multiple scales.

Sustainability has emerged as an important component of liberal education (Warburton, 2008; Cortese and Hattan, 2010). The university setting is a natural context for students to be exposed to, and gain competence in, sustainability related concepts through experience and education (Bowers, 2001; Bowers, 2002). However, little is known of the influence of different modes of instruction, or different pedagogies, on students’ sustainability literacy. Using a quasi-experimental design, this study tests the influence of sustainability-focused university curricula, study abroad programs, and the combination thereof on growth in students’ sustainability literacy.

Literature Review

Sustainability and Sustainability Literacy

Sustainability is defined broadly as an idealized state of human-environment interaction where the needs of present and future societies are met without eroding the natural capital that supports them, and basic human rights remain attainable by all (WCED, 1987; Solow, 1991). This definition encompasses social, economic, and environmental dimensions – the so called “three legged stool” or “triple bottom line” (Elkington, 1994; Dawe and Ryan, 2003). Realizing the transition to a sustainable society requires citizens able to critically evaluate consumer, political, and development decisions in a variety of contexts with respect to impacts on these three domains and the interrelationships among them (WCED, 1987). More recently, a fourth component, ethics/social justice, has led to the quadruple bottom line conceptualization of sustainability (Inayatullah, 2005).

Sustainability literacy can be defined as ‘competence in and knowledge of’ sustainability concepts (Barnes, 2014). Therefore, when attempting to measure sustainability literacy care should be taken to ensure that measures do not include assessment of values, attitudes and behaviors, which may be related, but should be considered independently (Barnes, 2014). Coyle (2005) argues that ‘literacy’ should be ‘distinct from simple awareness... because of its depth of information’. Due to the integrative nature of sustainability as a concept, assessing literacy according to these criteria is not a simple task. Measures of sustainability literacy must assess sustainability knowledge, interrelationships of sustainability domains, and the depth of information integration. As such, sustainability literacy measures can be complex, lengthy and face difficulty assessing skills and competence through simple formats such as multiple choice. On the other hand, a primary criticism levelled at many existing instruments has been the lack of

equal assessment of all dimensions in the triple bottom line *and* the interrelationships among them (Barnes, 2014). Balancing these factors is a significant challenge.

One of the most comprehensive instruments for the assessment of sustainability literacy is the ASK (Assessment of Sustainability Knowledge; Zwickle *et al.*, 2014). The final version of the ASK retained the sixteen most discriminating questions but has received criticism for lacking questions that integrate all three elements of the triple bottom line (Barnes, 2014). Researchers at the University of North Carolina (UNC) also developed an instrument for the assessment of sustainability literacy. Shorter than the ASK, with thirteen questions focused on sustainability literacy, it incorporates questions requiring integration of knowledge from social, environmental, and economic domains at some depth (University of North Carolina, 2012). However, the psychometric properties of the UNC measure have not been reported.

Course Content

Although many authorities suggest that sustainability literacy can be inculcated via direct instruction (see Armstrong, 2011; Burns, 2013; Burns, 2015; Howlett *et al.*, 2016; Segalas *et al.*, 2012), few studies have tested that supposition quasi-experimentally. College major has a mixed relationship with sustainability literacy (Zwickle *et al.*, 2014). Horvath and colleagues (2013) found the number of sustainability related courses a student reported completing had a non-linear relationship with sustainability literacy using a measure of their own making. These authors reported a threshold effect. Students who completed 1-2 sustainability related courses were not significantly more knowledgeable than those who completed no sustainability courses, while students who completed 3 or more sustainability related courses were more knowledgeable than students in either of the other categories.

Fisher and McAdams (2015) looked at the influence of sustainability coursework type and number of sustainability courses on how students conceptualized sustainability along four indices; ecosystems and nature, eco-efficiency, community and well-being, and systemic change and innovation. They found course content influenced the way students conceptualized sustainability within these indices, rather than the number of sustainability courses. For example, taking natural science subjects was related to higher scores on the ecosystems and nature index. However, it should be noted this study examines the relative importance students assign to aspects of sustainability rather than sustainability literacy per se. It is mentioned here to add context to Horvath *et al.*'s (2013) findings.

Mode of Delivery

Literature examining the impact of study abroad on sustainability literacy is limited. However, there is evidence that participation in international education may positively influence students' understanding of the interconnections among social, economic, and ecological systems; topics germane to sustainability education (Myers *et al.*, 2005; Cusick, 2009; Tarrant, 2010; Lee and Schottenfeld, 2012; Reilly *et al.*, 2016). For example, consider the interdisciplinary concept of global citizenship as a demonstrated outcome of study abroad programs focused on studies of society and the environment (Tarrant and Lyons, 2012; Tarrant, Rubin, & Stoner, 2015; Tarrant, *et al.*, 2015; Wearing *et al.*, 2015; Landon *et al.*, 2017). Reysen and Katzarska-Miller (2013) define global citizenship as 'awareness, caring, and embracing cultural diversity while promoting social justice and sustainability, coupled with a sense of responsibility to act'. Sustainability is thus regarded as a subset of global citizenship and the relationship between the two depends on the context of all other subsets.

Educational travel abroad where faculty guide students through learning experiences in the field, as opposed to studying abroad in traditional classroom settings, is regarded as having strong potential to deliver transformational learning experiences for students (Ritchie, 2013; Bell, *et al.* 2014), as is experiential learning in and of itself (Owens *et al.*, 2015). This may be an influential approach in situations where sustainability education challenges a student to significantly alter their conceptualization of the balance between social, environmental, and economic facets of life. Bell *et al.* (2014) looked at 150 US university students that had completed highly experiential programs in the South Pacific. Using qualitative analysis of reflective responses to open-ended questions, they identified four themes associated with sustainability and transformative learning:

1. A new socio-cultural understanding,
2. A new connection with the natural world,
3. Economic considerations,
4. And making changes.

The first three themes resonate strongly with the tenets of sustainability and the triple-bottom line, while the fourth is arguably a function of the recognition of the response social justice/ethics demands once understanding of the first three themes is acquired.

A number of studies have found an association between participation in study abroad and learning outcomes related to sustainability literacy, such as sustainability education in tourism (Tarrant *et al.*, 2015; Wearing *et al.*, 2015), ethics (Parmentier and Moore, 2016), and global citizenship (Tarrant, Lyons, Stoner, Kyle, Wearing, & Poudyal, 2014; Tarrant, Rubin, & Stoner, 2014). However, quantitative research solely focused on sustainability literacy and its relationship to instructional design is scarce, despite many universities having offered formal

certification in sustainability for some time. More explicit research on outcomes in these programs, as in may lead to targeted interventions that significantly improve educational goal achievement.

Purpose and Hypotheses

There has been little experimental exploration of the relationships between study abroad pedagogy, sustainability content, and sustainability literacy in the literature to date. With this gap in mind, our purpose in conducting this study was to test the influence of content (sustainability) and delivery mode (study abroad) commonly employed in the university setting to convey sustainability concepts using a quasi-experimental, pre-test/post-test design. Specifically, we hypothesize that:

1. Students engaged in study abroad programs in non-sustainability-focused courses will show greater growth in sustainability literacy from pre-test to post-test than students completing non-sustainability courses on home campus during the same term.
2. Students engaged in studying sustainability-focused courses on home campus will show greater growth in sustainability literacy from pre-test to post-test than students engaged in non-sustainability-focused courses, whether through study abroad or on home campus, in the same term.
3. Students engaged in educational travel in sustainability-focused courses will show greater growth in sustainability literacy from pre-test to post-test than students studying in all other courses combined (home campus sustainability, home campus non-sustainability, and study abroad non-sustainability courses) during the same term.

Methods

Data Collection and Sample Demographics

The study took place at the University of Georgia, a large public university in the southeastern United States. Surveys were administered to students enrolled in Sustainability Educational Travel courses (SETss; N=769), Sustainability Home Campus courses (SHC; N=175), Non-Sustainability Study Abroad courses (NSSA; N=236), and Non-Sustainability-Focused Home Campus courses (NSHC; N=523) settings during the spring and summer terms of 2014, 2015, and 2016. Courses considered “sustainability-focused” were listed on the university Office of Sustainability website as applicable to a certificate in sustainability (26 classes over the period 2014-2016), i.e. pertained primarily to sustainability topics. Sustainability courses included topics in ecology, public health, sustainable development, and marine sciences among others, conducted both on campus, in traditional classroom study abroad settings, and field-based educational travel study abroad settings. The educational travel study abroad programs surveyed included at least three credit hours of Field Studies in Natural Resources and were all delivered using a modular experiential educational travel pedagogy that moves students through multiple locations exploring relationships between societies and the environment.

Non-sustainability courses included topics in sociology, law, language, and history; again, including both on campus and study abroad courses (24 classes over the period 2014-2016). Surveys were administered in a pretest/posttest design commencing on the first and last day of the class. Participants provided informed consent and generated a unique identifier used to anonymously match pretest and posttest instruments. 68.4% of participants identified as female. Participants varied in class standing with 10.9% first year students, 28.2% sophomores, 35.3% juniors, 23.2% seniors, and 2.4% graduate students.

Measures

The measure of sustainability literacy was a knowledge test. Items measured were drawn from sustainability literacy scales previously administered at the University of North Carolina at Chapel Hill (Sustainability @ UNC, 2012) and Ohio State University (Zwickle *et al.*, 2014). For the purpose of this study, three questions in each of the three dimensions of sustainability (environmental, economic, and social) were selected from these studies for inclusion in the sustainability literacy scale. The questions were selected to reflect sustainability concepts that inform individual choices about human-environment interactions, and to include questions requiring synthesis of knowledge, concepts and processes.

Questions were presented in a multiple-choice format, for which there were five answer choices, including “Don’t Know.” Each item had a single correct answer. The score on this test was the number of correct answers selected, giving a range of scores from 0-9.

Analysis

Sustainability Literacy Scale Validation

The psychometric properties of the proposed sustainability literacy scale were explored using confirmatory factor analysis. Measurement models were tested in the lavaan package (Rosseel, 2012) for the *R* statistical software v3.3.1 (R Core Development Team, 2016). We hypothesized that the sustainability literacy scale measures a single latent construct reflected by the nine items described earlier (Appendix A). Since the data are dichotomous (correct or incorrect), and therefore do not conform to the normality assumptions of maximum likelihood, we used the diagonally weighted least squares (DWLS) estimator with the asymptotic covariance

matrix to estimate model parameters. Acceptable model fit was assessed following the recommendations of Hu and Bentler (1999) (Root Mean Square Error of Approximation RMSEA < 0.08; Non-Normed Fit Index NNFI, and Comparative Fit Index CFI > 0.95). Convergent validity (Netemeyer *et al.*, 2003) was assessed via Composite Reliability ($\geq .7$) and the Average Variance Explained ($\geq .5$), at cutoffs recommended by Fornell and Larker (1981), and Rykov (1997). Measurement models were tested independently at both pretest and posttest.

Hypothesis Testing

Hypotheses were tested using a factorial repeated measures analysis of variance (ANOVA). Participants were nested in combinations of context (home campus versus abroad) and subject matter (+/-sustainability) and crossed with the repeated measure, time of testing (pretest versus posttest). ANOVA models were estimated using the statistical software SPSS version 25.0 (IBM Corp., 2017). Planned Helmert contrasts were implemented to test a priori hypotheses. Post-hoc Bonferroni pairwise comparisons were carried out to further explore results.

Results

Scale Validation: Construct Validity, Model Fit, and Reliability.

An initial test of the measurement model (at pretest) demonstrated an adequate fit for the data. However, upon inspection of item factor loadings and modification indices, the item SL2 (Appendix A) failed to load adequately ($\lambda \leq .3$) on the factor and was subsequently dropped from the analysis (Fornell & Larker, 1981).

Results indicated that the hypothesized scale was valid and reliable when measured at both pretest ($\chi^2 = 33.49$, $df = 20$, $p = 0.03$; RMSEA = 0.02; CFI = 0.99; NNFI = 0.98) and posttest ($\chi^2 = 33.25$, $df = 20$, $p = 0.03$; RMSEA = 0.02; CFI = 0.99; NNFI = 0.99). The eight-item sustainability literacy scale demonstrated acceptable reliability (Composite Reliability = 0.87_{pre}/0.91_{post}) (Rykov, 1997). However, the average variance explained by the latent factor was slightly lower than is recommended, with values of 0.33 and 0.41 at pretest and posttest respectively. A complete summary of model fit can be found in Table 2.1.

Table 2.1. Summary of Model Fit and Reliability for Sustainability Literacy Scale

Model	χ^2	df	<i>p</i> -value	C.R.	AVE	RMSEA	CFI	NNFI
Pretest	33.49	20	0.03	0.87	0.33	0.02	0.99	0.98
Posttest	33.25	20	0.03	0.91	0.41	0.02	0.99	0.99

C.R. = Composite Reliability; AVE = Average Variance Explained; RMSEA = Root Square Mean Error of Approximation; CFI = Comparative Fit Index; NNFI = Non-Normed Fit Index; df = Degrees of Freedom

ANOVA Models

Cell means for sustainability literacy by Time (pre-test, and post-test) and Context (Sustainability Educational Travel, Sustainability Home Campus, Non-Sustainability Study Abroad , and Non-Sustainability Home Campus) are presented in Table 2.2. Results of the ANOVA model reveal a significant within subjects effect for Time x Context but with a small effect size (Table 2.3. $F = 9.162$, $df = 3$, $p < 0.01$, $\eta^2 = 0.016$).

Table 2.2. Mean and Standard Deviation for Sustainability Literacy at Pretest and Posttest

Condition	Pretest <i>M</i>	<i>S.D.</i>	Posttest <i>M</i>	<i>S.D.</i>	<i>N</i>
Educational Travel Sustainability	7.02	1.40	7.56	1.26	769
Home Campus Sustainability	6.25	1.94	6.50	1.99	175
Study Abroad Non-Sustainability	6.13	1.76	6.23	1.92	236
Home Campus Non-Sustainability	5.92	1.91	6.10	2.00	523

Planned contrasts show no significant difference for gain in sustainability literacy score between NSSA and NSHC (Difference estimate = 0.17, S.E. = 0.12, $p > .05$), and we find no support for H1 on that basis. SHC students showed greater gains in sustainability literacy score compared to NSSA and NSHC students combined (Difference estimate = 0.28, S. E. = 0.13, $p < .05$), supporting H2. SETss students showed greater gains in sustainability literacy score compared to SHC, NSSA, and NSHC students combined (Difference Estimate = 1.1, S.E.=0.08, $p < .001$), supporting H3. These results support the hypotheses that participation in sustainability-focused coursework will yield greater growth in sustainability literacy than participation in non-sustainability coursework (Figure 1), and that participation in educational travel focused on sustainability will yield greater growth in sustainability literacy than all other modes of instruction examined in this study (Figure 2.1).

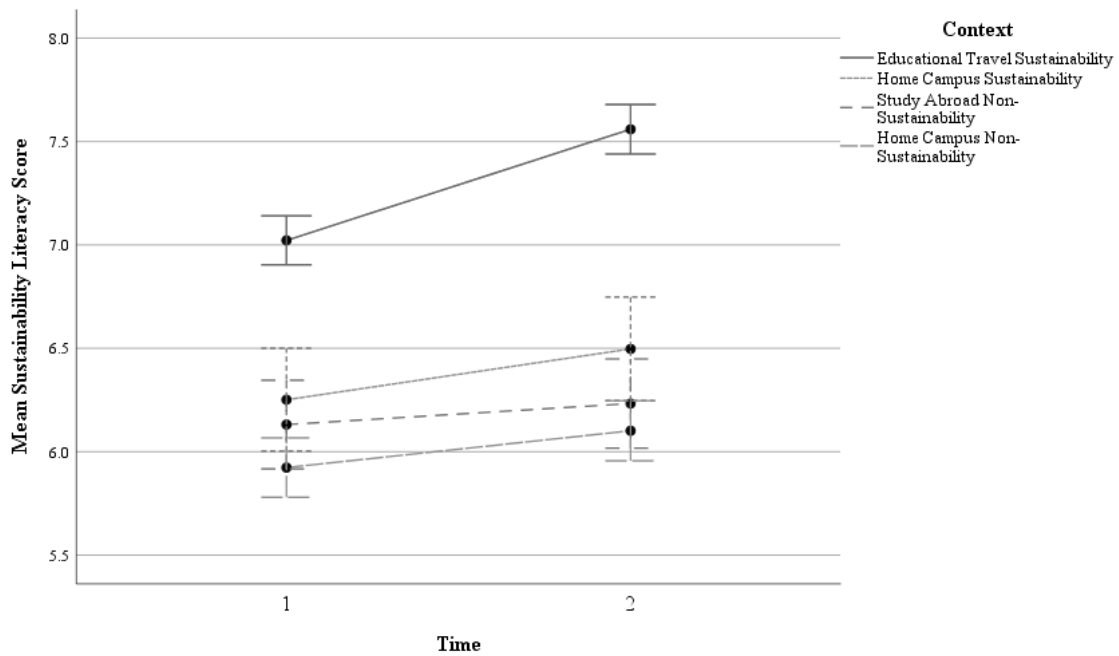


Figure 2.1. Mean Sustainability Literacy Scores at Pretest and Posttest by Context (error bars represent 95% C.I.).

Bonferroni post-hoc analysis offers greater resolution on the relationship between individual context categories. SETss students show significantly greater gain in sustainability literacy scores than any other category (Table 2.3). The relationship between SHC, NSSA and NSHC is also illuminated. SHC students show significantly greater gain in sustainability literacy score than NSHC students, but not in comparison to NSSA students (Table 2.3).

Table 2.3. Pairwise Comparisons for Differences in Mean Sustainability Literacy Score Gain.

	SETss	SHC	NSSA	NSHC
SETss	0	0.92*	1.11*	1.28*
SHC	-0.92*	0	0.19	0.36*
NSSA	-1.11*	-0.19	0	0.17
NSHC	-1.28*	-0.36*	-0.17	0

Note: differences = Column-Row; * $p < .05$ after Bonferroni adjustment; SETss = Sustainability Educational Travel *sensu stricto*; SHC = Sustainability Home Campus; NSSA = Non-sustainability Study Abroad; NSHC = Non-sustainability Home Campus.

Discussion

Our results demonstrate that educational travel focused on sustainability is an effective means of promoting growth in students' sustainability literacy over and above non-study abroad sustainability and non-sustainability education. Students studying abroad in the field and undertaking coursework recognized as contributing to campus sustainability initiatives demonstrated significantly greater growth in sustainability literacy compared to contemporaries engaged in more traditional courses of study. These results reflect the growth potential in a single term of studying sustainability abroad and are, thus, a lower bound estimate in assessing the efficacy of potential sustainability education efforts on campus. It remains to be seen what longer exposure to sustainability focused educational travel may yield.

The link between educational travel and support for environmental policies has already been established (Tarrant *et al.*, 2011; Cusick, 2009). The acquisition of sustainability knowledge through experiential learning on study abroad programs has already been investigated to some degree (Bell *et al.*, 2014). While post-program evaluations of experiential learning programs

report qualitative themes of sustainability, scales such as the one employed here will allow us to acquire quantitative evidence for increases related to so-called *transformational programs*. In addition, it is of interest whether aspects of the educational travel model, e.g. experiential learning or reflective practices, are as effective at increasing sustainability literacy if integrated into other curricula.

This research suggests studying abroad in the absence of sustainability-focused pedagogy may provide similar benefits in terms of gains in sustainability literacy as studying sustainability on home campus, although the differences are relatively small. It is plausible that this may be the results of exposure to differing worldviews, to relationships formed within and with other cultures, or to the experience of negotiating the complexities of unfamiliar societies. This result begs further investigation within the context of sustainability education.

Limitations

Although we feel that the results are promising, several limitations should be noted. First, the sustainability literacy scale was comprised of a relatively low number of items. This was a deliberate action in order to aid in the administration of the instrument (and correspondingly in the speed of assessment delivery). A larger scale may enable better discrimination of scores and may improve the overall ability of the scale to judge sustainability literacy. However, a tradeoff exists in item number and cognitive burden in survey administration.

Second, we sampled only one type of sustainability study abroad program. Results from similar research on other sustainability study abroad approaches may differ from those presented here. Thirdly, our sample consisted of undergraduate students at a southeastern university that may not be representative of the university population at large. Certainly, for study abroad

programs, self-selection is always a concern with regards to randomization. Furthermore, the observation that SETss students started programs with sustainability literacy scores above other groups, and demonstrated greater gains, may be evidence for self-selected SETss students being pre-disposed to the subject matter of the course and thus more influenced by it.

Fourth, there is wide variability in the amount of sustainability-related material taught in the courses involved in this study. Quantification of the degree of program fidelity, and of the types and ratios of teaching/learning occurring in each course (e.g. experiential, reflective), would increase the resolution of conclusions. Fourth, and intimately related to the previous point, instructor bias is a confounding variable whose effects are unknown.

Conclusion

As the world's population has increased, and competition for scarce resources has become more salient, sustainability has moved to the forefront of international and domestic discourse. It is now incumbent on higher education institutions to prepare graduates that can follow, understand, and meaningfully participate in that discourse. Many are making significant moves in that direction in curricula and in on-campus policy.

Institutions dedicated to sustainability education, and sustainability itself, can benefit from the ability to identify what type of content and pedagogy best deliver desired learning outcomes. In assessing students' functional knowledge regarding the social, economic, and environmental dimensions (Triple Bottom Line) of sustainability, this study provides some context for designing instructional programs that optimize or promote sustainability literacy (as a specific learning outcome). For example, study abroad programs are increasingly incorporating reflective exercises to promote engagement – designing programs that encourage student

reflection with sustainability topics that have been learned/addressed in the field/overseas could yield promising functional knowledge outcomes.

However, education is only the tip of the sustainability iceberg. Giving students the required literacy, knowledge, and tools to engage with in the sustainability discourse is a small, but important step on the path to a populace capable of making wise decisions regarding the sustainability of the choices they make in their personal, and professional, lives.

References

- Armstrong, C. M. (2011). Implementing education for sustainable development: the potential use of time-honored pedagogical practice from the Progressive Era of Education. *Journal of Sustainability Education, 2*.
- Barnes, N. (2014). Institutional Attempts To Measure Student Sustainability Knowledge. *Sustainability: The Journal of Record, 7*(2), 104–108.
- Bell, H. L., Gibson, H. J., Tarrant, M. a., Perry, L. G., & Stoner, L. (2014). Transformational learning through study abroad: US students' reflections on learning about sustainability in the South Pacific. *Leisure Studies, 43*67(October), 1–17.
- Bowers, C.A. (2001). Challenges in educating for ecologically sustainable communities. *Educational Philosophy and Theory, 33*(2), 257-265.
- Bowers, C.A. (2002). Toward an eco-justice pedagogy. *Environmental Education Research, 8*(1), 21-34.
- Burns, H. (2013) Meaningful sustainability learning: a study of sustainability pedagogy in two university courses. *International Journal of Teaching and Learning in Higher Education, 25*(2): 166-175.

- Burns, H. (2015) Transformative sustainability pedagogy: learning from ecological systems and indigenous wisdom. *Journal of Transformative Education*. 13(3): 259-276.
- Chaplin, G. and Wyton, P. (2014). Student engagement with sustainability: understanding the value–action gap. *International Journal of Sustainability in Higher Education*, 15(4): 404 – 417.
- Cortese, A.D., and Hattan, A.S. (2010). Research and solutions: Education for sustainability as the mission of higher education. *Sustainability: The Journal of Record*, 3(1): doi.org/10.1089/SUS.2009.9802
- Coyle, K. (2005). Environmental literacy in America: what ten years of NEEFT/Roper research and related studies say about environmental literacy in the U.S. The National Environmental Education and Training Foundation, 1–152. Washington, DC.
- Cusick, J. (2009). Study abroad in support of education for sustainability: a New Zealand case study. *Environment, Development and Sustainability*, 11(4): 801-813.
- Dawe, N.K. and Ryan, K.L. (2003). The faulty three-legged-stool model of sustainable development. *Conservation Biology*, 17(5): 1458-1460.
- Dobson, A. (2003). *Citizenship and the environment*. Oxford: Oxford University Press.
- Elkington, J. (1994). Towards the sustainable corporation: win win win business strategies for sustainable development. *California Management Review*, 36(2): 90-100.
- Fishbein, M. and Ajzen, I. (2010). *Predicting and changing behavior: The reasoned action approach*. Psychology Press, New York.
- Fisher, P.B. and McAdams, E. (2015). Gaps in sustainability education: the impacts of higher education coursework on perceptions of sustainability. *International Journal of Sustainability in Higher Education*, 16(4): 407-423.

- Fornell, C., and Larcker, D.F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research* 18(1), 39-50.
- Horvath, N., Steward, M., Shea, M. (2013). Toward instruments of assessing sustainability knowledge: Assessment development, process, and results from a pilot survey at the University of Maryland. *Journal of Sustainability Education*, 5(2013).
- Howlett, C., Ferreira, J. L., and Blomfield, J. M. (2016) Teaching sustainable development in higher education: building critical, reflective thinkers through an interdisciplinary approach. *International Journal of Sustainability in Higher Education*. 17(3), 1-17.
- Hu, L., and Bentler, P.M. (1999). Cutoff criteria for fit indices in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, 6(1), 1-55.
- Hungerford, H.R., and Volk, T.L. (1990). Changing learner behavior through environmental education. *The Journal of Environmental Education*, 21(3), 8-21.
- Hungerford, H.R., Peyton, R.B., and Wilke, R.J. (1980). Goals for curriculum development in environmental education. *Journal of Environmental Education*, 11(3), 42-46.
- IBM Corp. Released 2017. IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp.
- Kollmus, A., and Agyeman, J. (2002). Mind the gap: Why do people act environmentally and what are the barriers to pro-environmental behavior. *Environmental Education Research*, 8(3), 239-260.
- Landon, A.C., Tarrant, M.A., Rubin, D.A., and Stoner, L. (2017). Beyond “Just Do It”: Fostering higher-order learning outcomes in short-term study abroad. *AERA Open*, 3(1): 1-7.

- Lee, Y.S., and Schottenfeld, M.A. (2012). Internationalising Experiential Learning for Sustainable Development Education. *Journal of Education for Sustainable Development*, 6(2): 341-354.
- Millennium Ecosystem Assessment (MEA). (2005). *Ecosystems and Human Well-Being: Synthesis*. Island Press: Washington D.C.
- Myers, D.N., Hill, M., and Harwood, S.A. (2005). Cross-Cultural Learning and Study Abroad: Transforming Pedagogical Outcomes. *Landscape Journal*, 24(2): 172-184.
- Nassauer, J.I. (2011). Care and stewardship: From home to planet. *Landscape and Urban Planning*, doi:10.1016/j.landurbplan.2011.02.022.
- Netemeyer, R.G., Bearden, W.O., and Sharma, S. (2003). *Scaling procedures: Issues and applications*. Thousand Oaks, CA: Sage.
- Owens, C., Sotoudehnia, M. and Erickson-McGee, P. (2015). Reflections on teaching and learning for sustainability from the Cascadia Sustainability Field School. *Journal of Geography in Higher Education*, 39(3): 313-327.
- Parkin, S., Johnston, A., Buckland, H., Brookes, F., and White, E. (2004). Learning and Skills for Sustainable Development: Developing a Sustainability Literate Society. Guiding for Higher Education Institutions' (Forum for the Future).
- Parmentier, M.J. and Moore, S. (2016). 'The Camels are Unsustainable': Using Study Abroad as a Pedagogical Tool for Teaching Ethics and Sustainable Development. *Teaching Ethics*, 16(2): 207-221.
- R Development Core Team (2016). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria.

- Reilly, A.H., McGrath, M.A. and Reilly, K. (2016). Beyond ‘Innocents Abroad’: Reflecting on Sustainability Issues During International Study Trips. *Journal of Technological Management and Innovation*, 11(4): 29-37.
- Reysen, S, and Katzarska-Miller, I. (2013). A model of global citizenship: Antecedents and outcomes. *International Journal of Psychology*, 48 (5): 858-870.
- Ritchie, M.A. (2013). Sustainability Education, Experiential Learning, and Social Justice: Designing Community Based Courses in the Global South. *Journal of Sustainability Education*, 5:216-227.
- Röckstrom, J., Steffen, W., Noone, K., Persson, A., Chapin, F. Stuart III., Lambin, E., Lenton, T.M., Scheffer, M., Folke, Schellnhuber, H.J., Nkvist, B., de Wit, C.A., Hughes, T., van der Leeuw, S., Rodhe, H., Sörlin, S., Snyder, P.K., Costanza, R., Svedin, U., Fallkenmark., M., Karlberg, L., Corell, R.W., Fabry, V.J., Hansen, J., Walker, B., Liverman, D., Richardson, K., Crutzen, P., & Foley, J. (2009). Planetary boundaries: Exploring the safe operating space for humanity. *Ecology & Society*, 14(2): 32.
- Rossel, Y. (2012). lavaan: An R package for structural equation modeling. *Journal of Statistical Software*, 48(2): 1-36.
- Rykov, T. (1997). Estimation of composite reliability for congeneric measures. *Applied Psychological Measurement*. 21(2), 173-184.
- Schultz, P.W. (2011). Conservation means behavior. *Conservation Biology*, 25(6): 1080-1083.
- Segalàs, J., Mulder, K. F., Ferrer-Balas, D. (2012). What do EESD “experts” think sustainability is? Which pedagogy is suitable to learn it?: results from interviews and Cmaps analysis

- gathered at EESD 2008. *International Journal of Sustainability in Higher Education*. 13(3), 293-304.
- Solow, R.M. (1991). Sustainability: An Economists Perspective. In R.N. Stavins, *Economics of the Environment* (pp. 131- 138). New York, W.W. Norton and Company.
- Stibbe, A. and Luna, H. (2009). Introduction. In *The Handbook of Sustainability Literacy: Skills for a Changing World*. Dartington, UK: Green Books Ltd.
- Steffen, W., & Crutzen, P.J., & McNeill, J. R. (2007). The anthropocene: are humans now overwhelming the great forces of nature? *Ambio*, 36(8): 614-621.
- Tarrant, M. A. (2010). A Conceptual Framework for Exploring the Role of Studies Abroad in Nurturing Global Citizenship. *Journal of Studies in International Education*, 14(5), 433–451. <http://doi.org/10.1177/1028315309348737>
- Tarrant, M.A., Lyons, K., Stoner, L., Kyle, G.T., Wearing, S. and Poudyal, N. (2014). Global Citizenry, educational travel and sustainable tourism: evidence from Australia and New Zealand. *Journal of Sustainable Tourism*, 22(3): 403-420.
- Tarrant, M.A., Rubin, D.L., and Stoner, L. (2014). The added value of study abroad: Fostering a global citizenry. *Journal of Studies in International Education*. 26:68-82.
- Tarrant, M., Rubin, D., and Stoner, L. (2015). The effects of studying abroad and studying sustainability on students' global perspectives. *Frontiers: The Interdisciplinary Journal of Study Abroad*, 26(1): 68-82.
- Tarrant, M.A., Stoner, L., Tessman, K., Gleason, M., Lyons, K., and Wearing, S. (2015). Global programs in sustainability: A case study of techniques, tools, and teaching strategies for sustainability education in tourism. In G. Moscardo and P. Benckendorff (Eds),

- Education for sustainability in tourism: A handbook of processes, resources, and strategies. (pp. 229-237). New York, NY: Springer.
- Tarrant, M., and Lyons, K. (2012). The effect of short-term educational travel programs on environmental citizenship. *Environmental Education Research*, 18(3), pp. 403-416.
- Tarrant, M., Stoner, L., Borrie, W.T., Kyle, G., Moore, R.L., and Moore, A. (2011). Educational travel and global citizenship. *Journal of Leisure Research*, 43(3): 403-426.
- University of North Carolina. (2012). Sustainability Literacy Assessment Report. Retrieved from: <https://sustainability.unc.edu/files/2015/12/Sustainability-Literacy-Assessment-Report-Nov2012.pdf>
- Warburton, K. (2003), Deep learning and education for sustainability, *International Journal of Sustainability in Higher Education*, Vol. 4, Issue 1, pp. 44-56.
- Wearing, S., Tarrant, M.A., Schweinsberg, S., Lyons, K., and Stoner, K. (2015) Exploring the Global in Student Assessment and Feedback for Sustainable Tourism Education. In: Moscardo, G., Benckendorff, P. (eds) *Education for Sustainability in Tourism. CSR, Sustainability, Ethics and Governance*. Springer, Berlin, Heidelberg.
- Winter, J. and Cotton, D. (2012). Making the hidden curriculum visible: Sustainability literacy in higher education. *Environmental Education Research*, 18(6): 783-796.
- World Commission on Environment and Development. (1987). *Our Common Future*. Oxford, . Retrieved from http://mom.gov.af/Content/files/Brundtland_Report.pdf
- Zwickle, A., Koontz, T.M., Slagle, K.M., and Bruskotter, J.T. (2014). Assessing sustainability knowledge in the environmental, economic, and social domains. *International Journal of Sustainability in Higher Education*, 15(4): 375-389.

Appendix

Appendix A. Survey instrument – Correct answers in bold, origin of question in parentheses (OSU=Ohio State University, UNC=University of North Carolina).

Select the best answer from the following questions. Please check only one box.

SL1. What is meant by the term “carbon footprint”? (UNC)

- The age of an item found at an archeological site
- The carbon left on the ground each time you take a step
- The size of the carbon chain in a given quantity of gasoline
- The greenhouse gasses released by burning fossil fuels**
- Don't know

SL2. What is the term used for the technique to assess environmental impacts associated with all stages of a product's life from cradle to grave (resource extraction through usage and disposal or reuse)? (UNC)

- An energy audit
- A cost-benefit analysis
- A life-cycle assessment**
- A thermal system analysis
- Don't know

SL3. Which of the following is an example of sustainable forest management? (OSU)

- Setting aside forests to be off limits to the public
- Never harvesting more than what the forest produces in new growth**
- Producing lumber for nearby communities to build affordable housing
- Putting the local communities in charge of forest resources
- Don't know

SL4. Which of the following is the most commonly used definition of sustainable development? (OSU)

- Creating a government funded system that ensures universal access to education, healthcare, and social services
- Setting aside resources for preservation, never to be used
- Meeting the needs of the present without compromising the ability of future generations to meet their own needs**
- Building a neighborhood that is both socio-demographically and economically diverse
- Don't know

SL5. Workers around the world face a variety of social injustices, including low wages, poor working conditions, and lack of access to education. Of the following, what is the best way to

help improve conditions for these workers? (OSU)

- Purchase products from companies that do not allow workers to join labor unions
- Buy the newest products to keep factories around the world open
- Learn about how companies conduct business prior to purchasing their products**
- Support large corporations because they generally have more money to pay their workers
- Don't know

SL6. Of the following, which would be considered living in the most environmentally sustainable way? (OSU)

- Recycling all recyclable packaging
- Reducing consumption of all products**
- Buying products labeled "eco" or "green"
- Buying the newest products available
- Don't know

SL7. Which of the following is the most commonly used definition of economic sustainability? (OSU)

- Maximizing the share price of a company's stock
- Long term profitability**
- When costs equal revenue
- Continually expanding market share
- Don't know

SL8. What is included when corporations report their triple bottom line? (UNC)

- Three forms of financial reporting
- Environmental, social, and financial performance**
- Offering health, dental, and vision care to employees
- Incorporating community, labor, and government representatives on the board of directors
- Don't know

SL9. In order to support a local economy, which of the following is the best place to purchase goods? (OSU)

- At large chain stores that may employ workers from the local community
- Online from discount retailers
- From stores that sell locally-produced goods**
- From second-hand/thrift stores
- Don't know

CHAPTER 3

SHIFTING A PARADIGM: EDUCATIONAL TRAVEL AND WORLDVIEW.²

² Ling, S., Landon, A., Tarrant, M., and Rubin, D. L. To be submitted to *Journal of Sustainable Tourism*.

Abstract

Higher education institutions are tasked with education for sustainable development, of which the environment is a central pillar. Understanding the demographic factors that influence the establishment of environmental worldviews allows educators to better contextualize sustainability content and discussion. Identifying pedagogies capable of creating learning spaces within which worldviews can shift offers similar opportunities. Using a quasi-experimental design and model building, this study identifies important social psychological antecedents of environmental beliefs, assesses the effectiveness of travel education pedagogy at changing those beliefs, and identifies important predictors of the nature and magnitude of those changes. Sustainability educational travel courses was effective at increasing environmental worldview compared to a control group. At program commencement, political orientation and business majors were negatively associated with environmental worldview, while female gender was the reverse. For sustainability educational travel students, only gender was retained as a significant predictor of the nature and change of environmental worldview by course's end. These results suggest that the factors associated with environmental worldview upon commencement of a course do not necessarily predict the malleability of that worldview in higher education students.

Introduction

Universities in the U.S. recognize the benefits of study abroad and its potential for experiential learning and for nurturing undergraduates with global experience and perspectives. Over 332,000 U.S. students studied abroad for academic credit over the course of the 2016/2017 academic year (Institute of International Education, 2018). Study abroad has been put forward as a potentially transformative experience for participants (Bell *et al.*, 2014; Paige *et al.*, 2009;

Tarrant *et al.*, 2011) with the ability to alter participants' beliefs, attitudes and behaviors regarding sustainability and the triple-bottom line of society, economics and the environment (Tarrant, 2010).

As one of the pillars of modern sustainability concepts, the environment is an integral component of sustainability education content. Therefore, the factors that influence the environmental worldview of students are of interest in the design of sustainability communication and education approaches. Knowledge thereof gives educators the ability to focus on content relevant to students. Knowledge of the socio-demographic factors influencing change in student environmental worldview in response to programs designed to do so should also inform more effective curriculum design. Thus, the identification of effective teaching practices and/or learning experiences has the potential to increase the effectiveness of sustainability education efforts within higher education institutions.

The New Ecological Paradigm has emerged as one of the leading measures used to tap into environmental beliefs since its introduction in 1978 (as the New Environmental Paradigm) and subsequent revision in 2000 (Dunlap, 2008). It has become an important component of testing approaches investigating how proenvironmental attitudes evolve and how they are related to behavior through value-belief norm theory and the theory of planned behavior (Ajzen & Fishbein, 1970; Stern, Dietz, & Guagnano, 1995).

Using the New Ecological Paradigm as a measure of environmental worldview, this study first examines the demographic traits that influences students' positions on its spectrum at the commencement of a higher education course. Second, changes in environmental worldview of sustainability educational travel students versus a control group is tested. Finally, socio-demographic traits related to the magnitude and/or direction of change in student environmental

worldview are identified. The results of this work identify factors influential in the formation and evolution of students' environmental values with the aim of improving the design of pedagogical approaches aiming to foster critical examination and self-reflection of environmental worldview.

New Ecological Paradigm

The New Ecological Paradigm (Dunlap, van Liere, Mertig, & Jones, 2000) evolved from its predecessor the New Environmental Paradigm (Dunlap & Van Liere, 1978), and has arguably become the most widely applied and evaluated measure used to assess and track changes in environmental worldview since its implementation (Anderson, 2012; Dunlap, 2008). Grounded in Rokeach's theory of values (1968), the New Ecological Paradigm was assessed for internal consistency, dimensionality and validity on its inception (Dunlap, Van Liere, Mertig, & Jones, 2000) and has been constantly tested and tinkered with around the world. Google Scholar lists 4,384 citations since its publication (Google LLC, 2018).

The NEP measures the degree to which individuals express adherence to eco-centric worldviews, at one end of the spectrum, and anthropocentric worldviews at the other. Dunlap *et al.* (2000) conceptualize the NEP examining five 'facets';

1. Reality of limits to growth.
2. Anti-anthropocentrism.
3. Fragility of nature.
4. Rejection of exemptionalism.
5. Possibility of eco-crises or ecological catastrophe.

Respondents with higher NEP scores identify more closely with concepts that see humans as part of natural systems. Respondents with lower scores identify more closely with concepts that place humans apart from, or above, natural systems (Dunlap & Van Liere, 1978).

Criticisms of the NEP

Critiques of the NEP can be broadly grouped into three categories (Anderson, 2012; Hawcroft & Milfont, 2010). First, that the NEP lacks important theoretical elements of a pro-ecological worldview (Lalonde & Jackson, 2002; Lundmark, 2007). Lundmark (2007) points out that in relation to the ‘limits to growth’ facet, the NEP fails to incorporate the social and economic aspects of the contemporary sustainability debate. Furthermore, Lundmark (2007) points out that it is humanity’s exceptional abilities that allow us to perceive the dominant social paradigm as unsustainable, suggesting that the simple antagonistic relationship between anthropocentrism and ecocentrism posited by the NEP may not be sufficient.

The second major criticism of the NEP is that it does not relate strongly to pro-environmental behavior (Dunlap, 2008). Given that the measure was never intended to measure behaviors, this criticism has gained little traction within the literature. The NEP may detect changes in the attitudes and motives underlying pro-environmental behavior, but not necessarily the ability to act upon them (Dunlap, 2008; Stern, et al., 1995). Using a measure for a purpose for which it was never designed renders it invalid before the first respondent puts pen to paper (Messick, 1995).

A third major criticism of the measure, and the issue that has been raised most often, is that the NEP is not consistently unidimensional. Researchers have found anywhere from one to five factors underlying the NEP, which calls into question Dunlap *et al.*’s assertion of

unidimensionality (Amburgey & Thoman, 2012; Hawcroft & Milfont, 2010; Xiao & Buhrmann, 2017).

However, the analytic approaches used to criticise the NEP's dimensionality are fundamentally sample dependent; residing within the realm of the scoring tradition of psychometric measurement theory (Engelhard, 2013). Thus, inconsistency in dimensionality should be *expected*, at least to some degree, when the measure is deployed in a novel population. Dunlap himself recognizes this and has consistently recommended the NEP's dimensionality be investigated by factor analysis with each deployment to contextualize findings and facilitate comparison (Dunlap, 2008).

Hawcroft and Milfont's (2010) comprehensive review and meta-analysis makes some valid criticism about the inconsistency with which the NEP has been deployed and reported, noting drawbacks in edited versions of the NEP in which substantial numbers of items have sometimes been omitted. Furthermore, they draw attention to the inconsistency in reporting basic statistical and demographic information for the NEP and the sample within which it is being deployed. Perhaps most importantly, Hawcroft and Milfont (2010) report numerous studies that fail to either investigate or report the internal consistency of the NEP scale within their sample.

Demographic Antecedents to the NEP

Demographic factors are known to influence environmental attitudes and beliefs. Early work in this area found age or birth cohort to be a strong, consistent predictor of environmentalism (Jones & Dunlap, 1992; Van Liere & Dunlap, 1980). More specifically, several demographic variables are known to be associated with the NEP. Dunlap *et al.* (2000) found political liberalism to be strongly correlated with higher NEP ($r=.32, p<.05$), with other

variables significant at the same level including age ($r=-.11$), education ($r=.10$), political party ($r=.22$; Democrats scoring higher), and occupational sector ($r=.13$; primary industry workers score lower).

Using the 2000 National Survey on Recreation and the Environment, Johnson, *et al.* (2004) found significant relationships to NEP scores at $\alpha = .05$ for ethnicity (variable, depending on ethnicity), gender (higher in females), age (negative relationship), family size (negative relationship) and political orientation (higher in liberals) to have significant relationships to NEP. Casey and Scott (2006) also found gender, level of education and age influential on NEP scores in an Australian study drawing samples from 126 urban and rural locations using the same level of significance. More recently, Rexeisen (2013) and Rexeisen and Al-Khatib (2009) report gender as a significant moderator of change in NEP scores over time.

Dunlap and colleagues make no mention of gender in the NEP founding paper (Dunlap *et al.*, 2000). However, gender has been long known as influential on environmental concern and attitudes within the broader literature and that specific to the NEP, although its influence is reported by some as weaker and less consistent than that of age or birth cohort (Kalof, Dietz, Guagnano, & Stern, 2000; Rideout, Hushen, McGinty, Perkins, & Tate, 2005; Stern, Dietz, & Kalof, 1993).

The NEP in a Social Psychological Context

Conceptually, the NEP has been examined within the framework of the value-belief-norm theory of proenvironmental behavior (VBN; Stern *et al.*, 1995), which in turn is based on the norm-activation model of Schwartz (NAM; 1977), as well as in explorations of the theory of planned behavior (TPB, Ajzen, 1991; Kaiser *et al.*, 2006). Stern *et al.* (1995) see the NEP as

measuring grass-roots environmental beliefs, which are less intransigent than norms, but more intransigent than values. The NEP is conceptualized as dependent on the balance of personal values spread between three themes (altruistic, biospheric, and egoistic) and has been utilized to model multiple outcomes, such as proenvironmental behavior/intention (Figure 3.1; Stern *et al.*, 1995; Tarrant, 2010) and citizenship types (Wynveen, Kyle, & Tarrant, 2012). Generally, the NEP is associated positively with biospheric values and negatively with egoistic values, and its relationship with altruistic variables is indistinct (de Groot & Steg, 2008; Liu *et al.*, 2018).

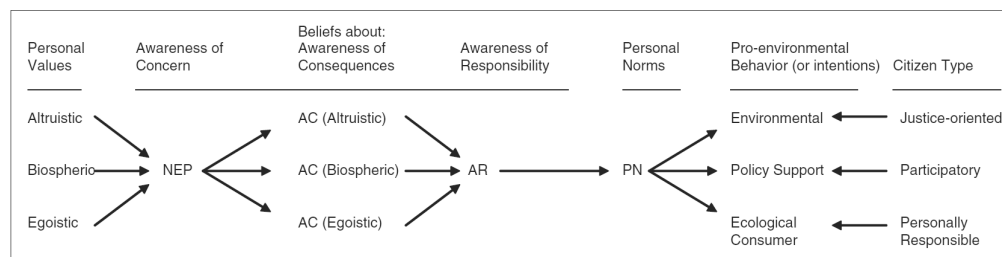


Figure 3.1. Adapted Value Beliefs-Norms Theory of Global Citizenship (from Tarrant, 2010).

Educational Travel and the NEP

Educational Travel can be based upon several significant theories of learning. Experiential learning theory (ELT; Kolb, 1984), whereby individuals construct meaning by reflecting on learning experiences of any kind is well suited to the variability in learning experiences offered by educational travel and its mix of formal, informal, physical and intellectual learning opportunities.

Transformational learning theory (TLT; Mezirow, 1990) follows on from ELT in that critical reflection is a core component. Building on critical reflection as core, TLT argues that changes in learners' perspectives occur through shifts in mental models that also increase an individual's investment in their own knowledge and learning experiences (Mezirow, 1990; Stone

& Duffy, 2015). This is a critical concept for sustainability educational travel programs seeking to foster changes in attitudes, behaviors, or perspectives that are constructed upon deeply held values and/or beliefs. International education has demonstrated the potential to facilitate shifts in values, beliefs, and scope of worldview in line with TLT (Hanson, 2010; Wynveen et al., 2012).

Situational learning theory (SLT; Brown *et al.*, 1988) insists that the reflective practice, central to the construction of meaning in ELT, cannot be considered in isolation from the physical, mental, and cultural world in which it occurs (Fenwick, 2001). From this perspective, meaning is not constructed in abstraction from the learner as a biological entity embedded in a physical world contextualized by culture.

Critical cultural pedagogy prioritizes political context as central to cognition in the study of human learning processes (Fenwick, 2000; Giroux & McLaren, 1989). Hierarchies of gender, race, and wealth are among the political contexts focused upon in CCP. Learners are asked to critically examine socio-political contexts within themselves and for others in order to foster learners' abilities to be more discriminating as to how they invest themselves in the hierarchies at hand (Fenwick, 2001).

Given these pedagogies' potential to effect complex learning outcomes, it is somewhat surprising that while the NEP has been used to assess worldview in general higher education students (see Harraway, *et al.*, 2012), few projects have utilized the NEP to examine the effect of study abroad upon it. Fewer still, have used quasi-experimental designs to facilitate comparative analysis of shifts in NEP score between different course types.

Rexeisen (2013) is among only a few authors to have used the NEP longitudinally in a study abroad context, deploying it to detect changes in business students studying abroad in London, surveying prior to departure, at the end of the semester abroad, and four months after

repatriation. He found support for a positive impact of study abroad on NEP scores over the course of the semester. Furthermore, when examining change over each of the five ‘facets’ posited by Dunlap *et al.* (2000), Rexeisen (2013) found mixed results examining change after repatriation, with unexpected gains and losses in subscale scores. Previously, Rexeisen and Al-Khatib (2009) found only limited support for study abroad influencing environmental attitudes with the only significant shift occurring on the exemptionalism subscale of the NEP.

Purpose and Hypotheses

This study first seeks to identify the demographic antecedents to environmental worldview in higher education students. Second, it investigates the effects of different higher education pedagogies on environmental worldview across academic programs of between a few weeks and a semester in duration. Third, it examines what factors are significant predictors of the *nature* of any detected change in environmental worldview in the second step. Overall, the study intends to increase educators’ understanding of the socio-political contexts within which environmental worldviews are generated, that they may better contextualize sustainability content and discussion, and to further understanding of the educational contexts within which environmental worldview may be moderated. We hypothesize that,

1. Demographic factors are related to the magnitude of student’s NEP scores at pretest in the following manner:
 - a. Being female is associated with higher NEP scores
 - b. Liberal political beliefs are associated with higher NEP scores
 - c. Business majors are associated with lower NEP scores

- d. Class standing is positively associated with higher NEP scores
 - e. Number of sustainability related courses is positively associated with higher NEP scores
2. Sustainability Educational Travel programs are associated with greater gains in NEP score pretest to posttest in comparison to other types of study abroad and home campus courses within the same time period, irrespective of course content.
 3. Demographic factors are related to the magnitude of change in student's NEP scores from pretest to posttest in Sustainability Educational Travel programs.

Methods

Data Collection and Sample Demographics

The study was conducted at a large public university in the southeastern United States of America. Data was drawn from a metadataset (MDS) generated from matched surveys completed on the first and last day of participating courses between 2008 and 2018. Surveyed students took courses on home campus, on residential campus study abroad programs, or on educational travel study abroad programs. Home campus was defined as the campus at which a student was registered. Residential campus study abroad programs were defined as those where students were outside the U.S. and attending a foreign higher education institution where courses were delivered in a traditional classroom setting. Educational travel study abroad programs were defined as those where students were outside the U.S. and undertaking higher education classes delivered predominantly in the field rather than in classrooms. Not all measures deployed by the surveys were utilized every year.

For the purposes of this study, students were classified into two subcategories within the MDS; those that responded while undertaking travel-based study abroad programs were grouped into Sustainability Educational Travel *sensu stricto* programs (SETss), and those that responded while participating in home campus or residential campus study abroad programs were grouped into Other Programs (OP). Furthermore, when analyses were comparing SETss and OP subjects, data from years where measures yielded data for both categories were employed (2013-2018). Demographic features for each sample are presented in Table 3.1.

Table 3.1 Sample Socio-Demographic Breakdown.

	N	% Female	% Freshman	% Sophomore	% Junior	% Senior	% Graduate	% Business Major	% Politically Right
MDS	3607	68.7	8.2	27.3	35.3	25.6	3.1	20.1	60.1
SETss	2622	70.1	8.4	29.9	34.8	24.3	2.6	23.1	62.4
2013-18 SETss	1775	71.5	10.8	34.2	34.6	18.2	2.3	21.0	66.0
2013-18 OP	1027	64.9	7.6	20.3	37.8	29.9	4.5	11.6	54.1

Note: MDS=metadataset. SETss=sustainability educational travel *sensu stricto*. OP=other programs. Percentages exclude invalid responses.

Measures

The New Ecological Paradigm scale (Dunlap et al., 2000) was used to measure worldview. In line with Dunlap et al.'s (2000) findings the scale was treated as unidimensional providing Cronbach's alpha was found to be sufficient.

Students were presented with 15 items, eight worded positively and seven negatively, representing beliefs about the relationship between humans and their environment. Reverse coding was employed on negatively worded items prior to summation of the final NEP score.

Higher scores reflect a more biocentric worldview (humans are a part of natural systems) and lower scores reflect a more anthropocentric worldview (humans are above nature). A five-point Likert scale was employed to measure item responses where 1=strongly disagree, 5=strongly agree, and 3=neither agree nor disagree.

Known correlates of the NEP were utilized to check its concurrent validity. Three personal values dimensions (Altruistic, Biospheric, and Egoistic; de Groot & Steg, 2008) and the Environmental Citizenship scale (Stern, *et al.*, 1999) were correlated with the NEP scale.

Political orientation was assessed in two ways between 2008 and 2017; originally on a four-item scale, with no neutral point, and later a 7-item scale that included a neutral point. For this study, these responses were recategorized as either left-wing or right-wing. Subjects who indicated no affiliation on the later 7-item scale were omitted from analyses. Dummy coding for political orientation was 0 and 1 for left-wing and right-wing, respectively.

A Gender variable was generated from a self-reported dichotomous item as male or female, dummy coded as 0 and 1 respectively. Major of study was reduced to a dichotomous variable representing majors either outside or inside the school of business, dummy coded as 0 and 1, respectively. Class standing, i.e. first year, second year...graduate student, was coded 1 through five.

To alleviate yearly cohort effects raw NEP scores were converted to z-scores by year. This was done by year for SETss and OP collectively for years where data existed for both groups, and across all years for SETss subjects. The conversion was accomplished by calculating a subject's distance from the mean NEP score for the year in which they studied and converting it to units of standard deviations (for that year's sample distribution). The directionality of distance from the mean was preserved.

NEP change scores were converted to z-scores within SET_{ss} subjects. Mean change in NEP and the standard deviation for the sample distribution was calculated for each year. Each subject's change score was then converted into a distance from yearly mean change in NEP, retaining directionality, in units of yearly standard deviation.

The MDS was examined for outliers (greater than 4 standard deviations above or below the mean) and influential data with regards to paired NEP scores (n=2502). Only one outlier, a respondent more than 4 standard deviations below the mean NEP score at pretest and more than 6.5 standard deviations above the mean change in NEP score pretest to posttest, was removed from the sample, leaving a sample of n=2501.

Analysis

Analyses were conducted using the statistical software SPSS version 25.0 (IBM, 2017). Prior to hypothesis testing, the reliability of the scale was assessed for the entire sample at pretest and posttest, as well as for each of the subsamples (SET_{ss} and OP) at both points. Demographic variables known from the literature to have some relationship to NEP scores (as above) were subjected to stepwise regression (α enter = .05, α remove = .10) to determine if any were significant contributors to variation in NEP z-scores at pretest. This was conducted for the entire metadataset and for the SET_{ss} subgroup.

Validation of Sustainability Educational Travel as an effective treatment for increasing NEP scores was conducted using a repeated measures ANOVA of Time (pretest and posttest) by Treatment (SET and OP) for years where NEP data for both SET and OP groups was present. For those years when NEP scores were obtained only for SET_{ss} students, differences in mean NEP score pretest to posttest across all SET_{ss} data were analyzed using a paired t-test.

Stepwise regression (α enter = .05, α remove = .10) of socio-demographic variables was used to identify significant predictors of change scores in NEP pretest to posttest in SETss students, using the change in NEP z-scores generated per the process outlined above.

Results

Summary statistics for the NEP at pretest and posttest are presented in Table 3.1. The increase in variation within the samples from pretest to posttest is of interest in contextualizing subsequent results and discussion thereof.

Table 3.2. Summary Statistics for the New Ecological Paradigm.

	n	Minimum	Maximum	Mean	Standard Deviation
MDS NEP Pretest	3607	26	75	52.19	6.839
MDS NEP Posttest	3579	22	75	52.79	7.541
2013-18 NEP Pretest	2688	26	75	52.17	6.919
2013-18 NEP Posttest	2671	22	75	52.68	7.623

Note: MDS=metadataset. 2013-18 are years where data for both Sustainability Educational Travel and Other Programs exist.

Validation of the NEP Within the Sample

Principal components analysis for the NEP scale at pretest for the MDS yielded three factors with initial eigenvalues above 1.00, with the first factor explaining 27.23% of the variance in the sample. After varimax rotation, eight items loaded most heavily onto the first factor, five onto the second factor, and the remaining two onto the third factor (Table 3.3). As Table 3.4 shows these results are not dramatically dissimilar to Dunlap *et al.*'s (2000) findings. However, this does not detract from the standing criticism that the NEP should not be considered

uni-dimensional according to these (and many other) results. The item-factor structure did not change markedly for the NEP scale at posttest and is included in Appendix A.

In the MDS, the NEP at pretest had corrected item-total correlations ranging from .13 to .56 with an average of .37. Three items had corrected item-total correlations lower than .30 (items 4, 6, and 14; Table 3.2). Removal of items 4 and 6 increases coefficient alpha by .007 and .009, respectively. Removal of item 14 does not affect coefficient alpha at this resolution. These changes are inconsequential to the point that the improvement gained by their removal is not worth the loss of comparability with other research using the NEP and they were retained for this purpose.

Reliability analysis of the NEP at pretest for the MDS yielded a coefficient α of .77 at pre-test (n=3607) and .81 at post-test (n=3579) for both categories combined. Reliability of the NEP for the SET_{ss} group yielded .76 at pretest (n=2622) and .81 posttest (n=2619). The remainder of the sample (OP group) yielded .78 at pretest (n=985) and .82 at posttest (n=970) for coefficient α .

Dunlap *et al.*'s (2000) four factor structure was not supported by reliability analysis results of SET_{ss} NEP responses (Table 3.4). In this sample only three factors emerge. However, three of Dunlap *et al.*'s 'facets' loaded in the same manner; Fragility, Anti-exemptionalism and Eco-crisis. Furthermore, at least one item from each facet loads most heavily on the first factor, also in line with Dunlap *et al.*'s findings. In the remaining 'facets' three items in our sample load most heavily onto the first factor rather than those with low eigenvalues, in contrast to Dunlap *et al.*'s results.

Table 3.3. Metadataset NEP Pretest Exploratory Factor Analysis (Principal Components with Varimax Rotation).

Item Number	Factor			CITC*
	1	2	3	
1. We are approaching the limit of the number of people the earth can support.	72	-16	11	.46
2. Humans have the right to modify the natural environment to suit their needs.	04	37	64	.31
3. When humans interfere with nature it often produces disastrous consequences.	65	08	-08	.41
4. Human ingenuity will insure that we do NOT make the earth unlivable.	15	60	21	.14
5. Humans are severely abusing the environment.	74	01	-14	.53
6. The earth has plenty of natural resources if we just learn how to develop them.	07	70	-02	.13
7. Plants and animals have as much right as humans to exist.	56	30	-49	.43
8. The balance of nature is strong enough to cope with the impacts of modern industrial nations.	-14	66	19	.34
9. Despite our special abilities humans are still subject to the laws of nature.	60	29	-16	.33
10. The so-called "ecological crisis" facing humankind has been greatly exaggerated.	-20	49	47	.44
11. The earth is like a spaceship with very limited room and resources.	72	-18	16	.45
12. Humans were meant to rule over the rest of nature.	-08	22	76	.39
13. The balance of nature is very delicate and easily upset.	67	07	00	.39
14. Humans will eventually learn enough about how nature works to be able to control it.	05	48	36	.23
15. If things continue on their present course, we will soon experience a major ecological catastrophe.	77	-02	-16	.56
Unrotated Eigenvalues	4.09	2.67	1.06	
Unrotated % of Variance	27.23	17.77	7.06	

Note: Factor loadings greater than .30 are in bold type. *Corrected Item-Total Correlations: values lower than .30 are in bold type. N=3607. Rotation method: Varimax with Kaiser Normalisation.

Table 3.4. Comparative Factor Structure for the NEP: Dunlap *et al.* versus SETss at Pretest.

Dunlap <i>et al.</i> 'Facets'	Item Number	Dunlap <i>et al.</i> Factors	SETss Factor
Limits	1. We are approaching the limit ...	3	1
	6. The earth has plenty of...	2	2
	11. The earth is like a spaceship...	3	1
Anti Anthro	2. Humans have the right to modify..	4	3
	7. Plants and animals have...	4	1
	12. Humans were meant to rule...	4	3
Fragility	3. When humans interfere....	1	1
	8. The balance of nature is ...	2	2
	13. The balance of nature is... delicate...	1	1
Anti Exemptionism	4. Human ingenuity will insure...	2	2
	9. Despite our special abilities ...	1	1
	14. Humans will eventually... control...	2	2
Eco Crisis	5. Humans are severely abusing...	1	1
	10. The so-called "ecological crisis"...	1	1
	15. If things continue...	1	1

Note: Columns 1 and 2 are divided into Dunlap *et al.*'s five 'facets' and the questions that pertain to them (for the full wording refer to Table 3.3). Columns 3 and 4 are color-coded by factor for ease of comparison of Dunlap *et al.*'s 4-factor results and the 3-factor results from this study.

The NEP showed strong, positive correlations with both Biospheric Values (.464, $p < .01$) and Environmental Citizenship (.468, $p < .01$; Table 3.5) A moderate, negative correlation existed between NEP and Egoistic Values (.297, $p < .01$). The Connectedness to Nature scale was moderately correlated with the NEP (.416, $p < .01$, $n = 568$), and is omitted from Table 3.4 as no correlations could be calculated with other variables as they were not assessed concurrently in any years.

Table 3.5. Pearson Correlations for NEP and Values at Pretest and Posttest.

	NEP	Altruistic	Biospheric	Egoistic	Environmental Citizenship
NEP	1 (n=3607)	.211** (n=616)	.485** (n=614)	-.250** (n=614)	.416** (n=3079)
Altruistic	.190** (n=616)	1 (n=1079)	.442** (n=1076)	.026 (n=1075)	.219** (n=600)
Biospheric	.464** (n=613)	.367** (n=1066)	1 (n=1079)	-.063* (n=1076)	.454** (n=599)
Egoistic	-.297** (n=616)	.002 (n=1068)	-.082** (n=1066)	1 (n=1080)	-.119** (n=599)
Environmental Citizenship	.468** (n=3113)	.180** (n=601)	.549** (n=600)	-.135** (n=600)	1 (n=4036)

Note: * $p < .05$. ** $p < .01$. ***Bold italic text*** report posttest results, else = pretest results.

The return of moderate correlations in the expected direction to other values-based variables in accordance with the knowledgebase supports the assertion that the NEP is functioning as intended and can discriminate changes in values/beliefs underlying the scale within the sample. Given the large sample size, the fact that the factor structure revealed by exploratory principal components analysis is similar to Dunlap *et al.*'s (2000) results, that the two items with concerning corrected item-total correlations are not overly influential on coefficient alpha, the authors proceed as Dunlap *et al.* (2000) recommend under such circumstances and accept the scale as unidimensional.

Hypothesis 1: Demographic Relationships to NEP at Pretest

Within the entire metadataset stepwise regression yielded a model with Political Orientation ($\beta = -0.61$, SE= 0.043), Gender ($\beta = 0.35$, SE= 0.047), and Business Focus ($\beta = -0.14$, SE= 0.054) as important contributors to variation in NEP z-scores at Pretest (n= 2001, F=103.56, $p < .001$; Table 3.6). Demographic factors have a significant association with NEP score at

pretest, supporting H1. Identifying as female is associated with higher NEP scores at pretest, while leaning to the political right and having a business focused major are associated with lower NEP scores at pretest. Of these, Political Orientation contributed the most to explaining the variation in NEP scores present in the sample.

Within the subset of SETss subjects stepwise regression yielded a model that included Political Orientation ($\beta = -0.65$, $SE = 0.05$) and Gender ($\beta = 0.41$, $SE = 0.05$) as significant contributors to variation in NEP z-scores at Pretest ($n = 1446$, $m = 52.19$, $d = 6.839$, $F = 126.83$, $p < .001$). Variable selection results are presented in Table 3.7. Demographic factors have a significant association with NEP score at pretest within SETss students, supporting H1. Identifying as female is associated with higher NEP scores at pretest, while leaning to the political right is associated with lower NEP scores at pretest. Of these, Political Orientation contributed the most to explaining the variation in NEP scores for SETss students.

Table 3.6. Stepwise Regression of Demographic Factors on NEP z-score at Pretest A (entire metadataset; $n = 2001$).

Model #. Variable Added	Cumulative R*	R ² Change	F Change	df1	df2	Sig. F Change
1. Political Orientation	.320	.102	227.628	1	1999	.000
2. Gender	.363	.029	67.432	1	1998	.000
3. Business Focus	.367	.003	7.117	1	1997	.008

Note: Independent variables entered: Gender, Political Orientation, Business Focus, Class Standing, Number of Human-Ecology Courses. *R is cumulative in this column as model # increases.

Table 3.7. Stepwise Regression of Demographic Factors on NEP z-score at Pretest B (sustainability educational travel group; n=1446).

Model #. Variable Added	Cumulative R*	R ² Change	F Change	df1	df2	Sig. F Change
1. Political Orientation	.338	.114	186.447	1	1444	.000
2. Gender	.387	.035	59.641	1	1443	.000

Note: Independent variables entered: Gender, Political Orientation, Business Focus, Class Standing, Number of Human-Ecology Courses. *R is cumulative in this column as model # increases.

Hypothesis 2: Sustainability Educational Travel Versus Other Programs

Repeated measures ANOVA results show a significant, but small, interaction for Time and Treatment (n=1638, F=37.65, df=1, p<.001, partial ω^2 =.01) and a significant, but small, effect for Treatment (F=54.46, df=1, p<.001, partial ω^2 =.02). SETss students' NEP scores rose from pretest (m=52.69, SE=0.17) to posttest (m=53.67, SE=0.19) whereas OP students showed no significant change in mean NEP score from pretest (m=51.20, SE=0.23) to posttest (m=51.02, SE=0.25; Figure 3.2).

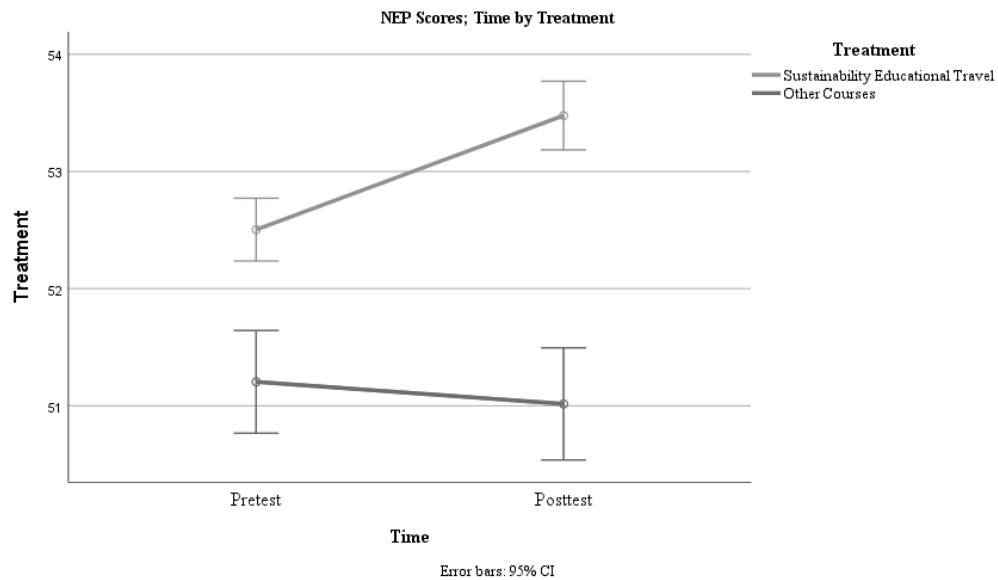


Figure 3.2. NEP Scores over Time by Treatment.

The paired t-test revealed a significant difference between pretest and posttest mean NEP scores (pretest=52.52, sd=6.78; posttest=53.47, sd=7.434) for SETss students (n= 2501, $t=-9.53$, $df=250$, $p<.001$). At the 95% confidence level, there is support for H2 that, on average, NEP scores at posttest are higher than at pretest in Sustainability Educational Travel programs.

Hypothesis 3: Demographic Predictors of Response to Treatment in SETss Students

Stepwise regression of demographic variables returned a model with Gender ($\beta=0.10$, $SE=0.05$) as the only significant predictor of change in NEP (as z-scores) Pretest to Posttest ($R=.06$, $F=5.027$, $p<.05$), supporting H4. Being female is weakly associated with higher change in NEP scores from pretest to posttest.

Linear regression showed a significant inverse relationship between change in NEP (as z-scores) Pretest to Posttest and NEP z-scores at Pretest (n=2501, $F=8.24$, $p<.01$). Students in SETss programs who scored lower on the NEP scale at pretest were more likely to show greater

gains in NEP score from pretest to posttest, than those with higher NEP scores at pretest (Figure 3.3).

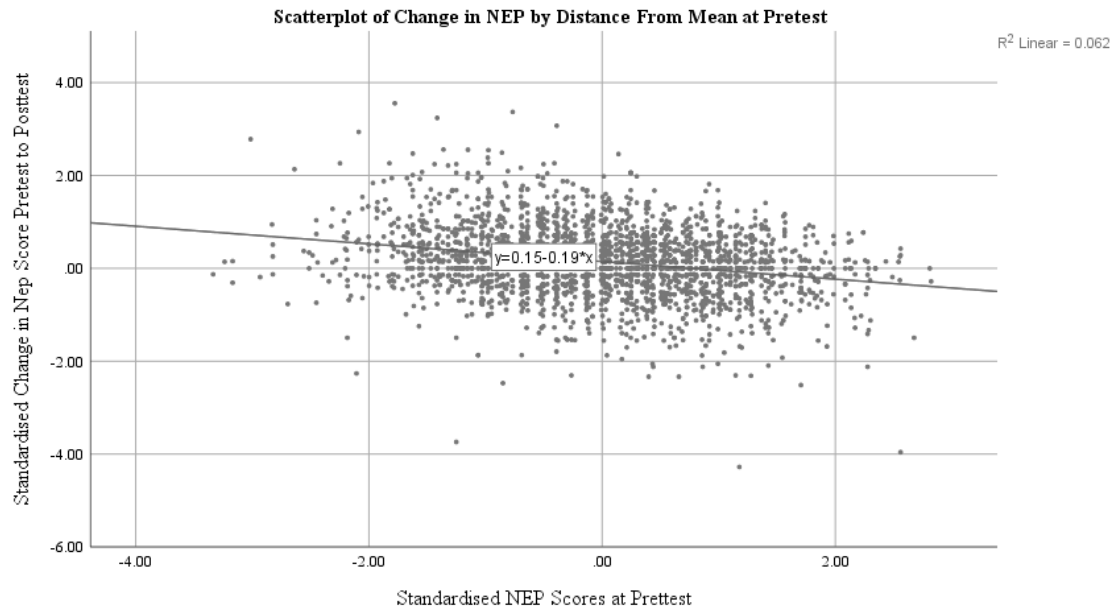


Figure 3.3. Scatterplot of Change in NEP by Distance From Mean at Pretest in Sustainability Educational Travel Students. Note: change scores and pretest scores are z-scores standardised by year.

Inclusion of NEP z-score at Pretest as an independent variable into a stepwise regression with demographic variables yielded a model that retained it as the most significant variable ($\beta = -0.21$, $SE = 0.02$) in accounting for variation in change in NEP (as z-scores) Pretest to Posttest. The model ($n = 1389$, $F = 31.95$, $p < .001$; Table 6) also retained Gender ($\beta = 0.19$, $SE = 0.04$) and Political Orientation ($\beta = -0.09$, $SE = 0.04$) as significant explanatory variables. Being female is associated with greater gains in change in NEP (as z-scores) Pretest to Posttest, as is leaning towards the political left.

Table 3.8. Stepwise Regression of Demographic Factors and NEP z-scores at Pretest on change in NEP (as z-scores) Pretest to Posttest (n=1389).

Model #. Added Variable	Cumulative R*	R ² Change	F Change	df1	df2	Sig. F Change
1. Standardised Distance From Mean NEP at Pretest	.222	.049	72.133	1	1387	.000
2. Gender	.249	.013	18.649	1	1386	.000
3. Political Affiliation	.254	.003	3.959	1	1385	.047

Note: Independent variables entered: Gender, Political Orientation, Business Focus, Class Standing, Number of Human-Ecology Courses. *R is cumulative in this column as model # increases.

Discussion

Socio-Demographic Predictors of the NEP

The results of variable selection within the entire MDS align with Dunlap *et al.*'s (Dunlap, Liere, et al., 2000) findings on antecedents of the NEP, to some degree; political orientation and intended occupation (major of study) are found to be significant predictors of NEP scores at pretest. In contrast to Dunlap *et al.*'s (2000) findings, gender is found to be a significant predictor. However, this resonates with other work on environmental attitudes such as that of Stern *et al.* (1993).

Class standing is not found to be a significant predictor of NEP scores. As a proxy for either age, or education level, the variable's range may be too restrictive (given this sample has few respondents outside undergraduate age range) to return results comparable to Dunlap *et al.* (2000), who found age to have a weak negative association with NEP scores. However, the result informs us that increments in educational level at this scale do not significantly contribute to variation in NEP scores.

One way of considering this result is from the perspective of self-selection of major of study. Prospective students approaching college education may seek areas of study that resonate with their world view, and/or that of their parents, potentially reducing the likelihood of them encountering educational transformative experiences that may alter, or broaden, that worldview. Selecting courses of study that sit comfortably within one's worldview may reduce the chance of encountering learning experiences capable of causing the cognitive dissonance whose resolution lies at the heart of theories of experiential learning.

Comparing the MDS variable selection results with those for the SET_{ss} category, we see the Business Focus now absent from the best model identified by stepwise regression to account for variability in NEP score at pretest. This is counterintuitive, given the higher percentage of business school students in the SET_{ss} group in comparison to the OP group (22% versus 18%, respectively).

Again, the most obvious rationale to address the difference is self-selection. Students are actively seeking out study abroad opportunities, of which a large range are on offer. Those that choose Sustainability Educational Travel programs may be predisposed to sustainability concepts or at least accepting of them. They may also be selecting the programs for their travel component, in contrast with studying abroad at a single institution or location. Furthermore, the choice to study abroad, regardless of the mode of study, may be indicative of students looking to broaden their worldviews who may therefore be more likely to alter their worldview to some degree.

With this in mind, a posthoc one-way ANOVA was conducted within business students (as a subset of the metadataset) using NEP pretest z-scores (standardized by year) as the independent variable and SET_{ss}/OP as the categorical dependent variable. In SET_{ss} students

mean NEP pretest z-score was -0.20 (n=399) while for OP students it was -0.54 (n=77). ANOVA results showed mean NEP pretest z-scores were significantly higher in SETss students than in OP students (see Appendix B), supporting the idea that self-selection is at work, at least in the subset of business majors.

The Effect of Sustainability Educational Travel

The repeated measures ANOVA yields results consistent with both the literature and theory. Travel-based study abroad programs are known to be efficacious at positively moving environmental measures in comparison to residential study abroad programs and home campus courses (Landon *et al.*, in press). It should be noted that the mean shift of NEP scores pretest to posttest, while significant, was relatively small. This is consistent with the notion that the NEP is measuring values and/or beliefs. According to VBN theory, values are more resistant to change than beliefs, which in turn are more resistant to change than norms (Stern *et al.*, 1999; Stern *et al.*, 1995).

Socio-Demographic Predictors of Response to Treatment

On average, students who were 0.79 standard deviations above mean NEP score at pretest are least likely to demonstrate any change in NEP score at posttest. Students below 0.79 standard deviations above the mean at pretest likely to increase their score pretest to posttest, while those above 0.79 standard deviations above the mean at pretest are likely to decrease their score pretest to posttest. Furthermore, the greater the difference between a student's NEP z-score at pretest and 0.79 standard deviations above the mean, the greater the absolute magnitude of change in standardized NEP score is likely to be, pre-test to posttest. *On average, those that scored lowest*

on the NEP at pretest had the greatest positive change from pretest to posttest, while those that scored the highest showed the greatest negative change from pretest to posttest.

It is possible that two processes detrimental to results are at work here. First, respondents close to either the lowest or highest possible NEP score at pretest may be subjected to a ‘ceiling effect’ on posttest. For the lowest respondents, there is nowhere to go but up. For the highest, there is nowhere to go but down. However, if all things are equal pretest to posttest why would they change at all? Second, the observed pattern may be indicative of regression to the mean, whereby unavoidable sources of error in repeated measurements of a stable property yield non-identical results that trend towards the mean (Agresti & Finlay, 2009; Campbell & Stanley, 1963; Schwarz & Reike, 2018).

However, NEP score variance increases from pretest to posttest (see standard deviations in Table 2), which runs contrary to expectations if regression to the mean is at work. If regression to the mean influences these results, we would expect variance to also decrease from pretest to posttest as more extreme results are moderated back towards the mean. The fact that variance increases from pretest to posttest gives us confidence that what we are seeing is likely to be related to actual processes rather than being a statistical artefact.

Several explanations for this observation resonate. First, students in SETss programs may be increasing or refining their understanding of their own worldview through the experience of contrasting it with cultural others. This may allow them to bring a more informed sense of their own worldview to the scale at posttest, i.e. causal factors have potentially changed between surveys. (Nesselroade, Stigler, & Baltes, 1980). However, this offers no explanation as to why this experience would differentiate the magnitude or direction of change in evidence here.

Second, self-selection may be at work. Students who select SETss programs may have a predisposition to responding more positively to the programs' contents, which explore pathways to balancing the triple-bottom line. It may be a case of preaching to the choir. As before, it is difficult to see why this would differentiate the magnitude or direction of change for subjects at different positions on the scale at pretest.

Third, sustainability as a concept goes further than ecological world view, as conceived during the era that spawned the first iteration of the NEP. Sustainability certainly recognizes the environment as a critical component of human well-being now and into the future, but it does not place it above the more anthropocentric concepts of social and economic well-being. It is, therefore, possible that SETss students who weight any of those three elements heavily in one direction or another at pretest, are being exposed to arguments for a more balanced approach. For example, someone with a strong environmental worldview may moderate their perspective if exposed to critical analysis of the triple bottom line concept for the first time. This has the capacity to explain what is observed occurring to change in NEP scores in this study.

Fourth, and related to the previous point, it is possible that other social-psychological factors are in play. SETss programs are termed island programs. Students are guided through unfamiliar physical and cultural landscapes in the knowledge that the safety and familiarity of their own cultural context is only ever as far away as their faculty and cohort. They eat, study, play and travel with each other and their faculty for periods ranging from three weeks to three months. Anecdotally, at least some students form new social coteries with people they did not know prior to the study abroad program.

This potentially intense social experience gives rise to the possibility that students shift their ideas of what is normative while on program, and beyond. This concept also has the

potential to explain why those at the extreme ends of the NEP scale are most likely to move towards the mean.

Limitations

Some inherent limitations should be noted. First, the inconsistency in the dimensionality of the NEP between samples noted elsewhere in the literature presents itself here. The authors have done their best to alleviate this issue by following Dunlap *et al.*'s (2000) procedures and recommendations in this regard and have presented the results in some detail to contextualize comparison between past and future work with the NEP and this study.

Second, the interactive effect of testing is unknown. For SETss programs, surveying occurs on the first and last days programs. Both are auspicious occasions during which students may be more or less excited/trepidatious about the beginning/end of their study abroad experience. If the effect is similar at both pretest and posttest, this point is moot. However, should such an effect be at work its influence would be difficult to ascertain.

Third, the span of time of data collection (2008-2018) was of concern due to the possibility of instructor bias and yearly cohort effects confounding results. Some instructors for SETss programs have been with the program for substantial periods of time while others remain for one or two years only. Accounting for the effect of instructors' abilities, and also for those who get better at teaching the course content through time is difficult.

The authors see no way of accurately accounting for differences in instructor's abilities within a given year. However, the standardization of change in NEP scores by year is intended to adjust for incremental gains in instructor effectiveness from year to year, while the standardization of NEP scores at pretest is intended to adjust for any yearly cohort effect.

Furthermore, although the seasonal context of the field locations is variable to some degree from program to program, the course content comes from a textbook specifically written for the course by the program director, and the in-country field guides have remained remarkably stable through time. This gives the authors some confidence that instructor and cohort effects have been significantly reduced.

Conclusion

These results suggest that within programs with a demonstrated ability to influence environmental world view, albeit marginally, the predictors of environmental worldview at the commencement of a program are not necessarily the predictors of susceptibility to change. The fact that political orientation was a significant predictor of NEP score at pretest but was not a significant predictor of *change* in NEP score should give educators hope. That difference suggests that higher education has the ability to overcome at least some of the biases students bring with them to the educational discourse and that SETss programs are effective at doing so.

Educators wishing to leverage this effect may wish to consider whether the pedagogies upon which SETss programs are based (ELT, SLT and TLT) can be incorporated into their curricula. To that end, further studies endeavoring to narrow down what aspects of SETss most contribute to such change would be of interest. Of course, it would be beneficial to know whether particular components of SETss programs are more effective at generating the observed effect than others. Within the syllabi of the SETss programs used for this study, one component stands out from others as exemplifying the tenets of ELT, TLT, SLT and CCP experiences; the socio-scientific issue (SSI).

SSIs are used to encourage reflection on the knowledge and application of knowledge surrounding a given issue in society (Ratcliffe & Grace, 2003). In SET_{ss} programs, SSIs are deployed in programs visiting Australia and New Zealand to focus student learning on contemporary ‘wicked’ problems, which have multiple stakeholders, different outcomes at different scales and no single solution. Students are assigned stakeholder or decision maker roles and must research and present or conduct their case per that role. Research through interaction with local stakeholders is encouraged. Students playing decision maker roles deliberate after stakeholder presentations and come to a decision, which is debated in character and then debriefed out of character.

As such, SSIs utilize reflection as a core process in the construction of meaning in line with ELT and TLT. Furthermore, through being physically present in the socio-political context of the issue at hand, the immersive aspect of SLT and the balance of power focus of CCP are invoked. Should other educators wish to explore the potential of SET_{ss} pedagogies in their own practice, we recommend SSIs as promising starting point.

However, in order to recommend specific practices for educators to deploy in pursuit of such goals more resolution on the agents of change is required. Testing the effect of SSIs on worldviews appears to be the lowest hanging fruit. The authors urge others with the opportunity to do so to contribute to the discourse on the social-psychological predictors of beliefs and their malleability in the sustainability education setting.

References

- Agresti, A., & Finlay, B. (2009). *Statistical methods for the social sciences* (4th ed.). Upper Saddle River, NJ: Pearson Prentice Hall.
- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179–211.
- Amburgey, J. W., & Thoman, D. B. (2012). Dimensionality of the New Ecological Paradigm. *Environment and Behavior*, 44(2), 235–256.
- Anderson, M. (2012). New Ecological Paradigm (NEP) Scale. *The Berkshire Encyclopedia of Sustainability*, 260–262.
- Azjen, I., & Fishbein, M. (1970). The predication of behavior from attitudinal and normative variables. *Journal of Experimental Social Psychology*, 6, 466–487.
- Bell, H. L., Gibson, H. J., Tarrant, M. a., Perry, L. G., & Stoner, L. (2014). Transformational learning through study abroad: US students' reflections on learning about sustainability in the South Pacific. *Leisure Studies*, 4367(October), 1–17.
- Brown, J. S., Collins, A., & Duguid, P. (1988). Situated Cognition and the Culture of Learning. *Educational Researcher*, 18(1), 32-42.
- Campbell, D. T., & Stanley, J. C. (1963). Experimental and Quasi-Experimental Designs for Research. In Gage, N.L. (Ed.). *Handbook of research on teaching*. Rand McNally: Chicago.
- Casey, P. J., & Scott, K. (2006). Environmental concern and behaviour in an Australian sample within an ecocentric - Anthropocentric framework. *Australian Journal of Psychology*, 58(2), 57–67.
- de Groot, J. I. M., & Steg, L. (2008). Value orientations to explain beliefs related to environmental significant behavior: How to measure egoistic, altruistic, and biospheric

- value orientations. *Environment and Behavior*, 40(3), 330–354.
- Dunlap, R. E. (2008). The New Environmental Paradigm Scale: From Marginality to Worldwide Use. *The Journal of Environmental Education*, 40(1), 3–18.
- Dunlap, R. E., Liere, K. D. Van, Mertig, A. G., & Jones, R. E. (2000). Measuring Endorsement of the New Ecological Paradigm : A Revised NEP Scale. *Journal of Social Issues*, 56(3), 425–442.
- Dunlap, R. E., & Van Liere, K. D. (1978). The “New Environmental Paradigm.” *The Journal of Environmental Education*, 9(4), 10–19.
- Engelhard, G. (2013). *Invariant Measurement*. New York: Routledge.
- Fenwick, T. J. (2000). Expanding Conceptions of Experiential Learning: A Review of the Five Contemporary Perspectives on Cognition. *Adult Education Quarterly*, 50(4), 243–272.
<http://doi.org/10.1177/07417130022087035>
- Fenwick, T. J. (2001). *Experiential Learning: A Theoretical Critique from Five Perspectives*. Retrieved from <https://files.eric.ed.gov/fulltext/ED454418.pdf>
- Giroux, H. A., & McLaren, P. L. (1989). Introduction: Schooling, Cultural Politics and the Struggle for Democracy. In H. A. Giroux & P. McLaren (Eds.), *Critical pedagogy, the state, and cultural struggle*. Albany, New York: State University of New York.
- Google LLC. (2019). Google Scholar. Retrieved February 9, 2019, from https://scholar.google.co.nz/scholar?hl=en&as_sdt=0%2C5&q=New+ecological+paradigm&btnG=
- Hanson, L. (2010). Global Citizenship, Global Health, and the Internationalization of Curriculum. *Journal of Studies in International Education*, 14(1), 70–88.
<http://doi.org/10.1177/1028315308323207>

- Harraway, J., Broughton-Ansin, F., Deaker, L., Jowett, T., & Shephard, K. (2012). Exploring the Use of the Revised New Ecological Paradigm Scale (NEP) to Monitor the Development of Students' Ecological Worldviews. *The Journal of Environmental Education, 43*(3), 177–191. <http://doi.org/10.1080/00958964.2011.634450>
- Hawcroft, L. J., & Milfont, T. L. (2010). The use (and abuse) of the new environmental paradigm scale over the last 30 years: A meta-analysis. *Journal of Environmental Psychology, 30*(2), 143–158. <http://doi.org/10.1016/j.jenvp.2009.10.003>
- IBM Corp. Released 2017. IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp.
- Institute of International Education. (2012). *Open Doors Report*. Retrieved from <http://www.iie.org/en/Research-and-Publications/Open-Doors>
- Institute of International Education (2018). Open Doors Press Release. Retrieved January 18, 2019, from <https://www.iie.org/Why-IIE/Announcements/2018/11/2018-11-13-Number-of-International-Students-Reaches-New-High>
- Jones, R. E., & Dunlap, R. E. (1992). The social bases of environmental concern: Have they changed over time. *Rural Sociology, 57*, 28–47.
- Kaiser, F. G., Hübner, G., & Bogner, F. X. (2006). Contrasting the Theory of Planned Behavior With the Value-Belief-Norm Model in Explaining Conservation Behavior Public Acceptance of Wind Energy View project. *Article in Journal of Applied Social Psychology*. <http://doi.org/10.1111/j.1559-1816.2005.tb02213.x>
- Kalof, L., Dietz, T., Guagnano, G., & Stern, P. C. (2000). Race, Gender and Environmentalism: The Atypical Values and Beliefs of White Men. *Race, Gender & Class, 9*(2), 112–130. <http://doi.org/10.2307/41675022>

- Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development*. New Jersey: Prentice Hall.
- Lalonde, R., & Jackson, E. L. (2002). The new environmental paradigm scale: Has it outlived its usefulness? *Journal of Environmental Education*, 33(4), 28–36.
<http://doi.org/10.1080/00958960209599151>
- Landon, A. C., Tarrant, M. A., Woosnam, K., Ling, S. T., & Rubin, D. L. (in press). Understanding and modifying beliefs about climate change through educational travel. *Journal of Sustainable Tourism*.
- Liu, X., Zou, Y., & Wu, J. (2018). Factors influencing public-sphere pro-environmental behavior among Mongolian college students: A test of value-belief-norm theory. *Sustainability (Switzerland)*, 10(5). <http://doi.org/10.3390/su10051384>
- Lundmark, C. (2007). The new ecological paradigm revisited: anchoring the NEP scale in environmental ethics. *Environmental Education Research*, 13(3), 329–347.
<http://doi.org/10.1080/13504620701430448>
- Messick, S. (1995). Validity of Psychological Assessment. *American Psychologist*, 50(9), 741–749.
- Mezirow, J. (1990). *Fostering critical reflection in adulthood*. San Francisco: Jossey-Bass.
- Nesselroade, J. R., Stigler, S. M., & Baltes, P. B. (1980). Regression Toward the Mean and the Study of Change. *Psychological Bulletin*, 88(3), 622–637. <http://doi.org/10.1037/0033-2909.88.3.622>
- Paige, M., Fry, W., Stallman, E. M., Josic, J., & Jon, J. (2009). Study abroad for global engagement: The long-term impact of mobility experiences. *Intercultural Education*, 20(1), 29–44.

- Ratcliffe, M., & Grace, M. (2003). *Science Education for Citizenship: Teaching Socio-Scientific Issues*. Maidenhead: Open University Press.
- Rexeisen, R. J. (2013). The impact of study abroad on the development of pro-environmental attitudes. *Ethics and Business Law Faculty Publications*, 49. Retrieved from <http://ir.stthomas.edu/ocbeblpub/49>
- Rexeisen, R. J., & Al-Khatib, J. (2009). Assurance of Learning and Study Abroad: A Case Study. *Journal of Teaching in International Business*, 20(3), 192–207. <http://doi.org/10.1080/08975930903099077>
- Rideout, B. E., Hushen, K., McGinty, D., Perkins, S., & Tate, J. (2005). Endorsement of the New Ecological Paradigm in Systematic and E-mail Samples of College Students. *The Journal of Environmental Education*, 36(2), 15–23. <http://doi.org/10.3200/JOEE.36.2.15-23>
- Rokeach, M. (1968). *Beliefs, attitudes, and values*. San Francisco: Jossey-Bass.
- Schwartz, S. H. (1977). Normative Influences on Altruism. *Advances in Experimental Social Psychology*, 10, 221–279. [http://doi.org/10.1016/S0065-2601\(08\)60358-5](http://doi.org/10.1016/S0065-2601(08)60358-5)
- Schwarz, W., & Reike, D. (2018). Regression away from the mean: Theory and examples. *British Journal of Mathematical and Statistical Psychology*, 71(1), 186–203. <http://doi.org/10.1111/bmsp.12106>
- Stern, P. C., Dietz, T., Abel, T. D., Guagnano, G. A., & Kalof, L. (1999). A Value-Belief-Norm Theory of Support for Social Movements : The Case of Environmentalism. *Research in Human Ecology*, 6(2), 81–97. <http://doi.org/10.2307/2083693>
- Stern, P. C., Dietz, T., & Guagnano, G. A. (1995). The New Ecological Paradigm in Social-Psychological Context. *Environment and Behavior*, 27(6), 723–743.
- Stern, P. C., Dietz, T., & Kalof, L. (1993). Value Orientations, Gender, and Environmental

Concern. *Environment and Behavior*, 25(5), 322–348.

<http://doi.org/10.1177/0013916593255002>

Stern, P. C., Kalof, L., Dietz, T., & Guagnano, G. A. (1995). Values, Beliefs, and Proenvironmental Action: Attitude Formation Toward Emergent Attitude Objects. *Journal of Applied Social Psychology*, 25(18), 1611–1636. <http://doi.org/10.1111/j.1559-1816.1995.tb02636.x>

Stone, G. A., & Duffy, L. N. (2015). Transformative Learning Theory: A Systematic Review of Travel and Tourism Scholarship. *Journal of Teaching in Travel and Tourism*, 15(3), 204–224. <http://doi.org/10.1080/15313220.2015.1059305>

Tarrant, M. A. (2010). A Conceptual Framework for Exploring the Role of Studies Abroad in Nurturing Global Citizenship. *Journal of Studies in International Education*, 14(5), 433–451. <http://doi.org/10.1177/1028315309348737>

Tarrant, M., Stoner, L., Borrie, W.T., Kyle, G., Moore, R.L., and Moore, A. (2011). Educational travel and global citizenship. *Journal of Leisure Research*, 43(3): 403-426.

Wynveen, C. J., Kyle, G. T., & Tarrant, M. A. (2012). Study Abroad Experiences and Global Citizenship: Fostering Proenvironmental Behavior. *Journal of Studies in International Education*, 16(4), 334–352. <http://doi.org/10.1177/1028315311426782>

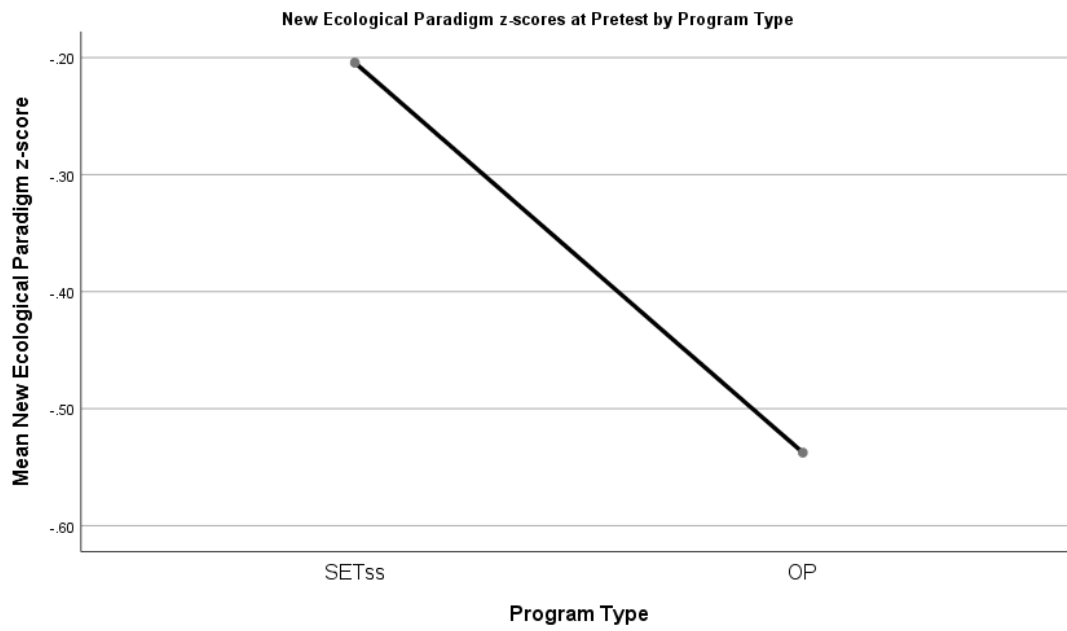
Xiao, C., & Buhrmann, J. (2017). The structure and coherence of the new environmental paradigm: reconceptualising the dimensionality debate. *Human Ecology Review*, 23(1), 179–198.

Appendices

Appendix A: Metadataset NEP Posttest Exploratory Factor Analysis (Principal Components with Varimax Rotation).

Item Number	Factor		
	1	2	3
1. We are approaching the limit of the number of people the earth can support.	74	-12	-05
2. Humans have the right to modify the natural environment to suit their needs.	-04	43	63
3. When humans interfere with nature it often produces disastrous consequences.	72	-01	-04
4. Human ingenuity will insure that we do NOT make the earth unlivable.	-11	66	17
5. Humans are severely abusing the environment.	78	01	-14
6. The earth has plenty of natural resources if we just learn how to develop them.	-02	73	-12
7. Plants and animals have as much right as humans to exist.	56	-21	53
8. The balance of nature is strong enough to cope with the impacts of modern industrial nations.	-14	68	17
9. Despite our special abilities humans are still subject to the laws of nature.	65	-17	-18
10. The so-called "ecological crisis" facing humankind has been greatly exaggerated.	-22	55	42
11. The earth is like a spaceship with very limited room and resources.	75	-13	-11
12. Humans were meant to rule over the rest of nature.	-12	31	76
13. The balance of nature is very delicate and easily upset.	71	-03	05
14. Humans will eventually learn enough about how nature works to be able to control it.	-03	59	24
15. If things continue on their present course, we will soon experience a major ecological catastrophe.	79	-07	14
Unrotated Eigenvalues	4.52	2.85	1.00
Unrotated % of Variance	30.14	18.98	6.67

Note: Factor loadings greater than .30 are in bold type. N=3607. Rotation method: Varimax with Kaiser Normalisation.



Appendix B: New Ecological z-scores at Pretest by Program Type.
Note: z-scores are standardized by year within the entire metadataset.

CHAPTER 4

Summary

More than 65% of U.S. students who study abroad (n= 332,727 in 2016/17) do so for less than one semester, arguably due to financial pressure and the constraints of their degree requirements (Institute of International Education, 2012, 2018). Under these circumstances, maximizing educational value at short time scales is imperative. We have demonstrated that SETss programs can be an effective approach for increasing sustainability literacy and influencing environmental beliefs. What this study cannot tell us is whether certain components of SETss pedagogy are more effective in producing these results than others.

Is SETss pedagogy greater than the sum of its parts, or is one component alone responsible for particular results? This is an important question for further research. If the whole is greater than the sum of its parts, higher education institutions committed to sustainability education should encourage participation in study abroad programs of this nature over and above others. However, if one of the parts is found to be more effective than others then such institutions would be well served to investigate whether that aspect of SETss pedagogy might be effectively incorporated into other study abroad and on-campus pedagogies.

Sustainability Education

The examination of sustainability literacy scores yielded results that sit well with contemporary literature on sustainability education. As one might expect, score gains are greater

for courses with sustainability content than courses with non-sustainability content. Sustainability *can* be taught. Greater gains in sustainability literacy scores, on average, were also seen in study abroad programs with sustainability content compared to study abroad programs with non-sustainability content, implying that studying sustainability topics facilitates the acquisition of the kind of sustainability knowledge assessed by this scale over and above any influence of studying abroad on its own.

It may be that the experience of studying abroad stimulates students to incorporate concepts at global scales into their worldview or that it stimulates them in ways that increase their receptiveness to new ideas, the reconsideration of old ideas, or the depth at which they reflect upon new/old ideas. This research does not address these hypotheses. However, if the expanded scale of worldview hypothesis is at work, one would expect students with less international travel experience to demonstrate the hypothesized effect to a greater degree than those with more international travel experiences. This, too, is worthy of investigation.

The small but significant shift in average environmental worldview reported in this research sits well with the literature. According to values-beliefs-norm (VBN) theory, beliefs should be more malleable than values and less so than norms. Thus, we should not expect a scale designed to measure environmental beliefs to shift much across a relatively short time frame, such as a semester. To further calibrate this result, it would be logical to next compare the magnitude of the change in values and norms alongside beliefs.

Nonetheless, the observed shift in beliefs effected by sustainability educational travel *sensu stricto* (SETss) pedagogy is an important result for sustainability educators; beliefs can be changed by small amounts over relatively brief periods of time. As mentioned in the Chapter 3 discussion it would be of interest to identify if certain components of SETss pedagogy were

more effective than others at influencing change in environmental worldview. However, it is unethical to consider testing this hypothesis within the SET programs sampled here. In good conscience, one cannot randomly *subtract* learning experiences from effective study abroad programs. Moving forward, the best one can do is identify components of SETss programs that are soundly based in theory and offer them as possibilities for research through *addition* into other programs for quasi-experimental comparative research purposes. For example, an extant study abroad program not currently using SSIs could sample students, using measures and procedures outlined above, before and after implementation of SSIs into the curriculum.

Theories of Experiential Learning

As Fenwick (2001) noted, the various theories of learning that fall under the experiential umbrella overlap or nest to some degree. It is therefore difficult to tease out which of these theories is most relevant in considering SETss pedagogy. Reflecting on the nature of the learning experiences present in SETss programs the author concludes that different experiences invoke different aspects of experiential learning theory (ELT), transformational learning theory (TLT), situated learning theory (SLT), and critical cultural pedagogy (CCP) at differing degrees. This is hardly helpful in terms of directing future research efforts but is indicative of the consideration given to these three theories in the design of SETss curricula.

More tangibly, reflection practices in SET programs are currently under investigation. Formal reflective practice positively influences student engagement (Ling *et al*, manuscript in preparation) in SETss students using the National Survey of Student Engagement as a measure. Higher levels of student engagement are associated with higher levels of student success, at least

at the undergraduate level (Kuh *et al.*, 2006). However, the influence, if any, of reflection practices on sustainability education learning outcomes remains to be seen.

One learning experience of note in SETss pedagogy which incorporates ELT, TLT, SLT, and CCP relatively evenly and is easily transferable to other curricula is the socio-scientific issue (SSI), which forms an assessable component in sampled SETss programs. SSIs have a substantial history in educational practice as a method of increasing and contextualizing scientific literacy in a manner facilitating the ethical, moral, and emotional growth of participants (Zeidler *et al.*, 2005). In the sampled SETss programs, the subjects of SSIs are wicked problems with no obvious solution, just a myriad of stakeholders and compromises with innumerable outcomes for society, the environment, and the economy. In the context of both experiential learning theories and sustainability education they appear well-suited.

In SETss SSIs the topic chosen is location sensitive. Students are required to take on either a stakeholder (in pairs) or political role (individually) and participate in a mock decision-making process determining the course society (at a given scale) will take regarding access to resources and the manner in which they are used. Students must research their stakeholder/political roles and are directed to do so by both assaying media coverage and by casual interaction with locals to ascertain their opinion on the topic at hand and stakeholders thereof.

Students then either present or assess presentations as part of the decision-making body, and then political role-players decide on a course of action, which is then presented to the collective. The whole process, and the issue at stake, is then debriefed as a group with faculty guiding the process. In Fiordland, New Zealand, an SSI might have students participate in a process to determine whether greater numbers of tourists will be allowed to visit Doubtful

Sound. On the Great Barrier Reef, Australia, an SSI might have students role-laying the decision making process to decide on the expansion of coal port facilities on the mainland nearby.

This process incorporates opportunities for students to learn in a broad range of styles;

1. Basic stakeholder perspectives and historical context are delivered in a traditional ‘transmission’ process.
2. Students representing stakeholders with whom their personal stance on the topic does not align are forced to consider the issue from another’s perspective.
3. Students in stakeholder roles must work in a small social setting.
4. Students in political roles must work as an individual, as a representative of their mock-constituents, and as part of a decision-making collective on their constituents’ behalf.
5. Students are encouraged to learn from interaction with local people and be critical in examining stakeholders’ opinions in context.
6. Students learn from their peers as part of the SSI process.
7. Reflection on the issue at hand and the interaction between stakeholders is drawn out by faculty at debrief.

Thus, reflection, central to ELT, is present in the SSI experience. So too is the contextual emphasis of SLT; SSIs are conducted in situ, with students directly experiencing both the social and physical environments within which the SSI is played out. Furthermore, through examination of stakeholder and political perspectives the CCP analysis of power structures is brought into the process. Finally, the icing on the cake is the examination of the resource issue using information generated through science framed within the QBL of society, economy, ethics, and the environment.

Recommendations

Over and above the recommendations for further research and/or application embedded in Chapters 2 and 3 there are opportunities to further our understanding of VBN theory through examination of the relative rates of change in values, beliefs and norms based on the quasi-experimental approach used here. The demonstration of SETss programs' ability to influence environmental belief within short time frames offers the opportunity to test for shifts in environmental values and environmental norms with a view to further refining understanding of where the New Ecological Paradigm sits along the VBN spectrum.

Teasing out the components of SETss pedagogy that are most influential on change in beliefs or sustainability literacy is a greater challenge. SSIs are identified as relatively low hanging fruit for further research. However, it must be noted that they, like the 'wicked problems' on which they focus, are complex and attention must be paid to ensure they are implemented effectively and consistently within curricula if any research based upon them is to be worthwhile.

One problem to bear in mind with transferring SSIs into other curricula is the context within which they are conducted. SLT would suggest that the *structure* of the SSI might transfer well into another setting only if the *content* was contextually relevant to students. Educators must be wary of this potentiality when selecting their SSI subject. Given the global possibilities of contemporary communication and media technology there are many opportunities to engage students with issues happening elsewhere on the planet and a reciprocal arrangement with another class at a similar institution in that locale would be worth exploring as a means of doing so for non-mobile educational settings.

Finally, research using quasi-experimental designs comparing courses implementing best practice SSIs with similar courses is called for. Ideally, surveying measures of sustainability literacy, values, beliefs and norms as variables of interest would contribute most to further refining the results presented in this thesis.

References

- Anderson, J. R., Reder, L. M., & Simon, H. A. (1996). Situated Learning and Education. *Educational Researcher*, 25(4), 5–11.
- Barnard, S., & Elliott, M. (2015). The 10-tenets of adaptive management and sustainability: An holistic framework for understanding and managing the socio-ecological system. *Environmental Science & Policy*, 51, 181–191.
- Baumgartner, L. M. (2001). An Update on Transformational Learning. *New Directions for Adult and Continuing Education*, 89, 15–24.
- Brown, J. S., Collins, A., & Duguid, P. (1988). Situated Cognition and the Culture of Learning. *Educational Researcher*, 18(1), 32-42.
- Carson, R. (1962). *Silent Spring*. New York: Houghton Mifflin.
- Chase, G. W., & Barlett, P. F. (2013). *Sustainability in Higher Education: Stories and Strategies for Transformation*. (G. W. Chase & P. F. Barlett, Eds.). Cambridge, Massachusetts: MIT Press.
- Cobb, P., & Bowers, J. (2014). Cognitive and Situated Learning Perspectives in Theory and Practice. *Educational Researcher* 28.
- Dawe, N.K. and Ryan, K.L. (2003). The faulty three-legged-stool model of sustainable development. *Conservation Biology*, 17(5): 1458-1460.
- Diamond, J. (2005). *Collapse: How societies choose to fail or succeed*. New York, New York:

Penguin.

Fenwick, T. J. (2000). Expanding Conceptions of Experiential Learning: A Review of the Five Contemporary Perspectives on Cognition. *Adult Education Quarterly*, 50(4), 243–272.

<http://doi.org/10.1177/07417130022087035>

Giroux, H. A., & McLaren, P. L. (1989). Introduction: Schooling, Cultural Politics and the Struggle for Democracy. In H. A. Giroux & P. McLaren (Eds.), *Critical pedagogy, the state, and cultural struggle*. Albany, New York: State University of New York.

Harraway, J., Broughton-Ansin, F., Deaker, L., Jowett, T., & Shephard, K. (2012). Exploring the Use of the Revised New Ecological Paradigm Scale (NEP) to Monitor the Development of Students' Ecological Worldviews. *The Journal of Environmental Education*, 43(3), 177–

191. <http://doi.org/10.1080/00958964.2011.634450>

Inayatullah, S. (2005). Spirituality as the fourth bottom line? *Futures* (37), 573-579. DOI:

10.1016/j.futures.2004.10.015

Kitchenham, A. (2008). Journal of Transformative Education The Evolution of John Mezirow's Transformative Learning Theory. *Journal of Transformative Education*, 6(2), 104–123.

<http://doi.org/10.1177/1541344608322678>

Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development*. New Jersey: Prentice Hall.

Kuh, G. D. (2008). *High-Impact Educational Practices: What They Are, Who Has Access To Them, and Why They Matter*. Washington, DC.

Kuh, G. D., Kinzie, J., Buckley, J. A., Bridges, B. K., & Hayek, J. C. (2006). *What Matters to Student Success: A Review of the Literature Commissioned Report for the National Symposium on Postsecondary Student Success: Spearheading a Dialog on Student Success*.

Retrieved from https://nces.ed.gov/npec/pdf/kuh_team_report.pdf

Leopold, A. (1949). *A Sand County Almanac*. Oxford, England: Oxford University Press.

Mezirow, J. (1990). *Fostering critical reflection in adulthood*. San Francisco: Jossey-Bass.

Piaget, J. (1947). *The Psychology of Intelligence*. Oxford, England: Armand Colin.

<http://doi.org/10.4324/9780203278895>

Sawada, D. (1991). Deconstructing Reflection. *Alberta Journal of Educational Research*, 37(4), 349–366. Retrieved from <https://eric.ed.gov/?id=EJ438294>

Stein, D. (1998). *Situated learning in adult education*. Columbus, Ohio. Retrieved from www.eric.ed.gov

Stephens, J. C., Román, M., Graham, A. C., Scholz, R. W., & Hernandez, M. E. (2008). Higher education as a change agent for sustainability in different cultures and contexts. *International Journal of Sustainability in Higher Education*, 9(3), 317–338.

<http://doi.org/10.1108/14676370810885916>

University Leaders for a Sustainable Future. (2015). Talloires Declaration Signatories List. Retrieved from <http://ulsf.org/96-2/>

Wals, A. E. J. (2014). Sustainability in higher education in the context of the UN DESD: a review of learning and institutionalization processes. *Journal of Cleaner Production*, 62, 8–15. <http://doi.org/10.1016/j.jclepro.2013.06.007>

World Commission on Environment and Development. (1987). *Our Common Future*. Oxford, .

Wright, T. S. A. (2002). *Deñitions and frameworks for environmental sustainability in higher education*. *Higher Education Policy* (Vol. 15). Retrieved from www.elsevier.com/locate/highedpol