The Pennsylvania State University

The Graduate School

College of Earth and Mineral Sciences

AWAKEN 101:

STUDENT EXPERIENCES IN

TRANSFORMATIVE ENVIRONMENTAL EDUCATION

A Dissertation in

Geography and Women's Studies

by

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Submitted in Partial Fulfillment
of the Requirements
for the Degree of

Doctor of Philosophy

August 2012

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ABSTRACT

Sustainability, the possibility that human and other life might flourish on the planet forever, implies a fundamental transformation of worldviews at both personal and societal scales. For educators, a significant site of engagement is the classroom, where learners can be invited to examine, challenge, and transform personal and societal values associated with (un)sustainability. At the core of such education is transformative learning, which involves experiencing a deep, structural shift in the basic premises of thought, feelings, and actions. Transformative environmental education prompts learners to reshape the unsustainable identities and worldviews they have inherited, with the goal of fostering more sustainable personal and societal ways of being.

To better understand the process and potential of transformative environmental education, this dissertation uses a case study approach to examine the outcomes of a college-level transformative environmental course. Through a mixed-methods mode of inquiry that combines qualitative semi-structured interviews with quantitative measurements of participants' values and behavior, I address the following research questions: (1) How does transformative environmental education affect learners' sense of self? (2) How does transformative environmental education affect learners' everyday lives? (3) How can environmental educators best implement transformative learning in their own teaching? In addressing these research questions, this dissertation paints a picture of transformative environmental education from the perspective of learners' lived experiences.

This work is part of an ongoing conversation with scholars and educators who are concerned with helping bring about a sustainable world. It draws from and contributes to the traditions of nature-society geography, transformative learning, feminist pedagogy, feminist environmentalism, and emotional geographies. Importantly, it also contributes to the pedagogy and practice of environmental educators across disciplines. Through an analysis of ecological identity, the social and relational dimensions of learning, and the internal/external landscape of transformation, this dissertation demonstrates that transformative environmental education is promising way for higher education to engage the challenge of sustainability.

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ACKNOWLEDGEMENTS

This dissertation was funded, in part, by the Penn State Institutes of Energy and the Environment. I am grateful for their assistance and their commitment to interdisciplinary environmental research.

I would like to thank my advisor, Lorraine Dowler, for her guidance, support, advice, and well-placed irreverence -- not to mention her skill at staying sane during the final semester, when I was flying the dissertation craft at ludicrous speed. She has a knack for providing just the right push in just the right direction at just the right time. Through her candid conversations, her award nominations, and her tireless and timely help, she managed to make many of my friends envy me my amazing advisor.

Thank you to each of my committee members: Brian King, whom I would hire as my academic agent if such a position existed; Petra Tschakert, whose boundless energy and dedication inspire me personally and professionally; Carolyn Sachs, who is appreciably well-grounded both in feminist environmentalism and in life; and Madhu Prakash, whose mentorship indelibly shaped my understanding of what education is and what it can be.

Thank you, too, to Chris Uhl, who has given the gift of BiSci 3 to the world. This project would not have existed without his courageous vision or without his support and generosity throughout all phases of the research: from our conversations, to my taking BiSci as a student, to my joining the TAs-in-training in Bio 400, to my repeated requests to distribute surveys in his classroom. Likewise, I would like to thank Seth Baum and Michael Dann for their warm accommodation.

Thank you to all the participants in this project, with a special shout-out to the spring 2010 Bio 400 class: Andrew, Brett, Brianna, Bridget, Caity, Dani, Gabby, JessR, Jess S, Jill, Jim, Julia, Kristin, Maggie, Maria, Marilyn, Megan, Sara, Solace,

Stacey, Tsultrim, and Vanessa. I am humbled to have received their trust, openness, and authenticity. Any time I feel less than optimistic about teaching or about the future, all I have to do is read a few of their wonderful interview responses and the world feels like a brighter place.

I would also like to thank Jess Watson and the staff in the Department of Geography and Department of Women's Studies offices, who saved my hide a number of times that I am aware of -- and probably several that I am not. Thank you, too, to my office-mate and unofficial sixth member of my committee, Maralee Mayberry, who selflessly provided me with advice and conversation throughout writing the dissertation and searching for a job, and who graciously allowed me to keep the desk by the window, while she was relegated to a desk in the windowless closet.

Thank you to Andrei Israel, who is my guide through the geography of Geography (which makes sense, I guess, given that at any point in time he has more library books stacked on his desk than the library has remaining on their shelves). His unwavering lightness of heart and passion for his life's work is refreshing and infectious. Furthermore, I would be remiss to overlook thanking him for his companionship as a teammate and as a (unfortunately not quite as tall) competitor in ultimate Frisbee, the activity that I credit with maintaining my mental and physical health through my graduate school years. Also, thank you to Nicole Laliberte for her insights into the magical realm of emotional geographies and to Rob Andrejewski for introducing me to environmental psychology and the Nature Relatedness scale.

Lastly, I would like to thank my partner, my star, my love, Hillary Jones. She has been with me through it all, thick and thin: research, writing, and revisions, with an especially keen eye for format and an insistence on using the irritating "show paragraph marks" option in MS Word to great effect (okay, admittedly, I'm using it right now). Hillary is my academic role model. It is no exaggeration to say that just about everything

I know about the nuts and bolts of research or academia I learned from her. Dissertation formatting, dissertation outlining, online collaboration and backup software, academic publications, academic blogs, academic search engines, academic jargon, major thinkers in multiple fields, teaching resources, teaching activities – if I can name it, it probably came from Hillary. Although I am quite convinced that she does, in fact, know everything, her wealth of knowledge comes in second to her richness of spirit. Hillary was a bottomless well of support and patience throughout this marathon of a project. Whenever a deadline loomed, she picked up the slack. Whenever I felt overwhelmed, she made things manageable. Whenever I got lost, she lighted the way. I feel honored and loved to be travelling this path with her.

Chapter 1

Introduction

> The crisis of sustainability, the fit between humanity and its habitat, is manifest in varying ways and degrees everywhere on earth. It is not only a permanent feature on the public agenda; for all practical purposes it is the agenda. […] Sustainability is about the terms and conditions of human survival, and yet we still educate at all levels as if no such crisis existed. — David Orr (1992, 83)

> Sustainability should reunify Geography. It carries at its core ecosystem functioning, the values of such functions aesthetically, economically and biologically, and the need to resonate them for adaptation and learning about the human condition. It equally carries the principles of peace, justice, resilience and reciprocity. These are core geographical outcomes of how people relate to themselves in a habitable world. […] But will geographers claim this new central ground? — Timothy O'Riordan (2003, 138)

Sustainability, understood as the possibility that human and other life will flourish on the planet forever (Ehrenfeld 2008), is perhaps the most significant issue facing humanity today. It manifests a tremendous political and technical challenge, but it is also a challenge of identity: how we perceive ourselves in relation to the natural world, how deeply we question the unsustainable worldviews we've inherited, and whether we value the knowledge, desire, and ability to actively shape more sustainable pathways. In short, sustainability implies a fundamental transformation at both personal and societal scales.

As prompted by David Orr, the question for higher education is what role universities and colleges can play in encouraging and informing this transformation. The field of geography, in particular, is well-suited for engaging both ecological and social dimensions of nature-society relationships and sustainability. For geographers and other

environmental educators, a significant site of engagement is the classroom, where learners can be invited to examine, challenge, and transform personal and societal values associated with (un)sustainability. At the core of such education for sustainability is transformative learning:

> Transformative learning involves experiencing a deep, structural shift in the basic premises of thought, feelings, and actions. It is a shift of consciousness that dramatically and irreversibly alters our way of being in the world. Such a shift involves our understanding of ourselves and our self-locations; our relationships with other humans and with the natural world; our understanding of relations of power in interlocking structures of class, race and gender; our body awarenesses, our visions of alternative approaches to living; and our sense of possibilities for social justice and peace and personal joy. (O'Sullivan 2002, 11)

Applying transformative learning to environmental education creates what might be called transformative environmental education. Transformative environmental education prompts learners to reshape the unsustainable identities and worldviews they have inherited, with the goal of fostering more sustainable relationships with the natural world on personal and societal scales. Through inviting and challenging learners to transform personal and societal ways of being, transformative environmental education appears to be a promising way for higher education to meet the challenge of sustainability.

Research Questions

To better understand the process and potential of transformative environmental education, this dissertation uses a case study approach to examine the outcomes of a college-level transformative environmental course. I employ a mixed-methods mode of inquiry, combining qualitative semi-structured interviews with quantitative measurements

of participants' values and behavior. This dissertation addresses the following research questions:

1. How does transformative environmental education affect learners' sense of self? In other words, what aspects of learners' identities change, and in what are the key aspects of this transformed identity?
2. How does transformative environmental education affect learners' everyday lives? In other words, does a shift in identity lead to a shift in pro-environmental action, and how do these shifts interact with learners' social networks?
3. How can environmental educators best implement transformative learning in their own teaching? In other words, what specific activities and general attributes are most important for encouraging transformation?

In addressing the above research questions, this dissertation paints a picture of transformative environmental education from the perspective of learners' lived experiences.

Case Study: BiSci 3

The case study examined in this project is a 300-person introductory biology course for non-science majors, BiSci 3 (officially BI SC 003)[1], offered every fall at The Pennsylvania State University by Dr. Christopher Uhl. Nicknamed "Awaken 101," BiSci 3 explicitly aims to be transformative, inviting and challenging students to explore sustainability as a cultural story and a personal outlook. The theme of the course is the

[1] As an introductory-level offering in biological science, the course is officially listed as BI SC 003. However, those involved in the course refer to it as BiSci 3 ("bye-sye-three"), or simply BiSci, a convention I adopt throughout this dissertation.

development of "ecological consciousness," or ecological identity, an internalized awareness of how one is connected to the natural world. In the fall 2010 course syllabus, Chris Uhl states:

> In this course I, along with the TAs and course coordinators, invite you to examine, from a variety of perspectives, the magnificence and mystery of life on Earth in hopes that we all might expand our ecological consciousness. […] My goal in BiSci 3 is no less than this: That each of us might think thoughts that we have never had the knowledge to think; that we might write what we have never had the wisdom to write; that we might say what we have never had the courage to say; and that we might feel what we have never had the awareness to feel… and, in so doing, that each of us might come to experience ever-more fully what it means to be an alive and awake human being.

As an explicitly transformative course, BiSci 3 features a number of practices, activities, and assignments designed to foster transformation and ecological identity.

The course is divided into three thematic parts: first, awakening to a sense of connectedness to Earth; second, honestly facing the severity of the current ecological crisis; and third, fostering personal and planetary transformation. In Part I of the course, titled "Earth Our Home," students explore ideas such as the role of conventional education, the awareness of life and breath, the interconnectedness of ecosystems, and what it means to be human. Part II of the course, titled "Assessing the Health of Earth," is about listening, literally and figuratively, to the health of Earth and exploring the connections between apathy, separation, and a refusal to listen to the declining state of human and natural systems. Transformation is brought to the forefront in the final part of the course, Part III, titled "Healing Ourselves: Healing Earth." The central theme of this part is transforming self and transforming society. Here students explore the possibilities of sustainability as a cultural story and a personal outlook, ecologically and socially healthy applications to daily life, and shifting from passivity to activity.

However, the transformational aspect of the course is in more than just the assignments and material. Above all, it is in the spirit of the course, the manner in which the course participants approach learning. It is clear from the beginning that this is a different kind of course. By the second week of BiSci 3, students have encountered questions like, where is home? Where did I come from? How did things come to be? What is my purpose here? Is the universe alive? With its focus on ecological identity, relationships, sustainability, and transformation, BiSci 3 is a paradigmatic case study for understanding transformative environmental education.

Significance of the Study

The significance of this study is twofold. First, it draws from and informs the theory and practice of interlocking traditions in geography, women's studies, and education. Nature-society geography provides the overarching rationale and entry point for this work – namely, sustainable relationships between humans and the environment – and the field of transformative learning situates this concern in the context of higher education. Feminist pedagogy, specifically traditions informed by feminist environmentalism, also shares a similar outlook on personal and societal transformation. Also using the lens of emotional geographies to illuminate the landscape of transformation, this dissertation thus contributes to the central socio-environmental concerns of nature-society geography and feminist environmentalism, exploring how transformative learning and feminist pedagogy can reshape humanity's relationship with the natural world.

Second, this dissertation can also serve as a guide for environmental and sustainability educators across disciplines. The challenge of sustainability knows no disciplinary boundaries, and as such, this study is fiercely interdisciplinary. It originates in geography, but it is informed by research methods from women's studies, explores a paradigm of learning from adult education, uses a biology course as a case study, and draws from the fields of environmental studies, psychology, and sociology. This work is part of an ongoing conversation with educators across disciplines who are concerned with helping bring about a sustainable world. It addresses Janet Moore's (2005) feminist, critical, and interdisciplinary call for higher education to explore transformative learning in the service of sustainability:

> The message is quite simple – a paradigm shift needs to occur if we are going to stop the increasing global rates of human-caused environmental and social degradation. The difficult question is How can education include the dialogue and actions necessary to create this kind of change? What role can transformative learning play in creating a more sustainable future? (Moore 2005, 79)

Ultimately, this study is about relationships, at scales ranging from the personal to the societal. Sustainability requires a deep shift in many of these relationships, and higher education can play an important role in fostering that transformation. This dissertation informs, and will hopefully inspire, this important process.

Chapters of the Dissertation

This dissertation consists of seven chapters:

1. Introduction
2. Literature Review
3. Research Methods
4. Transformation and Identity
5. Transformation and Learners' Everyday Lives
6. Implementing Transformative Environmental Education
7. Conclusion

The following sub-sections preview each of the six upcoming chapters.

Preview of Chapter Two: Literature Review

Chapter two situates this study in scholarly conversation and provides a review of existent literature. The traditions of nature-society geography, transformative learning, feminist pedagogy, feminist environmentalism, and emotional geographies most directly inform this work.

In studying the connections between humans and the environment, nature-society geography is fundamentally about relationships. Nature-society geography provides the overarching rationale and entry point for this work: what is our relationship with nature, and what ought it to be? Applying this question to the context of higher education involves asking how education can shape, reinforce, challenge, or alter learners' relationships with nature along more sustainable pathways. This is a matter of transforming identity, of transformative learning. The tradition of transformative learning

views education not as the accumulation of information, but as a fundamental shift in the self.

Transformative learning has much in common with feminist pedagogy. The characteristics of feminist pedagogy include learner empowerment, building community, privileging the individual voice, and challenging traditional views. Extending feminist pedagogy to engage environmental concerns draws from the tradition of feminist environmentalism, an umbrella term that includes approaches like ecofeminism, feminist political ecology, and ecogender. Feminist environmentalism is a matter of putting and keeping environmentalism on the feminist agenda, and vice versa.

Feminism and geography coalesce in the study of emotional geographies, a subfield of human geography. Emotional geographies illuminate how emotions are co-constitutive of everyday life, emerging through relationships and shaping the self. This, then, returns to the idea of personal and societal transformation. Woven together, the traditions of nature-society geography, transformative learning, feminist pedagogy, feminist environmentalism, and emotional geographies inform the study of transformative environmental education.

Preview of Chapter Three: Research Methodology

The third chapter discusses the research methodology and methods used in this study. Methodologically, my approach is informed by feminist and participatory perspectives, which view the researcher as an integral part of the research. I also stand behind the feminist commitment to fostering empowerment and promoting social change.

I use a case study approach to examine BiSci 3 as a case of transformative environmental education in a large university setting. The primary research population consists of former students who returned to the course as teaching assistants, but the class as a whole is also an important population. Methodologically, I employ a mixed-methods approach, including both qualitative and quantitative methods. A mixed-methods approach was chosen to provide rich detail about the process and outcomes of transformative learning, triangulating results between qualitative interviews and quantitative measurements.

I use qualitative interviews explore participants' lived experiences within and outside BiSci 3. Personal, qualitative change is the essential nature of transformative learning; hence, qualitative methods are the primary mode of inquiry for this study. Learners experience transformation in multiple and differentiated ways, and qualitative methods emphasize multiple meanings rather than a single, static interpretation. The learner's own understanding of the experience enriches the assessment of what changes occurred, how they happened, and what contributed to them.

I administered quantitative pre- and post-test surveys to the whole BiSci 3 class at the beginning and end of the fall 2009 and fall 2010 semesters. The 2009 survey uses the Nature Relatedness scale to assess the development of ecological identity over the duration of the semester. The 2010 survey uses a variety of scales and measurements to assess changes in participants' everyday lives, including pro-environmental action and interactions with their social networks. Additionally, both post-test surveys include a mix of closed-response and open-response items from the Learning Activities Survey,

assessing how strongly particular course activities contribute to participants' transformative experiences.

Preview of Chapter Four: Identity and Transformation

Chapter four begins the main body of the dissertation. It addresses the following research question: How does transformative environmental education affect learners' sense of self? In other words, what aspects of learners' identities change, and in what are the key aspects of this transformed identity?

The chapter consists of two parts. The first part is about ecological identity, which describes an internalized sense of connection with nature. Developing ecological identity is one of the major goals of transformative environmental education, and is also an explicit goal of BiSci 3. In order to assess the development of ecological identity, I draw from the quantitative Nature Relatedness scale. The NR scale consists of three components: NR-Self, which represents internalized identification with nature; NR-Perspective, which represents a nature-focused worldview; and NR-Experience, which represents physical comfort and familiarity with natural world. Results from the NR surveys demonstrate that transformative environmental education can indeed lead to significant development of ecological identity, and that transformation is not just limited to an engaged few learners. This conclusion is further strengthened by an analysis of qualitative interview and survey responses, which provide an in-depth account of transformation and ecological identity.

The second part maps the internal terrain of the self, exploring how transformative environmental education affects learners' sense of self beyond their relationship with nature. Here I take an inductive approach, drawing from the most common themes expressed in participant interviews and surveys. The results demonstrate the importance of critical self-reflection, a caring and authentic relationship with the self, and adopting course ideas as a way of life. One aspect of participants' experiences that is particularly notable is the centrality of emotion to transformation. The presence of happiness and passion, but also intense sadness and feelings of loss, demonstrate that transformation is strengthened by, and perhaps even requires, strong emotion. From an emotional geographies perspective, emotions are the connective tissue that links self with nature, providing for the foundation of ecological identity.

Preview of Chapter Five: Transformation and Learners' Everyday Lives

Chapter five addresses the following research question: How does transformative environmental education affect learners' everyday lives? In other words, does a shift in identity lead to a shift in pro-environmental action, and how do these shifts interact with learners' social networks?

This chapter's two parts mirror the two parts of the research question. The first part is about pro-environmental actions and participants' perceived importance of those actions. Beginning with a discussion of empowerment and active caring, I use qualitative interviews and quantitative survey results to examine the relationship between beliefs and actions, including the belief-action gap. The story of pro-environmental action that

emerges is complex and murky; transformative environmental education does lead to empowerment and increases pro-environmental beliefs and actions, but in some cases no more than more traditional environmental education, and perhaps not in ways that could make the most significant difference on a broader scale. There appears to be more room for fostering action in transformative environmental education

The second part considers participants' social networks, examining the presence and absence of support in their everyday lives. The clear theme that emerges from participant interviews is the mixed level of support that participants receive, particularly from their friends and peers. For participants and their social networks, transformation is a double-edged sword: it strengthens some relationships but strains others. These results are corroborated by the quantitative Social Connectedness Scale, which reveals a decline in social connectedness among participants who report being changed by BiSci 3. Fortunately, participants also report greater confidence in their beliefs and commitment to their causes in the presence of others. Drawing on insights from emotional geographies, I argue that transformative learning is inherently relational, with a particularly strongly social dimension. The social dimension of transformation, along with the findings on pro-environmental action, paint a complex picture of the effects of transformative environmental education in learners' everyday lives.

Preview of Chapter Six: Implementing Transformative Environmental Education

The sixth chapter addresses the following research question: How can environmental educators best implement transformative learning in their own teaching?

In other words, what specific activities and general attributes are most important for encouraging transformation?

Like the previous chapters, this chapter consists of two parts. The first part considers which specific aspects of BiSci 3 contribute most strongly to participants' transformation. I draw from the quantitative elements of the Learning Activities Survey to examine the course activities and people that contribute to learners' transformative experiences. The results reveal that active learning with an element of reflection, or reflective action, is the foundation upon which transformation is built. Extra-rational dimensions of learning, as illuminated through the lens of emotional geographies, also emerge as key elements of transformation.

The second part explores the more general characteristics of BiSci 3 that are important for transformative environmental education. Here I draw primarily from an inductive analysis of the themes that emerged from participants' interview and open-ended survey responses. The analysis suggests that transformative environmental education is about engaging real life, not focusing on tests and grades, and maintaining a personal, learner-centered emphasis. However, transformation not only requires looking inward at the self, but also outward at the world. This is the landscape of transformation, which transcends the internal/external boundary. I integrate these findings with the results from pervious chapters, concluding with a list of specific lessons for environmental educators who are interested in implementing transformative learning in their own teaching. The lessons reinforce the importance of reflection, peer guidance, the whole self, active learning, and taking action to transformative environmental education.

Preview of Chapter Seven: Conclusion

Chapter seven concludes the dissertation, summarizing the arguments of the previous chapters and suggesting directions for future research. In doing so, it highlights the contributions of this study to geography, women's studies, education, and other disciplines concerned with fostering more sustainable nature-society relationships through empowering education.

In particular, the landscape of transformation revealed by this study has important theoretical and practical implications. The landscape of transformation demonstrates that to make a significant difference, transformation must bridge the internal/external boundary between the internal self and the external world. Similar blurring of the internal/external divide is reflected in the social dimension of transformation, the dual importance of self-reflection and reflective dialogue with others, and the relational nature of transformative experiences grounded in particular places.

Through an analysis of ecological identity, the social dimension of transformation, and the landscape of transformation, this dissertation demonstrates that transformative environmental education represents a promising way for higher education to engage the challenge of sustainability.

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Chapter 2

Literature Review

This chapter situates this study in scholarly conversation and provides a review of existent literature. The traditions of nature-society geography, transformative learning, feminist pedagogy, feminist environmentalism, and emotional geographies most directly inform this work.

Nature-Society Geography

The overarching rationale and entry point for this work is provided by nature-society geography. The tradition of nature-society geography is fundamentally about relationships, foregrounding the study of connections between people and the environment. Susan Hanson (2004, 720) describes the understanding of these relationships between people and the environment as the primary characteristic of "'the geographic advantage,' a phrase that communicates the truth that geographers have something to offer that others do not."

Nature-society geography embraces a wealth of subfields and traditions. The traditions most relevant to this project that are at least partially located in geography are sustainability science, political ecology, and resilience studies. Sustainability science, as I use it here, is an umbrella term for multiple sciences that address meeting human needs while supporting the life-systems of the planet (Kates and Parris 2003; Turner et al.

2003), including vulnerability analysis and land-change science (Turner and Robbins 2008). Sustainability, and creating sustainable societies, is likewise a concern for nature-society geography more broadly (Whitehead 2007). In this tradition,

> The question is *not* how do we re-integrate humans and nature in order to have a more sustainable existence (suggesting that humans are currently an external disturbance to nature), but why do we have socio-ecological systems that are unsustainable and what do we need to create more ecologically friendly and socially just human-environment relations? (Mansfield 2009, 40)

An understanding of social-ecological systems as tightly linked is a core feature of nature-society geography. Society and the environment are intertwined; as geographers, "From the outset we must insist that these two categories are interlaced and impossible to separate" (Robbins et al. 2010, 3).

Similarly, Karl Zimmerer and Thomas Bassett (2003) identify the synthesis of social and ecological dimensions of environmental issues as one of the hallmarks of a geographic approach to political ecology. Paul Robbins (2004) describes political ecology in terms of a dual metaphor: the hatchet and the seed. Political ecology is both a critique (the hatchet) and a research project that promotes equity and sustainability (the seed). As a critique, political ecology exposes flaws in dominant approaches to and understandings of the environment. For political ecologists, it is axiomatic that current social and environmental conditions are specific outcomes of power and not inevitable, so one of the chief aims is to denaturalize these conditions. As equity and sustainability research, political ecology is about preserving and developing sustainable ways to make a living. Both the hatchet and the seed contain an explicitly normative commitment to helping shape a more just and sustainable world. It is in this normative sense that political ecology informs this project. This project address two questions suggested by the hatchet

and seed metaphor, one empirical and one ethical: what is our relationship with nature, and what ought it to be?

Lastly, the tradition of resilience studies has a special relationship with transformative learning. The resilience perspective views coupled social-ecological systems are complex adaptive systems, which are multi-scalar, nonlinear, surprising, self-organizing, evolving, and involve multiple overlapping interactions and feedbacks (Folke 2006). One of the key insights from the resilience perspective is that change is a fundamental aspect of complex systems (Nelson et al. 2007). Learning is essential for coping with such change and uncertainty in complex social-ecological systems. Derek Armitage, Melissa Marschke, and Ryan Plummer (2008, 87) assert that "building the capacity of individuals, organizations and societies to collaboratively learn through change and uncertainty is fundamental to environment and resource management and sustainability science." Armitage and colleagues outline a typology of learning types based on Mezirow's transformative learning theory, arguing for double-loop learning, which challenges existing worldviews and underlying values. They also describe triple-loop learning, which is concerned with how governance systems provide for double-loop learning. In the context of this project, double-loop learning clearly corresponds to the process of transformative learning, while triple-loop learning describes the creation and maintenance of spaces that foster transformation. Hence, transformative environmental education can be understood in terms of double- and triple-loop learning.

Green Human Geography

This study speaks to the central concerns of nature-society geography, but it would be more accurate to locate this project in the intersection of nature-society geography and human geography. Among the subfields of human geography, I specifically discuss feminist geography below in the section on emotional geographies, and this project also draws from critical geography more broadly. Although Nicholas Blomley (2006) argues that the label of critical geography is overused and difficult to pin down, I use it here in the sense described by Marv Waterstone (2004, 487), as part of the effort to "break down the 'commonsense' notions that support and legitimize the regressive status quo." Transformative environmental education reflects this critical orientation, both in its premise that problematic personal and societal worldviews underlie unsustainable practices, as well in its normative commitment to challenging those worldviews.

This suggests a need for understanding the role of perception and value systems in shaping the relationships between humans and the environment. Noel Castree (2005, 72) argues that in the 1970s, geography missed a "golden opportunity" to focus on human impact studies and environmental issues, and that purportedly ethically neutral and value-free research on human impacts "did little to challenge the human actions and value systems that generated environmental degradation in the first place." This is precisely the entry point for transformative environmental education.

In this view, this project is most strongly situated in Castree's hypothetical "green human geography," which focuses on "people's attitudes towards, and uses of, the non-

human world" (Castree 2005, 89). Karen O'Brien (2011b) similarly calls for the development of a new science on global change that integrates insights from human geography and fosters transformational social change:

> [C]limate change, biodiversity loss, land cover changes, water quality and availability, and many other environmental problems are about more than just 'human impacts on the environment'. They are manifestations of modernity, symptoms of dominant patterns of development, outcomes of social relations, and products of short-sighted visions, which are closely linked to beliefs, values, and world-views. Consequently, a deeper understanding of the role of human beings and their social, cultural, political, and economic relations is needed to foster the large-scale transformations in human attitudes, behaviors, and systems necessary to respond to what scientists consider to be an 'overstepping of planetary boundary conditions' in a complex, interconnected Earth System. (O'Brien 2011b, 542)

O'Brien further argues for research in geography that "helps us to understand how to deliberately transform systems and society in order to avoid the long-term negative consequences of environmental change" (O'Brien 2011a, 7). Applying this deliberately transformative approach of green human geography to the context of higher education involves asking how education can shape, reinforce, challenge, or alter learners' relationships with nature along more sustainable pathways.

Transformative Learning

Transformative learning is both a tradition of adult education and a type of learning. For transformative educators, learning not about the mere accumulation of information, but about the transformation of the self. Here, transformation is understood as more than change; transformation is a dramatic, discontinuous paradigm shift (Mezirow 2000b; Poutiatine 2009). The particular vision of transformative learning that I

am using to inform this project is "integral" transformative learning, defined by Edmund O'Sullivan (2002, 11) as "experiencing a deep, structural shift in the basic premises of thought, feelings, and actions." Transformative learning is a matter of identity, of who learners are and how they relate to the world. Integral transformative learning specifically emphasizes developing relationships with the natural world, which can be described as ecological consciousness (O'Sullivan and Taylor 2004) or ecological identity (Thomashow 1995). Ecological identity involves being mindful of and celebrating one's embeddedness within nature, holding pro-nature beliefs and values that are meaningful on a personal level, and having awareness and appreciation for the wonder of life. O'Sullivan and other scholars at the Transformative Learning Centre at the University of Toronto have applied integral transformative learning in the context of adult environmental education (Clover et al. 2000), politics and spirituality (O'Sullivan et al. 2002), and diverse life settings (O'Sullivan and Taylor 2004).

O'Sullivan describes integral transformative learning as central to an ecozoic planetary vision, or a more holistic, ecologically-sound way of being that recognizes the interdependent relationships between parts of the natural world, including humanity. In the words of O'Sullivan:

> I would say that an ecozoic vision must have as its fundamental premise this broadened sense of community and the integral relationships that the humans have to have with it. The development of this consciousness must be one of the profound educational directions for [our time]. (O'Sullivan 1999, 70)

Thus, O'Sullivan's integral transformative learning is less about the theory and practice of teaching and learning than it is about a vision for education (Moore 2005). This study operationalizes the vision of integral transformative learning, putting it in conversation

with more theory- and practice-based traditions of transformative learning. Still understood as a shift in consciousness or identity, the blending of these traditions forms what I am calling transformative environmental education.

Though its vision is central to this project, integral transformative learning is not the only approach to transformative learning. John Dirkx (1998) outlines four additional strands of transformative learning, each with an overlapping but somewhat distinct emphasis and historical trajectory:

1. Transformation as consciousness-raising
2. Transformation as critical reflection
3. Transformation as development
4. Transformation as individuation

The first two strands, transformation as consciousness-raising and transformation as critical reflection, are the two that are most relevant to this project. I explore these two strands in the following sub-sections.

Transformation as Consciousness-Raising

Many of the ideas in transformative learning can be traced back to Paulo Freire, best known for his foundational work in critical pedagogy. Freire's *Pedagogy of the Oppressed* (1970), first published in Portuguese in 1968 and English in 1970, draws from Freire's experiences with educating illiterate adults in Brazil and is rooted in a Marxist critique of oppression, colonization, and class struggle. Freire argues that the fundamental task of education is liberation, engaging learners in the act of *conscientização* (conscientization or critical consciousness), which involves "learning to perceive social,

political, and economic contradictions, and to take action against the oppressive elements of reality" (1970, 17). Both learning to recognize oppression and taking action against it are central to critical consciousness.

Freire's more recent work expands and deepens this early analysis; his posthumously-published writings explore the need for combining social justice with ecological sustainability and biocentric concerns (Freire 2004). This approach, labeled ecopedagogy, has since been continued by Moacir Gadotti (2002) and other scholars at the Paulo Freire Institute in São Paulo. In the United States, Richard Kahn's work on ecopedagogy (2010) is rooted in the same tradition. Kahn's objective is to develop "a dialectical blending of critical pedagogy and environmental education" that works towards "a more inclusive, critical and transformative ecopedagogy" (Kahn 2003, 5). The most direct way that the Freirean tradition of transformation as consciousness-raising informs this project is through feminist pedagogy, and the work of bell hooks (1994) in particular. I will return to bell hooks later in the section on feminist pedagogy.

Transformation as Critical Reflection

By far the most extensive tradition in transformative learning is centered on the work of Jack Mezirow (1990; 2000b), which I refer to as classic transformative learning theory. Based on his work with women who had returned to school as adults in the 1970s, Mezirow developed a theory of transformative learning that draws from cognitive and developmental psychology. Critical self-reflection and active dialogue are central

components of transformation, which is primarily a process of reflecting rationally on one's assumptions and beliefs. In this view,

> Transformative learning refers to the process by which we transform our taken-for-granted frames of reference (meaning perspectives, habits of mind, mind-sets) to make them more inclusive, discriminating, open, emotionally capable of change, and reflective so that they may generate beliefs and opinions that will prove more true or justified to guide action. (Mezirow 2000a, 8)

In transformative learning theory, a frame of reference is essentially equivalent to a paradigm (Kitchenham 2008), so transforming taken-for-granted frames of reference means transforming unexamined worldviews. While Mezirow does not apply this theory to any particular context, it has clear and immediate applicability to transformative environmental education, where unsustainable worldviews necessitate personal and societal transformation.

Classic transformative learning theory points to a disorienting dilemma that often triggers transformation, but the transformative process itself can be quite long and involved. According to Mezirow, the transformative process includes ten stages (Mezirow 2000a):

1. A disorienting dilemma
2. Self-examination with feelings of fear, anger, guilt, or shame
3. A critical assessment of assumptions
4. Recognition that one's discontent and the process of transformation are shared
5. Exploration of options for new roles, relationships, and actions
6. Planning a course of action
7. Acquiring knowledge and skills for implementing one's plans
8. Provisional trying of new roles
9. Building competence and self-confidence in new roles and relationships
10. A reintegration into one's life on the basis of conditions dictated by one's new perspective

Although presented in a numbered list, it is important to note that the stages of transformation aren't necessarily linear in practice (Baumgartner 2001). Transformation is a complex and fluid process.

Most work in the field of transformative learning is based in this classic tradition of critical reflection. Notable transformative learning scholars include Patricia Cranton (2006), Edward Taylor (2007), and Kathleen King (2009). Although it still emphasizes cognitive-rational reflection at the center of the transformative process, newer work in this tradition is more open to considering emotion and other extrarational ways of knowing as important parts of transformative learning (Baumgartner 2001; Cranton 2006).

One of the most notable studies that emphasizes extra-rational ways of knowing is Gordon Ball's (1999) qualitative study social and environmental activists. As the underlying research question, Ball queries what experiences lead some people to care

passionately about the welfare of the planet and future generations. His findings indicate that transformation is often accidental, arises from certain common experiences, is preceded by readiness for transformation (the locus of learning is in the person, not the event), and is part of a larger context instead of being just a single time-bound experience. Similar to but importantly different than Mezirow, Ball's analysis suggests five phases of transformation:

1. Disequilibrium: intense emotion; real, concrete experiences
2. Meaning making: not a deliberate, intellectual process; locus of change in behavior rather than solely intellectual; expansion of possibilities; unity and connectedness; confidence and empowerment; integrating change into identity
3. Building commitment and responsibility: clearer direction; personal, moral imperative; passion; draw support from kindred others
4. Acting anew: action necessary to confirm transformation; impatient to act; strong feelings; political action becomes personal
5. Renewal: more open to further change

The strongest, most consistent finding from this study is the degree to which emotions accompany transformation. Ball's work provides an important foundation for this study, emphasizing the importance of extra-rational ways of knowing and providing a framework for understanding transformation in the lives of social and environmental activists.

In a similar vein, Elizabeth Lange (2004) examines the potential of transformative learning for revitalizing action toward a sustainable society. Her qualitative study of returning students in an extension course suggests a dialectic of transformative learning and restorative learning, where the disorientation of transformation is balanced by the

stability of personal ethics. Many participants in her study indicated that they did not transform their fundamental principles, but were instead able to return to their inner compass. They noted a restoration of relationships and a shift from having (things) to being. Lange's work is important for this project in large part because it posits that transformation is not just an epistemological process involving a change in worldview and thinking, but an ontological process where participants experience a change in their being in the world.

Other Transformative Approaches to Environmental Education

While not situated directly in the tradition of transformative learning, other emerging approaches to radical, transformative education help inform this project. From a geographically-informed perspective, David Gruenewald (2003) argues for combining the traditions of critical pedagogy and place-based environmental education to create a critical pedagogy of place. Like the hatchet and the seed from political ecology, Gruenewald addresses the dual objectives of decolonization and reinhabitation: both challenging ecologically destructive ways of being and learning to live in specific places in more ecologically-sound ways.

Place is also central to David Orr's work on ecological literacy (1992; 2004). Orr describes the basis of ecological literacy as "knowing, caring, and practical competence" (Orr 1992, 92) regarding both how to live well in one's particular place and how whole societies might live sustainably. Work at the Center for Ecoliteracy in Berkeley builds upon Orr's concepts of ecological literacy along with Fritjof Capra's work on holistic

systems thinking (Capra 2002). Its central concern is how to educate children with "the competencies of heart and mind that they will need to create sustainable communities" (Stone and Barlow 2005, 1).

The theme of holism is also explicitly taken up by the appropriately-named field of holistic education, particularly John Miller (2007) and Ron Miller (1990). Ron Miller describes holistic education in terms of transformation and the creation of "a more compassionate, democratic, life-affirming, ecologically sustainable society" (Miller 1990, vi), based on an organic relationship with the natural world and an interconnected sense of self. Notably for this project, the instructor of BiSci 3, Chris Uhl, specifically situates his pedagogy in the tradition of John and Ron Miller, among others (Uhl and Stuchul 2011, x).

Feminist Pedagogy

Returning to the view of transformation as consciousness-raising, bell hooks (1994) draws specifically on Freire to build a transgressive feminist pedagogy that empowers students and challenges existing systems of domination. hooks' key extension of Freire's ideas is a focus on multiculturalism, and specifically an awareness of gender, race, and class. She speaks of the "power of transformative pedagogy rooted in a respect for multiculturalism" (hooks 1994, 40), identifying the building of community as a central part of this process. In this multicultural community, individual voices and different ways of knowing are valued, creating a climate of openness, free expression, and collective responsibility. An active, participatory approach to learning is key, as

"making the classroom a democratic setting where everyone feels a responsibility to contribute is a central goal of transformative pedagogy" (39). For hooks, transformative education is rooted in an awareness of and respect for difference.

In her foundational essay, Carolyn Shrewsbury (1993, 8) also describes a feminist classroom as a liberatory environment, in which "a community of learners is empowered to act responsibly toward one another and the subject matter and to apply that learning to social action". According to Shrewsbury, the three central concepts to feminist pedagogy are

1. Empowerment: feminist pedagogy seeks to increase the power of all students, where power is understood as capability, "as energy, capacity, and potential rather than domination" (Shrewsbury 1993, 10). To be empowered is to recognize one's agency with regard to learning, connecting to others, and working for social change.
2. Community: Shrewsbury notes that relationships are the very web of existence. In this view, the classroom is a community of learners where both autonomy of self and mutuality with others are emphasized. There is also a drive to move learning beyond the classroom and link theory to action.
3. Leadership: the feminist teacher is a role model of a leader, where leadership is characterized as "the embodiment of our ability and our willingness to act on our beliefs" (Shrewsbury 1993, 13) and "a special form of empowerment that empowers others" (Shrewsbury 1993, 14). The role of such leadership is to help create an empowered community inside the classroom that can continue to work for positive change outside the classroom.

Shrewsbury describes feminist pedagogy as engaged teaching/learning, which includes engagement with the self in a reflective process, with the material, with other learners in

a network of relationships, and with outside communities and movements for social change.

In their multidisciplinary literature review, Lynn Webb, Myria Allen, and Kandi Walker (2002) expand on Shrewsbury's concepts and identify six principles of feminist pedagogy that underscore much of the field. These principles are

1. Reformation of the relationship between professor and student: blurring the line between teacher and learner, such that students increasingly assume roles as co-teachers and instructors increasingly assume roles as co-learners
2. Empowerment: emphasizing democratic and shared power and linking theory to practice
3. Building community: forging connections between people within the classroom, and between the classroom and its outside communities
4. Privileging the individual voice as a way of knowing: valuing individuals' knowledge, experiences, values, and actions
5. Respect for diversity of personal experience: valuing ways of knowing that are traditionally silenced, such as intuition and emotion
6. Challenging traditional views: working against oppressive hierarchies inside and outside the classroom; recognizing that education and knowledge are never context- or value-free

Taken together, the principles of Shrewsbury and Webb and colleagues contribute to the creation of an engaged, transformative learning environment, one that speaks to many of the concerns of transformative environmental education.

Feminist Environmentalism

As both a social movement and a body of theory, feminism has a long history of engagement with environmental concerns. This overlap of feminism and environmentalism is often labeled as ecofeminism. However, "ecofeminism" is a contested label, and one that sometimes connotes an essentialist conception of women as inherently closer to nature and/or a spiritual orientation that many academic feminists critique as apolitical and atheoretical (Seager 2003). On the other hand, Noel Sturgeon (1997) makes a compelling case that this is a "straw woman" characterization of ecofeminism, one that arises from a selective reading of early ecofeminist work and does not do justice to the sophisticated conversations in the field. In light of this contested terrain, I have opted to use the more cumbersome but less problematic term "feminist environmentalism" to denote the general overlap of feminism and environmentalism, reserving the label "ecofeminism" for work that self-identifies in the ecofeminist tradition. As used here, feminist environmentalism is an umbrella term for a number of feminist approaches to environmentalism, including ecofeminism in all its variants, ecogender (Banerjee 2007), and feminist political ecology (Rocheleau et al. 1996; Elmhirst 2011). Feminist environmentalism, broadly defined, is about the "enterprise of putting and keeping environmentalism on the feminist agenda and feminism on the environmental agenda" (Seager 2003, 949).

Feminist Environmental Philosophy

Relationships with the natural world are a central concern in feminist environmentalism, particularly ecofeminism. Ecofeminism challenges the perceived separation of humans from nature, arguing that a sustainable future hinges on recognizing and celebrating our relationships with the natural world (Warren and Erkal 1997). For ecofeminists, relationships are specific and embodied. Val Plumwood (1991) critiques ethical universalism and abstractions that often denigrate the embodied, the emotional, and the natural world itself as inferior. She argues that

> Special relationship with, care for, or empathy with particular aspects of nature as experiences rather than with nature as abstraction are essential to provide a depth and type of concern that is not otherwise possible. Care and responsibility for particular animals, trees, and rivers that are known well, loved, and appropriately connected to the self are an important basis for acquiring a wider, more generalized concern. (Plumwood 1991, 7)

According to Plumwood, not only are empathy and care important prerequisites for long-term change, but this empathy and care must be born out of specific connections to particular places.

Informing the ecofeminist emphasis on the particular and embodied, feminist ethics prioritize relationships and relationality. Starting from a critique of abstract, universalist ethics, Carol Gilligan (1982) and Nell Noddings (1984) articulate an "ethic of care" that prioritizes specific, embodied, material relationships. In this view, moral decisions are emergent from specific contexts, and emphasize the responsibility of nurturing and care inherent in interconnectedness. Mary C. Raugust (1992) describes the central priority of feminist ethics as relationship with other beings, and the principle measure of ethical behavior as the giving and receiving of care. As an important

ecofeminist extension to these views, Deane Curtin (1991) argues that an ecological ethic of care is a politicized ethic of care, one which involves action and making connections to larger scales. In geography, work on the geographies of care further emphasizes connection, scale, and politics. Victoria Lawson (2007, 3) describes how feminist care ethics begins with a social ontology of connection, foregrounding social relationships of mutuality and trust, but "what is most important is that care ethics suggests different ways of theorizing politics." Personal and politically responsible relationships are central to feminist environmental philosophy.

The importance of relationships also has implications for the process and characteristics of knowledge itself. Donna Haraway (1988), Sandra Harding (2004), and other scholars of feminist epistemology hold that knowledge is situated, partial, and contextual. In her work on ecological thinking, Lorraine Code (2006) describes an epistemology that is fundamentally relational, situated, embodied, and interdependent. It also suggests a collective responsibility for knowing. Knowledge is constitutive of, and responsible to, specific places and communities. It does not exist apart from these relationships, and attempting to extract it from these locations only serves the aims of mastery and domination. Working against this ethos of mastery, and working towards the production of habitats where people can live well are major goals of ecological thinking. As Code describes,

> [E]cological thinking is not simply thinking about ecology or about the environment; it generates revisioned modes of engagement with knowledge, subjectivity, politics, ethics, science, citizenship, and agency, which pervade and reconfigure theory and practice alike… ecological thinking is about imagining, crafting, articulating, endeavoring to enact principles of ideal cohabitation. (Code 2006, 24)

For Code, taking relationships and ecology seriously means rethinking both the process and responsibilities of knowledge. This relates directly to the teaching and learning of environmental education.

Feminist Environmental Pedagogy

An environmentally-oriented feminist pedagogy is an emerging perspective still in the early stages of development. It is also diffuse. Insights from feminist environmentalism, especially ecofeminism, have informed pedagogical approaches to natural science (Zell 1998), environmental philosophy (Hallen 2000), literacy (McAndrew 1996), and social work (Besthorn 2003), among others. In this last approach, educating social workers for ecological activism and social justice, Fred Besthorn argues that social and environmental issues overlap and reinforce each other in significant ways. He articulates what could be considered the central premise of feminist environmental pedagogy, that "issues of social and economic justice are inseparable from ecological justice and all three are intimately associated with the ways of power" (Besthorn 2003, 87).

In their discussion of ecofeminist pedagogy, Constance Russell and Anne Bell (1996) identify the dual goals of helping students participate in local issues that are personally meaningful for them and making connections between those issues and the "big picture". Habits of both the heart and mind are important. As Russell and Bell argue, "If environmental education is to be truly transformative, students must have both the desire and the ability to become actively involved" (Russell and Bell 1996, 179). They

also distinguish between teaching *about* the environment, *in* the environment, *for* the environment, and *with* the environment. Mainstream environmental education typically teaches only about the environment, and nature remains an abstraction. In contrast, Russell and Bell argue that teaching in, for, and with the environment is necessary for developing an appreciation for and connectedness to particular places, especially students' home places.

One of the most extensive explorations of feminist environmental pedagogy is Jenn Kamrar's (2008) master's thesis on ecofeminist pedagogy. Kamrar discusses ecofeminist pedagogy in terms of a holistic approach to education that prioritizes relationships between humans and the greater living world. She distinguishes the ecofeminist approach as one that values "a relationship to nature as opposed to subjugation of nature" (Kamrar 2008, 127), where nature is understood as a dynamic, relational community of beings. As she describes, "Pedagogy in the critical, ecofeminist vein then, is a hard refusal of all forms of domination and celebration of the whole, human learner at the center of education who exists within a context of a larger environment, ecosystem, and natural world" (Kamrar 2008, 128). Building on Kamrar's work, ecofeminist pedagogy, and feminist environmental pedagogy generally, can be described as transformative, holistic, and relational.

Emotional Geographies

As a tradition of human geography, emotional geographies link geography, transformation, and feminism. The tradition is strongly interdisciplinary: "Emotional

geographies encompass a growing interdisciplinary scholarship that combines the insights of geography, gender studies, cultural studies, sociology, anthropology and other disciplines to understand how the world is mediated by feeling" (Thien 2005, 450). Among the many roots of emotional geographies, one of the most salient connections is with feminism and feminist geography (Sharp 2009). Indeed, Melissa Wright (2010) argues that it would be hard to imagine the "emotional turn" in geography without feminist challenges to epistemology, objectivity, rationality, and the gendering of knowledge. Note that "emotion" and "affect" can signal very different traditions in geography (Pile 2010); this study draws primarily from geographic work on emotion.

Emotional geographies begin with the premise that emotions are important aspects of identity and everyday life: "Without doubt, our emotions *matter*. They have tangible effects on our surroundings and can shape the very nature and experience of our being-in-the-world" (Davidson and Milligan 2004, 524). Emotional geographies involves the study of the relational and socio-spatial aspects of emotion, especially as they mediate between people and between people and places. Work in this tradition is informed by "an understanding that emotions are situated within, and co-constitutive of, our working (as well as social) lives" (Bondi et al. 2007). In their pivotal editorial, Kay Anderson and Susan Smith (2001) argue that since social relations are lived through emotions, the emotional qualities of social life should feature strongly in geography and other social research. Mick Smith and colleagues (2009b) extend this call and note how emotional geographies not only illuminate the workings of emotion, but the field of geography itself.

Joyce Davidson, Mick Smith, Liz Bondi, and colleagues (Davidson et al. 2005; Smith et al. 2009a) have put together the most extensive collection of work in emotional geographies to date in two edited volumes. Of particular importance for this project is the work in these volumes that address the connections between emotions and ecology. In her discussion environmental aesthetics, Jennifer Foster (2009) analyzes the feelings that lie at the core of environmental decisions. She argues that viewing environmental experiences as both embodied-sensory and cognitive-social "yields an understanding of how natures are both viscerally felt and learned in ways that cannot be ignored by those concerned with social justice and environmental sustainability" (Foster 2009, 100). Similarly, David Conradson (2005) explores the emotional and transformative characteristics of place, viewing these emotional encounters as affective outcomes of relational encounters between the self and a landscape. He advances an understanding of an "ecology of place" that remains attentive to social interactions between people, engagement between people and things, and relationships between people and other biological entities.

Conradson's work also highlights how emotional geographies understand the self as relational. Drawing on the tradition of phenomenology, he describes this conception of the relational self: "In contrast to the tightly bounded autonomous formulations of personhood, the self is understood as emerging within and through its relations to other people and events" (Conradson 2005, 3). The relational self suggests that identity is not wholly internal, but is also comprised of connections to the outer world. This has important implications for transformative environmental education, where foregrounding relationships means emphasizing the relational self, a self not just embedded in, but

defined by its relationships. From this perspective, transforming relationships *is* transforming the self, and vice versa.

Chapter 3

Research Methodology

From the beginning, this project was informed and inspired by feminist and participatory research methodologies. I self-identify as a feminist, and as Sandra Harding (1987) points out in her discussion of feminism and methodologies, the researcher is always part of the research. Who I am is intimately intertwined with my choice of research topic, my approach to researching it, and the purposes for which I do it.

I would describe this project as feminist in orientation, but this orientation is not a property of the research methods I employed. Harding draws a distinction between methods, methodology, and epistemology; methods are simply techniques for gathering evidence. This project employed multiple methods, both qualitative and quantitative, but the methods themselves are not feminist. What makes this project feminist is its methodology, or framework for how research should proceed. Fundamentally, this means the project is connected in principle to feminist struggle, including challenging the basic ideologies of oppression, seeking to foster empowerment, and promoting social justice and social change (Brooks and Hesse-Biber 2007).

Study Site and Populations

This study employed a case study approach, examining BiSci 3 as a case of transformative environmental education in a large university setting. A case study

approach is most appropriate when the researcher has a clearly identifiable case with boundaries and seeks to provide an in-depth understanding of the case (Creswell 2007). This in-depth understanding is the primary strength of a case study approach, while the primary limitation is generalizability: how widely the results might apply to contexts other than the chosen case. Here, a case study approach was used to seek an in-depth understanding of BiSci 3 as experienced by its students, particularly those who return as teaching assistants.

The instructor, Chris Uhl, teaches the course once every fall semester, with approximately 200-300 students enrolled at one time. Students meet twice a week as a whole class in a large lecture hall lead by Uhl, and once a week in small recitation sections capped at 13 students each. The recitation sections are lead by undergraduate TAs: former BiSci students who have returned from previous semesters to assist the course. The TAs also lead class activities and are responsible for most of the grading. TAs (and super TAs, described below) receive five credits for assisting BiSci 3.

Near the end of each fall semester, Uhl solicits for a new group of students to return as next year's TAs. Students both volunteer and are nominated by their current TAs. In total, approximately 40-50 students interview to return. In collaboration with current TAs, Uhl selects approximately 15-20 new TAs through this interview process. The newly-selected TAs take a TA training course together in the spring (Bio 400), which is led by Uhl, then help teach BiSci the following fall. Similarly to how BiSci students are guided by former students returning as TAs, BiSci TAs are also guided by

former TAs returning as teaching coordinators, or super TAs.[1] At the end of each fall semester, Uhl and the current TAs jointly select four TAs to return as next year's super TAs. The following timeline outlines the trajectory of students, TAs, and super TAs through BiSci 3 and Bio 400 (where applicable):

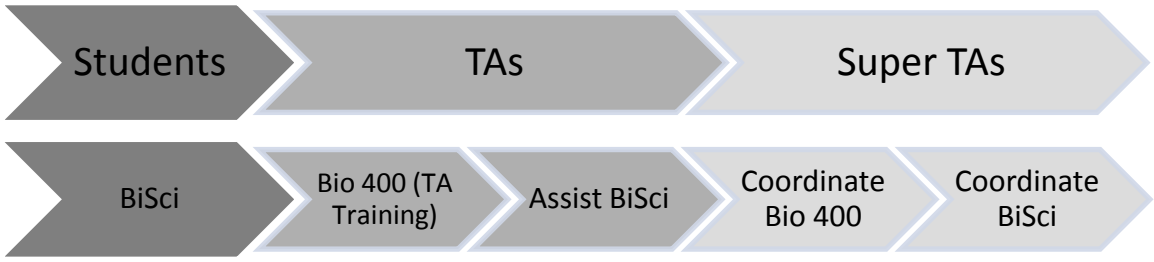

Figure 3.1: Trajectory of Students, TAs, and Super TAs

In Figure 3.1, each segment in the bottom row represents one semester. Hence, students enroll in BiSci for one semester, TAs enroll in BiSci/Bio 400 for three semesters, and super TAs for five.

The group of TAs and super TAs who took the TA training course (Bio 400) in spring 2010, with the intention of assisting BiSci in fall 2010, was the main population for this study. I will refer to this group as the TA class of 2010. This population consisted of 17 TAs (or TAs-in-training, during spring 2010) and four super TAs. Generally speaking, the TAs in this group took BiSci in fall 2009, and the super TAs took BiSci in fall 2008. I selected this group as the main population based on two key assumptions: first, that these students were a subset of those who found the class the most meaningful and/or transformative, so their experiences would be able to provide rich insights into transformative learning in BiSci 3. Second, that the process of transformation might

[1] Tongue in cheek, Uhl and the teaching assistants refer to super TAs as TATAs, or TAs for the TAs.

extend beyond just one semester, such that students' time as TAs and TAs-in-training might be an important components of the transformative process. Hence, the lived experiences of the TA class of 2010 were the main focus of my inquiry. Perspectives from additional populations, such as former TAs and former students, were used supplementally.

This study was also concerned with a the BiSci 3 class as a whole in fall 2009 and fall 2010. There were approximately 300 enrolled students in fall 2009 and 200 enrolled students in fall 2010. Although these students' experiences could not be explored as deeply as the smaller group of TAs, these populations were helpful in providing a portrait of how the class as a whole experienced BiSci 3.

Population Demographics

BiSci 3 is an introductory course for non-science majors that satisfies university-wide general education requirements. As such, most students who enroll in the course are first- or second-year students who do not intend to pursue any significant study in biology or other scientific field. Most have either not declared a major, or are currently pre-major status within a college, which means they have not yet officially begun study in a specific major. Tables 3.1 and 3.2 outline the number of years enrolled and the most common majors of the course-wide populations from the fall 2009 and fall 2010 semesters of BiSci 3.

Table 3.1: Participants' Years Enrolled in College, BiSci F09 and F10

Years Enrolled in College, BiSci F09 and F10	Percent
First Year	49.1%
Second Year	33.6%
Third Year	14.7%
Fourth Year or higher	2.6%

Table 3.2: Participants' Most Common Majors, BiSci F09 and F10

Most Common Majors, BiSci F09 and F10	Percent
Undeclared	30.5%
Liberal Arts*	10.8%
Education*	9.1%
Communications*	8.8%
Business Administration	7.1%
Health and Human Development*	4.0%
* = Pre-major status	

Note that the majors listed in Table 3.2 are students' declared majors at the beginning of the course. After those listed in the table, no other single major is shared by more than 1.5% of the study population.

Demographically, the large majority of participants from the fall 2009 and fall 2010 BiSci populations are aged 18-20 and self-identify as white. The age distribution is to be expected in an introductory course at a university that serves primarily traditionally-aged students (note that participants were required to be at least 18 years old to participate in this study). The racial/ethnic distribution likewise reflects the overall demographics of The Pennsylvania State University (University Budget Office 2011). The majority of participants are also female, who outnumber male participants by a 2:1 ratio. This ratio does not match the university as a whole, and can possibly be attributed to the status of BiSci as a course for non-science majors: male-dominated majors such as

science and engineering are underrepresented in the course, and female-dominated majors such as liberal arts and education are overrepresented. Tables 3.3, 3.4, and 3.5 present the age, race/ethnicity, and sex distributions of the fall 2009 and fall 2010 BiSci populations.

Table 3.3: Participants' Age, BiSci F09 and F10

Age, BiSci F09 and F10	Percent
18-20	90.4%
21-24	8.9%
25+	0.7%

Table 3.4: Participants' Race/Ethnicity, BiSci F09 and F10

Race/Ethnicity, BiSci F09 and F10	Percent*
White	85.4%
Black or African American	6.1%
Asian	5.4%
Hispanic or Latino/Latina	4.7%
Other ethnicity not listed	1.4%
American Indian or Alaska Native	0.7%
Native Hawaiian or Pacific Islander	0.0%
* = Percentages do not add to 100 because participants could choose more than one category	

Table 3.5: Participants' Sex, BiSci F09 and F10

Sex, BiSci F09 and F10	Percent
Female	66.7%
Male	33.3%
I do not identify with either category	0.0%

Implications of these demographics, specifically as they pertain to the limitations of a case study approach, will be discussed in the concluding chapter.

Methods: Overview

I began my work on this project by enrolling and participating in BiSci 3 as a student during fall 2008. Uhl and my teaching assistant knew about my intention to study the course, but in all other ways I completed the assignments and participated in the activities just like any other student. My experience in the course helped lay the foundation for my future work, and allowed me to view the course from the perspective of a provisional "insider".

This study was driven primarily by qualitative inquiry, supplemented by quantitative inquiry. Taken together, these multiple methods constitute the in-depth data collection involving multiple sources of information that is characteristic of case studies (Creswell 2007). Such a mixed methods approach is also consistent with feminist research methodologies, as employing a range of methods allows a range of individuals or circumstances to be understood in responsive, complex ways (Reinharz and Davidson 1992). Indeed, in their recommendations for implementing the feminist perspective in social science research, Toby Epstein Jayaratne and Abigail Stewart (1991) explicitly recommend using a mixed method approach whenever possible.

Although I embraced a mixed methods approach and devote much of this chapter to discussing my quantitative instrument design, I think it is important to emphasize again that qualitative inquiry was the heart of this study. As Kathleen P. King (2009) notes, personal and qualitative change is the essential nature of transformative learning. The learner's own understanding of the experience enriches the assessment of what changes occurred, how they happened, and what contributed to them. Furthermore, learners

experience transformation in multiple and differentiated ways, and qualitative methods emphasize multiple meanings and interpretations rather than a single, dominant interpretation (Winchester 2005). Thus, qualitative methods are essential for understanding the personal process of transformation.

The following outlines summarize the methods used in this study, as well as their associated populations:

Qualitative methods

- Semi-structured interviews, spring 2010
    - 17 TAs-in-training (TA class of 2010)
    - Four super TAs (TA class of 2010)
    - Four former TAs
    - Seven former students
- Semi-structured interviews, spring 2011
    - Seven former TAs (TA class of 2010; second round of interviews)
    - Three super TAs (TA class of 2010; second round of interviews)

Survey methods

- Surveys, fall 2009
    - 226 BiSci students
    - 89 students in control group
- Surveys, fall 2010
    - 125 BiSci students
    - 40 students in control group
- Surveys, fall 2011
    - 55 students in control group[2]

[2] The fall 2011 control group was not part of the initial study design, but was added later to provide greater confidence in the quantitative survey results.

Supplemental methods

- Student coursework, as supplements to interviews
- Focus groups, spring 2010
    - Six TAs and super TAs (TA class of 2010)
- Participant observation (informal), Bio 400, spring 2010
    - 21 TAs and super TAs (TA class of 2010)

Qualitative Methods

Semi-Structured Interviews

Research with the main population, the TA class of 2010, consisted mainly of semi-structured interviews. Because lived experiences are complex and layered, semi-structured interviews allow for an open response that is guided by what the participant feels is important (Dunn 2005). Interview themes centered around my main research questions, specifically:

1. How does transformative environmental education affect learners' sense of self? In other words, what aspects of learners' identities change, and in what are the key aspects of this transformed identity?
2. How does transformative environmental education affect learners' everyday lives? In other words, does a shift in identity lead to a shift in pro-environmental action, and how do these shifts interact with learners' social networks?
3. How can environmental educators best implement transformative learning in their own teaching? In other words, what specific activities and general attributes are most important for encouraging transformation?

I conducted two rounds of interviews with the TA class of 2010. The first was in spring 2010, after the participants had completed BiSci and were in the midst of TA training. The second was in spring 2011, after the participants had completed assisting BiSci as TAs (some were still coordinating Bio 400 as super TAs). Conducting the interviews some time after the participants' experience in the BiSci 3 course itself, whether as students or as TAs, was important. Previous work on transformative learning indicates that transformation is sometimes only clear in retrospect (Cranton 2006; King 2009), and conducting the interviews months after the official end of BiSci allowed the participants time for this critical reflection.

The timing of the interviews played another important role in the design of this study. Similarly to taking BiSci 3 as a student in fall 2008, I joined the TAs in Bio 400 in spring 2010. I participated in most in-class activities and discussions, including a weekend retreat, though I did not complete the course assignments. I sometimes acted as an informal observer, but by far the most important aspect of this experience was establishing rapport with the TAs as we got to know each other in the close-knit and personal atmosphere of the training course. These relationships with the TAs were essential. Qualitative research is grounded in interactive, intensive relationships, where "the interaction is the method" (Sprague 2005, 121). Additionally, as Sharlene Nagy Hesse-Biber and Deborah Piatelli (2007) point out, "a feminist perspective argues that without empathic, interpersonal relationships, researchers will be unable to gain insight into the meaning people give to their lives." Through my presence in the course, the TAs came to know me as a fellow teacher who was passionate about BiSci, who cared about environmental issues, and who cared about them. I didn't begin my first interview until I

had been with the TAs in Bio 400 for over two months, which allowed for a level of comfort in the interviews that I would probably not have been able to achieve otherwise.

For the first round of interviews, preplanned questions asked of most participants included:

- What brought you to BiSci in the first place?
- What moments from BiSci really stand out to you?
- What were the most central lessons of BiSci for you?
- How did BiSci affect your relationships with other people?
- Imagine you had never signed up for BiSci; how do you think your life would be different now?
- How did you know these changes were happening, or had happened?

Preplanned questions for participants who had been or were training to be TAs also included:

- What made you want to come back as a TA?
- What do you hope to accomplish as a TA?

For the second round of interviews, preplanned questions asked of most participants (all of whom had been TAs) included:

- How was your experience in BiSci different the second time through?
- Imagine you had never signed up for BiSci; how do you think your life would be different now? (revisiting the first-round question)
- Are there any final thoughts on your overall BiSci experience that you'd like to share?

Other questions generally followed the themes of my research questions, such as how the course affected the participants' everyday lives and which course characteristics they

found most meaningful. Beyond this small set of preplanned questions, however, the semi-structured interviews were largely open-ended and driven by what the participants described to be most salient to them.

For the first round of interviews in spring 2010, I interviewed all 17 TAs and all four super TAs, plus four former TAs and seven former students. Then for the second round of interviews in spring 2011, I re-interviewed ten of the TAs (seven were now former TAs, and three were now super TAs). All together, the two rounds totaled 42 interviews with 32 participants. The typical interview was 30-40 minutes, with the shortest being 15 minutes and the longest being one hour.

I recorded, transcribed, and coded all first-round interviews with the TA class of 2010, and coded the other interviews from a recording and/or notes without transcription. Across all interviews, some codes were generated based on participant responses to preplanned questions (e.g., What made you want to come back as a TA?), but most codes were generated "bottom up" from the lives and experiences of the participants. In these cases, I did not start with a pre-planned list of codes, but rather identified themes and key points as participants described them. After coding each interview, I re-evaluated the existing list of codes to judge whether any codes could be combined, or whether I had overlooked instances where existing codes might apply to the interview. Such a bottom-up approach is similar to that of grounded theory, and takes on particular importance in a feminist project because it builds from the voices of participants and values the multiplicity of interpretation and meaning (Hesse-Biber and Piatelli 2007).

I used the software program, NVivo 9, by QSR International, to organize and code the interviews. A list of the most common interview codes is presented in Appendix A.

Survey Methods

Research with the entire fall 2009 and fall 2010 classes of BiSci 3 consisted mainly of course-wide surveys. The surveys were a mix of qualitative and quantitative questions, and largely adapted from existing sources. In each semester, I administered the survey once at the beginning of the course and once at the end of the course. The pre-test surveys at the beginning of the course assessed the students' pre-existing values and behaviors, establishing a baseline against which the end-of-course surveys could be compared. Particularly for the quantitative measures, this process provided a broad, course-wide measure of the transformative process.

Surveys: Fall 2009

The fall 2009 survey was based mainly on two sources: the Nature Relatedness scale (Nisbet et al. 2009) and the Learning Activities Survey (King 2009). These two components are described in the following sub-sections.

Nature Relatedness

The Nature Relatedness scale measures an individual's level of connectedness with the natural world, and was used in this study to assess the transformation of the self associated with the course's objective of ecological identity. As stated by the authors of the NR scale (Nisbet et al. 2009),

> Nature relatedness is not unlike the deep ecology concept of an ecological self, the notion of a self-construal that includes the natural world. The concept of NR encompasses one's appreciation for and understanding of our interconnectedness with all other living things on the earth.

The Nature Relatedness scale consists of 21 items measured on a 5-point Likert scale: "disagree strongly," "disagree a little," "neither disagree nor agree," "agree a little," and "agree strongly." Responses to the 21 items, some of which are reverse-scored, are averaged together to compute an individual's overall NR score from 1.0 to 5.0. The scale further breaks down into three subscales: (1) NR-Self, which represents an internalized identification with nature; (2) NR-Perspective, which represents an external, nature-focused worldview; and (3) NR-Experience, which represents a physical familiarity with the natural world.

The pre-test administered in early fall 2009 consisted solely of the Nature Relatedness instrument with two modifications. Item #4, "I always think about how my actions affect the environment," was changed to "I usually think about how my actions affect the environment," in order to be more consistent with the linguistic labels assigned to the Likert scale. For example, what it means to "agree a little" than one "always" does something is somewhat ambiguous; it is more straightforward to assign degrees of agreement to the modifier "usually." Item #18, "Conservation is unnecessary because

nature is strong enough to recover from any human impact," was changed to two items: "Wilderness conservation is unnecessary," and "Nature is strong enough to recover from any human impact." The necessity of conservation and nature's ability to recover are two separate issues[1], and the revised survey reflected this distinction. These two new items were given equal weight relative to all other items when computing the overall NR score and the NR-Perspective sub-score.

Learning Activities Survey (Fall 2009)

The fall 2009 post-test featured the modified Nature Relatedness instrument plus questions modeled after the Learning Activities Survey (King 2009). The Learning Activities Survey is designed to assess learners' transformative learning experiences and is grounded theoretically in Mezirow's transformative learning theory (Mezirow 2000b). It has two major purposes: (1) identifying whether learners have had a transformative experience as a result of a particular course, and (2) if so, determining what learning activities contributed to it. The LAS consists of a mix of closed-response questions (e.g., "Which of the following influenced this change?") and open-response questions (e.g.,

[1] Results from the pre-test surveys support this assertion. Including all 723 responses from the 2009-2010 test and control groups, the mean pre-test response for "Wilderness conservation is unnecessary" was 1.55, whereas the mean pre-test response for "Nature is strong enough to recover from any human impact" was 2.18. While the two scores are positively correlated ($r = 0.201$, $p < 0.01$), they are also significantly different, with a difference greater than half of either item's standard deviation (difference = 0.63, standard deviations = 0.92 and 1.14, $p < 0.01$ for a two-tailed paired samples t-test). The item, "Wilderness conservation is unnecessary" correlates more strongly with the overall NR score and NR-Perspective sub-score ($r = -0.517$ and -0.451, respectively) compared to the item, "Nature is strong enough to recover from any human impact" ($r = -0.428$ and -0.181, respectively), but all the correlations are statistically significant at the 0.01 level.

"Please describe what happened.") Minor modifications were made to the LAS to adapt it specifically to BiSci 3, such as replacing a list of generic assignments with actual BiSci assignments.

Surveys: Fall 2010

The fall For the fall 2010 survey, the focus shifted from assessing ecological identity to measuring more external characteristics of transformation. The fall 2010 survey incorporated insights gained from the first round of interviews, which I will briefly discuss here, but will explore more fully in later chapters.

The fall 2010 survey included four measurements:

1. Active caring
2. Pro-environmental action
3. Pro-environmental beliefs (perceived importance of pro-environmental action)
4. Social connectedness

These measurements are described in the following sub-sections.

Active Caring

The first measurement, active caring, was a central theme from the first round of interviews. A number of participants reported that BiSci made them feel that they were part of something larger than themselves, that they could make a difference in the world, and that they wanted to act. E. Scott Geller (1995) describes this orientation as one of "actively caring." He identifies empowerment (which itself consists of personal control,

self-effectiveness, and optimism), self-esteem, and belongingness as major components of active caring. These three major components can be combined pair-wise and all together in four different combinations, as illustrated in Figure 3.2:

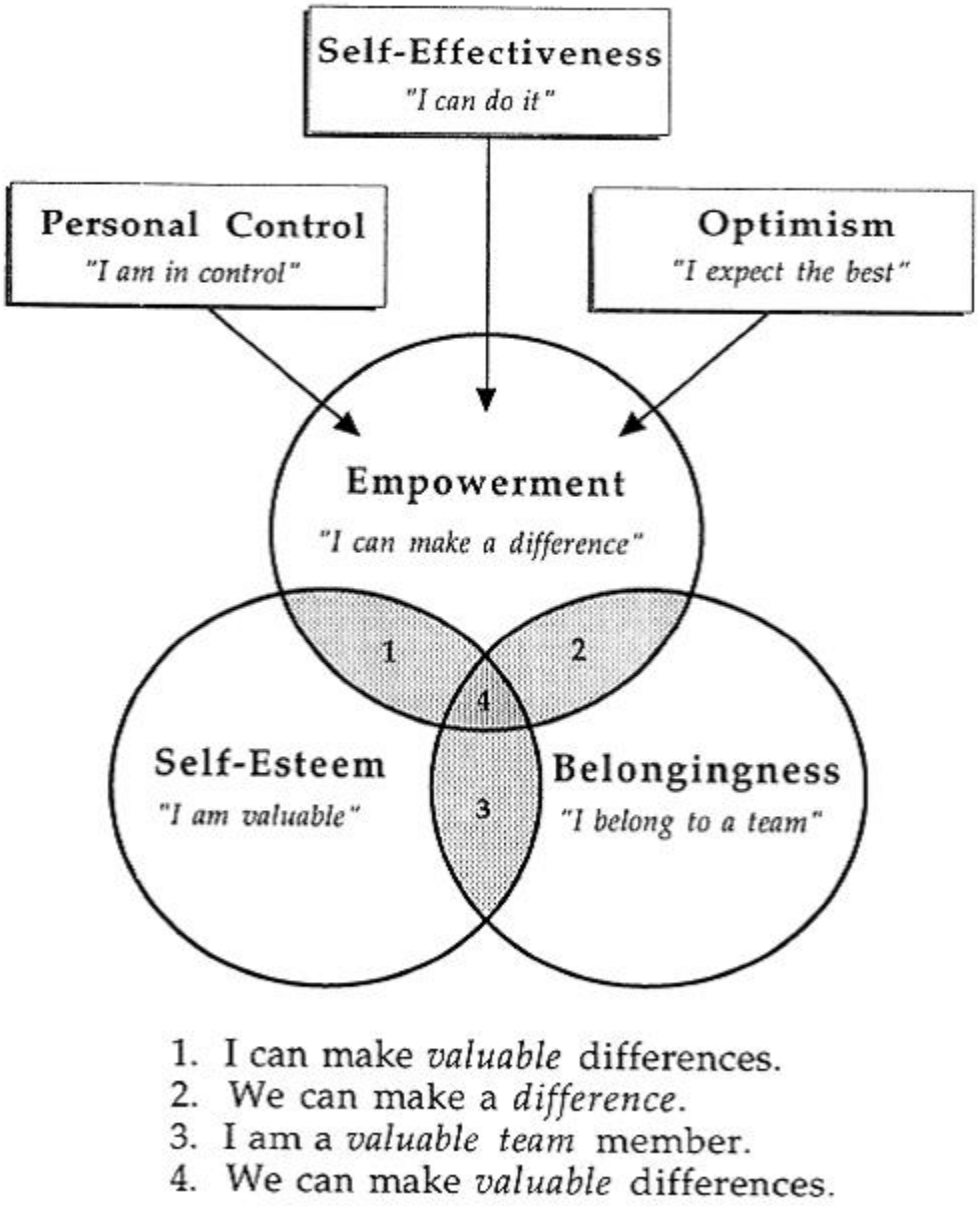

Figure 3.2: Components of Active Caring
Source: Geller (1995)

The six individual components that Geller identifies (personal control, self-effectiveness, optimism, empowerment, self-esteem, and belongingness), in addition to the four possible combinations of the three major components, suggest a ten-item survey to assess active caring. Because belongingness was to be assessed as part of social connectedness (described below), I dropped belongingness as an item, yielding the following nine items to assess active caring, with (*) indicating a reverse-scored item:

1. Empowerment: All my actions, big and small, make a difference in the world
2. Personal control: Environmental issues are beyond my control*
3. Self-effectiveness: I'm not really capable of helping with environmental issues*
4. Optimism: Considering all the world's problems, the future looks bleak and hopeless*
5. Self-esteem: I am a valuable and worthy person, at least equally with others
6. Empowerment plus self-esteem: If I put my heart into it, I can help bring about positive change in the world
7. Empowerment plus belongingness: Environmentally, I don't think we'll be able to change the direction we're heading*
8. Self-esteem plus belongingness: I feel like an important part of something larger than myself
9. All three: Together, we will be able to rise to the challenge of making the world a better place

Please note that the question about optimism was adapted from the Relevance of Science Education project (Schreiner and Sjoberg 2004), and the question about self-esteem was adapted from the Rosenberg Self-Esteem Scale (Rosenberg 1979). Similarly to Nature Relatedness, these nine items were measured on a 5-point Likert scale and averaged to compute an overall active caring score from 1.0 to 5.0.

Pro-Environmental Action and Pro-Environmental Beliefs

The second and third measurements addressed in the revised surveys of fall 2010 were pro-environmental action and pro-environmental beliefs. After the initial surveys of fall 2009 indicated that there was a significant change in participants' ecological identities, this raised important questions about the link between identity and behavior. Hence, I added a section to the surveys that addressed self-reported pro-environmental action, as well as a section that addressed the perceived importance of pro-environmental action. The reasoning for assessing the perceived importance of action is at least twofold: first, given the constraints of time and opportunity, BiSci students may not be able to translate many of their newfound values into action in a single semester, but a higher perceived importance of those actions at least indicates an awareness and understanding of the options available to them. Second, analyzing the belief-action gap between the perceived importance of an action and its frequency of practice is useful in itself, as it can inform environmental educators and others as to where common "sticking points" to pro-environmental behavior are (Leiserowitz et al. 2010).

In considering which pro-environmental actions to include on the survey, my primary criteria was whether an action *mattered,* environmentally speaking. In other words, does that action at least have the potential to make a significant positive environmental impact, relative to alternative actions? The ultimate objective of pro-environmental behavior, after all, is to have a significant positive effect on the environment, so actions that have little or no impact are not worth assessing. In fact, a case could be made that these insignificant actions are counterproductive, because they

consume time and energy, and can create a comforting but misleading illusion that one is living environmentally responsibly.

With this criteria specifically in mind, the Union of Concerned Scientists (Brower and Leon 1999) outlined concrete priorities for personal action, including suggestions for transportation, food, and household operations. They also discussed priorities for influencing collective and government action. I used these as the foundation for pro-environmental actions assessed in the survey, along with items from the Environmentally Responsible Behavior Index (Smith-Sebasto 1995) and a recent environmental behavior survey (Leiserowitz et al. 2010). I included 16 items in all; eight addressing personal pro-environmental actions and eight addressing collective pro-environmental actions, or what might be labeled private-sphere and public-sphere environmentalism (Biga 2006).

The eight personal actions were:

1. Walk, bike, or use public transportation when possible, instead of driving
2. Recycle everything possible
3. Eat vegetarian or vegan
4. Repair or re-use old products instead of buying new ones
5. Purchase products specifically designated as environmentally friendly
6. Eat locally-grown food when in season (such as from a farmers' market, CSA, or your own garden)
7. Choose renewable energy from your utility company, or purchase renewable energy certificates (RECs) to guarantee that renewable energy is generated
8. Try to educate yourself about environmental issues, outside of schoolwork

The eight collective actions were:

1. Volunteer with or donate money to environmental organizations
2. Write, call, or e-mail your elected officials about environmental issues
3. Write in a public forum (such as a public blog or a letter to a newspaper) about environmental issues
4. Initiate efforts to make your school, workplace, or community group (such as a fraternity/sorority or church) more environmentally responsible
5. Talk with other people about environmental issues, outside of schoolwork
6. Vote for a candidate based on his/her stance on environmental issues
7. Join others in an environmental service project in your community
8. Consciously act as a role model for others, modeling environmentally-responsible behavior

The measurements for pro-environmental action and pro-environmental beliefs were also assessed on a 5-point Likert scale, but instead of degree of agreement, these measurements reflected the frequency of action and degree of importance. The scale for frequency of action included the labels, “Never,” “Rarely,” “Sometimes,” “Often,” and “Regularly.” The scale for the degree of importance included the labels, “Not at all important,” “A little important,” “Somewhat important,” “Moderately important,” and “Very important.” Like the previous portions, the items were averaged together to create overall action and belief scores ranging from 1.0 to 5.0, with sub-scores for personal and collective actions.

Social Connectedness

The fourth and final measurement addressed in the revised surveys of fall 2010 was social connectedness. A theme frequently brought up by interview participants was their relationships with other people, whether generalized others or specific people in their lives. Whereas many participants reported an increased feeling of connection with specific people and generalized others due to BiSci, they also frequently reported feeling misunderstood or teased by their peers about the course. To better evaluate the overall effect of BiSci 3 on participants' relationships with others, I included a subset of items from the Social Connectedness Scale, or SCS (Lee et al. 2001). Social connectedness is "an attribute of the self that reflects cognitions of enduring interpersonal closeness with the social world *in toto*" (Lee et al. 2001, 310), or perception of one's degree of connection to other people and society. I selected six items from the 20-item scale that I felt were sufficiently different from one another, and that had high factor loadings on the first and primary factor of the SCS, as calculated by Lee et al. The six social connectedness items used in this study are the following, with (*) indicating a reverse-scored item:

1. I feel distant from people*
2. Even around people I know, I don't feel that I really belong*
3. I am able to relate to my peers
4. I catch myself losing a sense of connectedness with society*
5. I am able to connect with other people
6. I feel understood by the people I know

As with the other measurements, these six items were assessed on a 5-point Likert scale and averaged to compute an overall social connectedness score from 1.0 to 5.0.

Learning Activities Survey (Fall 2010)

The previous four items – active caring, pro-environmental action, pro-environmental beliefs, and social connectedness – were included in both the pre- and post-test surveys for fall 2010. Like the 2009 survey before it, the fall 2010 post-test survey also included the Learning Activities Survey to assess transformative learning experiences. I made further modifications to the LAS, including supplementing the question, "As a result of taking BiSci 3, do you believe you experienced a time when you realized that your values, beliefs, opinions or role expectations had changed?" with a 5-point Likert scale to assess the significance of that change. Similarly, I modified questions about what course activities and people helped influence the change from a single checklist to individual 5-point Likert scales indicating their degree of influence.

Surveys: Control Groups

For the fall 2009 and fall 2010 semesters, I selected a control group and distributed the same pre-test surveys as the participants. The post-test surveys were also the same, except the modified LAS, which queries transformative learning experiences, was not included in the post-test surveys for the control groups. For fall 2009, the control group was a 170-student introductory geography course, "Geographic Perspectives on

Sustainability and Human-Environment Systems," or GEOG 030. For the fall 2010 semester, the control group was two 30-stduent sections of BI SC 003 designed and taught by someone other than Chris Uhl. These alternate sections of BI SC 003 were conducted from a more traditional environmental science perspective, rather than the nontraditional, explicitly transformative approach of Chris Uhl's BiSci 3. Using these alternate sections of BI SC 003 as control groups allowed me to identify which outcomes of BiSci 3 were likely associated with its approach, rather than just those associated with its environmental subject matter.

To provide greater confidence in the quantitative survey results, I added a third control group in fall 2011, which again consisted of two alternate sections of BI SC 003. This fall 2011 control group completed the Nature Relatedness pre- and post-test surveys like the fall 2009 group. In all cases, I distributed pre-test surveys during the second week of the semester, and post-test surveys during the second-to-last week of the semester.

Quantitative Analysis

To analyze the quantitative results, I used the software program, PSAW Statistics 18, by SPSS Inc. This is a powerful and robust program with the ability to perform many sophisticated statistical techniques, though most of the quantitative analysis in this study is based on three relatively straightforward measurements: difference, significance, and effect size. Table 3.6 illustrates how these measurements will be presented in later chapters, comparing the main population and control group scores of a hypothetical item:

Table 3.6: Quantitative Scores for Hypothetical Item

Hypothetical Item	Pre-Test	Post-Test	Difference	Significance (paired)	Effect Size (Cohen's d)
Main Population	3.00	3.32	+0.32	$p < 0.01$	0.45
Control Group	3.00	2.93	-0.07	not significant	

Note that the above numbers are arbitrarily constructed for illustration purposes.

Difference (between means) is the most straightforward measurement to understand and calculate. It measures the change in an item's score between pre- and post-tests, calculated simply the difference between the mean post-test score and the mean pre-test score for a particular item. Although it is straightforwardly intuitive, the difference between means is not necessarily informative by itself; other measurements are needed to assess whether the observed change is statistically significant.

Significance (paired t-test) measures the statistical significance of the observed difference, where the p-value is the probability of obtaining a result of at least this magnitude if the null hypothesis were true. In other words, it is the probability that the given difference could have arisen by chance. Here, significance is calculated by a paired-samples t-test.[2] Lower p-values indicate a lower probability of the result arising by chance, and if a p-value is less than the desired significance level, the result can be said to be statistically significant. I use the common significance levels of 0.05 and 0.01 in this study. In the above table, the main population's difference has a corresponding p-value of less than 0.01, which means the difference is statistically significant at the 0.01 level. The control group's difference, on the other hand, has a corresponding p-value greater than

[2] The t-test is based on the ratio of the difference between means to the standard error of the difference, and requires a table lookup to interpret if calculated by hand (Norman and Streiner 2003, 38). For this reason, I relied on the PSAW Statistics software for all calculations of significance using the t-test.

0.05, which means the difference is not statistically significant. Hence, the main population saw a significant change in the measured item, but the control group did not. While the t-test can establish statistical significance, though, it does not in itself indicate the magnitude of the effect.

Effect size (Cohen's d) measures the magnitude or strength of the observed difference. The measure of effect size used in this study, Cohen's d, is calculated by dividing the difference between means by the standard deviation of the data. In essence, it describes how many standard deviations the mean shifts between the pre-test and post-test. The greater the effect size, the greater the magnitude of the change. Interpreting the numerical value of Cohen's d is a matter of judgment, but as a heuristic, Jacob Cohen suggested that 0.2 should be considered a small effect, 0.5 a medium effect, and 0.8 a large effect (Norman and Streiner 2003, 35). In the above table, the main population's difference has a corresponding effect size of 0.5, which is roughly a medium effect. The effect size could technically be calculated for the control group's

Taken together, the these three measurements describe how much an item changed, whether that change is statistically significant, and, if so, the magnitude of the effect. They are useful for analyzing the changes that occur within a population, such as the students in BiSci 3.

However, when comparing changes *between* populations, such as the students in BiSci 3 to the students in a control group, one more measurement is necessary. In order to assess whether the changes in a population are statistically significant compared to a control group, the two populations' difference between means must be compared against

each other. Table 3.7 continues the above hypothetical example, illustrating how this final measurement of significance will be presented in later chapters:

Table 3.7: Control Group Comparison for Hypothetical Item

Hypothetical Item vs. Control Group	Control Group	Main Population	Difference	Significance (indep.)	Effect Size (Cohen's d)
Hypothetical Item	-0.07	+0.32	+0.39	$p < 0.01$	0.52

Note that the control group and main population measurements of difference are taken from the previous table (Table 3.6).

Significance (independent t-test) measures the statistical significance of the observed difference between groups. In most respects it is similar to the measurement of significance described above, with one key difference: it is calculated by an independent-sample t-test that compares the difference in the main population to the difference in the control group. Interpreting the resulting p-value remains the same: if the p-value is less than the significance level (0.05 or 0.01), the difference between the main population and control group can be said to be statistically significant. Likewise, the effect size can be interpreted with the same small, medium, and large heuristic. In the above table, the difference between the populations can be said to be statistically significant at a 0.01 level, with a roughly medium effect size. Thus, we can conclude that the intervention in the main population (in this case, taking BiSci 3) resulted in a significant change in the hypothetical item relative to the control group.

Supplemental Methods

Semi-structured interviews and pre- and post-test surveys were the main methods used in this study, occasionally supplemented by other methods. I used student coursework from BiSci 3 to supplement the interviews, particularly through providing a basis for interview questions. For instance, the final BiSci synthesis essay centered around the meaning of the course for the student, which was one of my major interview themes. Likewise, other course activities and projects provided useful talking points for interview participants.

Initially, I had planned to conduct focus groups with the TA class of 2010 to complement the semi-structured interviews, particularly because I thought the familiar environment of Bio 400 would provide a foundation for enriching focus group discussions. Generally, focus groups strongly benefit from the synergistic effect of participant interaction (Cameron 2005), and I thought this synergy would be significantly enhanced by the students' shared experiences. In practice, however, I ran a pilot focus group with six participants and found the results not to be qualitatively different than the individual interviews, with less opportunity for the participants to talk about their experiences in depth. I discovered that because I was conducting the interviews during the same semester as Bio 400, the synergistic effects of the training course were already translating quite well to the interviews, with participants eager to talk about their shared experiences in the course. While a few insights from that pilot focus group were used productively in this project, I decided against conducting more focus groups and instead used the semi-structured interviews as the primary method for gathering qualitative data.

Lastly, I also acted as an informal observer in Bio 400, generally participating in the course activities but occasionally drawing back and observing. As stated previously, my presence there was primarily intended to gain rapport with the TAs-in-training as we got to know each other better. I also used the shared experience to guide interview questions and discuss issues that I knew had come up during the training course. While this period of observation is only occasionally incorporated directly into my overall findings, it does consistently influence my findings indirectly through my interview questions and survey design.

Ethical Considerations

Of significant ethical importance in qualitative research is the positionality of the researcher. In aligning myself with feminist and participatory research methodologies, I endeavor to position myself among research participants, rather than over them (Rose 1997; Kindon 2005). Particularly while joining the participants in Bio 400, I positioned myself primarily as a fellow educator who believes in the value of BiSci 3. I believe my position as a fellow educator was important. Just like the TAs-in-training, I was enthusiastic about BiSci and supported its goals and outlook. Some feminist researchers also recommend sharing the concerns that animate the research project with the interviewee, "so that the conversation can unfold as a collaborative moment of making knowledge," (DeVault and Gross 2007). Indeed, the goal of my study, to inform transformative environmental education in theory and practice, resonated with many of the TAs and I believe contributed to their interest and enthusiasm for the project.

The dynamic I tried to be most conscious of, however, was one of inclusion and exclusion. In a personal situation like Bio 400 where we all get to know each other fairly well, it would have been easy to assume that everyone was on board with my project, or to create situations where the participants felt pressured to conform in a particular way. This is particularly important for focus groups, where participants knowing each other increases the influence of peer pressure and the possibility of participants under-disclosing or selectively disclosing details of their lives (Cameron 2005), which is an additional reason I decided to work primarily with interviews rather than focus groups. I continually stressed the voluntary nature of participation in my project, and I believe it became clear to participants that they could trust me to maintain confidentiality. I also feel that it is a testament to their faith in this relationship that the participants were comfortable about talking about their personal lives and occasionally sharing their reservations about BiSci or Bio 400.

For the course-wide surveys, the danger of coercion was less acute, though still important to consider. Participants in BiSci 3 received extra credit for completing one or both of the surveys, and participants in GEOG 030 received attendance credit. Participants in the alternate BI SC 003 courses did not receive credit for their involvement, due to the instructor's preference. In the cases where course credit was offered, students had the option of completing short alternate assignments for credit instead of participating. All submitted surveys were given full credit, regardless of content. Neither the instructor nor anyone else with grading authority in the course had access to their individual responses. These commitments to confidentiality and voluntary participation were important for reducing the possibility of coercion.

Finally, my feminist commitment surfaces in the normative commitment of this project. Through studying transformative environmental education, I hope to challenge destructive and unsustainable ways of being, promote learner empowerment across disciplines, and help shape a more just and sustainable world.

Chapter 4

Transformation and Identity

Who are we?

For environmental educators dedicated to shaping a more just and sustainable world, this question holds a special significance. Individually and collectively, who we are right now is a profoundly unsustainable people, particularly in First World contexts, where many of us lack the knowledge, desire, or ability to even attempt to live sustainably. In addition to its political and technical challenges, sustainability also represents a challenge of identity: how we perceive ourselves in relation to the natural world, how deeply we question the unsustainable worldviews we've inherited, and whether we value the knowledge, desire, and ability to actively shape more sustainable pathways. At heart, this is a matter of transformation, of transformative learning.

Transformative learning involves experiencing a deep, fundamental shift in the basic premises of thought, feelings, and actions. When applied to the realm of environmental education, this means inviting learners to develop their ecological identity or ecological self, and to examine, challenge, and transform personal and societal ways of being associated with (un)sustainability. This is what I refer to as transformative environmental education. Using BiSci 3 as a case study, this chapter addresses the following research question: How does transformative environmental education affect

learners' sense of self? In other words, what aspects of learners' identities change, and in what are the key aspects of this transformed identity?

Two broad themes emerge from the data, mirroring two of the major objectives of BiSci 3: developing relationships with nature (ecological identity), and developing relationships with the self. The first theme, ecological identity, includes affective, cognitive, and experiential components of participants' perceived connection to the natural world. I draw from the quantitative Nature Relatedness scale (Nisbet et al. 2009) and qualitative interview and survey responses to demonstrate that transformative environmental education can indeed lead to significant development of ecological identity. The second theme, developing relationships with the self, emerges inductively from participants' interview and survey responses. Critical self-reflection, striving for an authentic sense of self, trusting emotions as a way of knowing, and adopting course material as a way of life all prove to be key components of transformative environmental education. Woven together, these two themes outline how higher education can successfully engage the challenge of sustainability.

Defining and Recognizing Transformation

As understood in the tradition of transformative learning, transformation is more than a synonym for change. Change is continuous and commonplace, whereas transformation is discontinuous and periodic. Transformation involves a deep paradigm shift, permeates all aspects of an individual's life, and is irreversible (Poutiatine 2009). A similar distinction between change and transformation applies to the learning process.

Derek Armitage, Melissa Marschke, and Ryan Plummer (2008) contrast single-loop learning, which is incremental and occurs within an existing worldview, with double-loop learning, which is critical and involves a fundamental alteration or creation of a new worldview. Double-loop learning is transformative learning[1].

It is in this paradigm-altering spirit that Edmund O'Sullivan defines integral transformative learning:

> Transformative learning involves experiencing a deep, structural shift in the basic premises of thought, feelings, and actions. It is a shift of consciousness that dramatically and irreversibly alters our way of being in the world. Such a shift involves our understanding of ourselves and our self-locations; our relationships with other humans and with the natural world; our understanding of relations of power in interlocking structures of class, race and gender; our body awarenesses, our visions of alternative approaches to living; and our sense of possibilities for social justice and peace and personal joy. (O'Sullivan 2002, 11)

Recognizing learners' transformation in practice thus involves a few key elements: (1) a fundamental change in identity, (2) a reconfiguring of relationships with the self, other beings, and the natural world; and, most generally, (3) a paradigm shift evidenced in thought, feelings, and actions;. This is the operating definition of transformation I employ in this study. This chapter examines each of these aspects of transformation, beginning with participants' changes in identity.

[1] Armitage and colleagues also describe triple-loop learning, which is concerned with how governance systems provide for double-loop learning. Triple-loop learning describes the creation and maintenance of spaces that foster transformation, which is also directly relevant to transformative learning.

Ecological Identity

The power of transformative environmental education is that it can go beyond merely imparting knowledge, and can actually shape learners' identities. In this study, over a quarter of the interview participants mentioned how BiSci 3 involved more than learning information and facts, and some were explicit about how the course changed who they perceived themselves to be. One TA-in-training made the distinction between agreeing with the course and its values on a superficial level and incorporating the course and its values as an aspect of her identity:

> I started talking about [BiSci 3] a lot, you know, I could see it was becoming a part of me because I wanted to tell everybody about it. So at first, I guess I identified with it on a superficial level, kind of an almost like – correlating already with society's expectations. So my friends saw me more as just like, oh, you're just a hippie, a green hippie, like trying to think outside of the box. But then it kind of just evolved into part of my true identity. I mean, definitely at this point I would say it's a significant part of me, how I define myself.

This distinction echoes the division between change and transformation, between single-loop and double-loop learning.

In both interviews and survey responses, participants routinely referred to the influence that BiSci 3 had on their identities and outlook in everyday life outside of class. As a super TA notes, "BiSci, it just sticks with you. If you let it in, it will never go away." When something becomes a part of one's identity, it is no longer inert information that can simply be forgotten, but is deep learning that guides one's life. This kind of deep learning, which Ken Bain (2004) describes as making a "sustained, substantial, and positive influence on the way students think, act, and feel," is precisely the kind of

learning that drives transformative environmental education. A TA-in-training describes how the deep learning in BiSci has become a part of her life:

> [BiSci 3] changes my perception, the way I think about things. It sticks with me, it's not something I can forget. I can't forget what I've learned here. I just took a test in oceanography and I probably forgot half the things already, because I'm just so glad to get it out of my mind. But there's no – I can't even look and be like, oh, I learned this in BiSci. It's just an experience of growing, and that keeps continuing. I love learning, and I forgot. I really forgot.

Transformative learning is about shaping identity, a process that involves prompting learners to rethink who they are and how they relate to the broader world.

The significance of transformative environmental education, in particular, is that it applies the general approach of transformative learning toward fostering pro-nature and pro-sustainability identities and relationships. Transformative environmental education invites learners to develop and shape their ecological identity, or their perceived connection to, support for, and awareness of nature. Mitchell Thomashow (1995, xiii) describes this transformative process as ecological identity work:

> This is the basis of what I call ecological identity work: using the direct experience of nature as a framework for personal decisions, professional choices, political action, and spiritual inquiry. Ecological identity refers to how people perceive themselves in reference to nature, as living and breathing beings connected to the rhythms of the earth, the biogeochemical cycles, the grand and complex diversity of ecological systems. (Thomashow 1995, xiii)

Ecological identity involves being mindful of and celebrating one's embeddedness within nature, holding pro-nature beliefs and values that are meaningful on a personal level, and having awareness and appreciation for the wonder of life. In short, developing one's ecological identity implies developing one's relationship with nature.

Nature Relatedness

Fostering relationships with nature, or nature relatedness, is a fundamental part of personal and societal transformation for sustainability. Ecofeminism, along with environmental traditions like deep ecology (Sessions 1995), has long challenged the perceived separation of humans from nature, and argued that a sustainable future hinges on recognizing and celebrating our relationships with the natural world (Warren 2000). From the perspective of ecological identity, nature is a dynamic web in which one is embedded as a co-inhabitant, rather than an abstraction above which one stands as a dominator.

Relationships are key here: Chris Uhl openly describes BiSci 3 as a course that invites students to re-examine their relationships with nature, with other beings, and with themselves. In an interview, a TA-in-training illustrates how BiSci 3 changed her relationship with nature:

> I remember, I would do the readings, and I would sit outside, and every time the wind blew, I would really inhale, you know what I mean? It's like I could breathe the air, it was so cool. And then there was a grasshopper, and I put the book down, and I kind of looked at it, and hung out with the grasshopper, you know? I think [my relationship with Earth] was the relationship that was impacted most for me. My human-to-human relationships were, you know, not *really* impacted, but my relationship with Earth was *deeply* impacted, deeply. I just appreciate the little things, like the rain, and – I don't know, I think that's what did it for me.

To assess the course-wide transformation of students' relationships with nature, I distributed pre- and post-test surveys utilizing the Nature Relatedness scale (Nisbet et al. 2009) to the fall 2009 section of BiSci 3. The surveys were also distributed to two control groups: a fall 2009 introductory geography course on sustainability, and fall 2011 sections of BiSci 3 designed and taught by someone other than Chris Uhl. The NR scale

measures the affective, cognitive, and experiential aspects of individuals' connection to the natural world. As the authors of the scale note, nature relatedness is very similar to the concept of the ecological self, and "encompasses one's appreciation for and understanding of our interconnectedness with all other living things on the earth." (Nisbet et al. 2009, 3). Hence, I use the Nature Relatedness scale as a measurement of learners' perceived relationship with nature and the salience of their ecological identity more broadly. The overall score on the NR scale ranges from 1.0 to 5.0; the scores from BiSci 3 and the control groups are outlined in Tables 4.1 and 4.2:

Table 4.1: Nature Relatedness

Nature Relatedness	Pre-Test	Post-Test	Difference	Significance (paired)	Effect Size (Cohen's d)
BiSci F09 (n = 226)	3.42	3.64	+0.21	$p < 0.01$	0.38
Control F09 (n = 89)	3.68	3.67	0.00	not significant	
Control F11 (n = 55)	3.47	3.44	-0.03	not significant	

Table 4.2: Nature Relatedness versus Control Groups

Nature Relatedness vs. Control Groups	Control Group	BiSci F09	Difference	Significance (indep.)	Effect Size (Cohen's d)
Nature Relatedness*	0.00	+0.21	+0.22	$p < 0.01$	0.57
Nature Relatedness**	-0.03	+0.21	+0.25	$p < 0.01$	0.64
* = compared to Control F09 ** = compared to Control F11					

Results of the pre- and post-test surveys indicate that the students in BiSci 3 experienced a significant increase in their perceived relationship with nature. The BiSci 3 students' mean score increased by +0.21 over the duration of the semester. This change is statistically significant at the 0.01 level, and is considered a medium effect size based on Cohen's d (0.38). In contrast, neither control group experienced significant change in its NR score.

The Nature Relatedness scale further breaks down into three subscales: (1) NR-Self, which represents an internalized identification with nature; (2) NR-Perspective, which represents an external, nature-focused worldview; and (3) NR-Experience, which represents a physical familiarity with the natural world. Each of these subscales is discussed individually in later sections, but tables 4.3 and 4.4 group the subscales together for reference:

Table 4.3: Nature Relatedness and Subscales

Nature Relatedness and Subscales	Pre-Test	Post-Test	Difference	Significance (paired)	Effect Size (Cohen's d)
BiSci F09 (n = 226)	3.42	3.64	+0.21	p < 0.01	0.38
…NR-Self	3.28	3.60	+0.31	p < 0.01	0.44
…NR-Perspective	3.73	3.93	+0.20	p < 0.01	0.35
…NR-Experience	3.20	3.31	+0.11	p < 0.01	0.13
Control F09 (n = 89)	3.68	3.67	0.00	not significant	
…NR-Self	3.55	3.58	+0.03	not significant	
…NR-Perspective	3.78	3.78	0.00	not significant	
…NR-Experience	3.70	3.65	-0.05	not significant	
Control F11 (n = 55)	3.47	3.44	-0.03	not significant	
…NR-Self	3.48	3.51	+0.02	not significant	
…NR-Perspective	3.59	3.52	-0.07	not significant	
…NR-Experience	3.26	3.20	-0.06	not significant	

Table 4.4: Nature Relatedness and Subscales versus Control Groups

NR and Subscales vs. Control Groups	Control Group	BiSci F09	Difference	Significance (indep.)	Effect Size (Cohen's d)
Nature Relatedness*	0.00	+0.21	+0.22	p < 0.01	0.57
…NR-Self*	+0.03	+0.31	+0.29	p < 0.01	0.53
…NR-Perspective*	0.00	+0.20	+0.20	p < 0.01	0.44
…NR-Experience*	-0.05	+0.11	+0.16	p < 0.01	0.32
Nature Relatedness**	-0.03	+0.21	+0.25	p < 0.01	0.64
…NR-Self**	+0.02	+0.31	+0.29	p < 0.01	0.54
…NR-Perspective**	-0.07	+0.20	+0.26	p < 0.01	0.58
…NR-Experience**	-0.06	+0.11	+0.17	p < 0.01	0.34
* = compared to Control F09 ** = compared to Control F11					

As shown Tables 4.3 and 4.4, the students who took BiSci 3 experienced a significant change in all components of the Nature Relatedness scale, while students in the control

groups experienced no such changes. Thus, BiSci 3 encouraged a strong and demonstrable development of ecological identity, above and beyond what might be expected from a more traditional environmental science course. In the following sections I discuss the three components of nature relatedness: self-in-nature, beliefs about nature, and comfort with nature.

Self-in-Nature

For participants, the most salient aspect of their growing ecological identity was their sense of personal connection to the natural world, their perception of their self-in-nature. This is reflected in the NR-Self subscale, which represents the participants' internalized identification with nature. A sample NR-Self item is, "My relationship to nature is an important part of who I am." Table 4.5 outlines the changes in NR-Self for BiSci 3 and the control groups:

Table 4.5: NR-Self Subscale

NR-Self Subscale	Pre-Test	Post-Test	Difference	Significance (paired)	Effect Size (Cohen's d)
BiSci F09 (n = 226)	3.28	3.60	+0.31	$p < 0.01$	0.44
Control F09 (n = 89)	3.55	3.58	+0.03	not significant	
Control F11 (n = 55)	3.48	3.51	+0.02	not significant	

Table 4.6: Nature Relatedness-Self versus Control Groups

NR-Self vs. Control Groups	Control Group	BiSci F09	Difference	Significance (indep.)	Effect Size (Cohen's d)
NR-Self*	+0.03	+0.31	+0.29	$p < 0.01$	0.53
NR-Self**	+0.02	+0.31	+0.29	$p < 0.01$	0.54
* = compared to Control F09 ** = compared to Control F11					

The NR-Self subscale showed a greater difference (+0.31) and a greater effect size as measured by Cohen's d (0.44) than any other subscale or the composite Nature Relatedness score. This suggests that BiSci 3 was particularly effective in encouraging students to develop an internalized identification or connection with nature.

Some participants described this growing connection with nature as waking up, as discovering something wonderful about themselves and the world around them. The theme of awakening runs through BiSci 3; the title of this study, "Awaken 101," comes from Chris Uhl's unofficial title for the course. Looking back on the outdoor retreat that began the TA training course (just after BiSci 3 had ended), a TA-in-training tells of her awakening to her connection with nature:

> On the retreat we did the partnership where you had to lead your partner blind through the woods. And that's when it finally first clicked for me, because my partner said, "Open your eyes and look at yourself in the mirror," and I never thought of myself as actually part of nature until that moment. And it was just – it was like an epiphany. I was like, wow, I'm really part of nature. And I think that was the moment that I woke up, and I realized that finding me was first, and then I found myself in nature, and I realized that we're all a part of this great thing.

"Being called awake," or learning one's identity both apart from and intimately connected to a larger whole, is one way to view the transformative process. Indeed, research in the lives of environmental activists underscores how important this process is to sustaining a commitment to activism in the long run (Kovan and Dirkx 2003). In this study, participants who experienced a growing connection with nature reported that being a part of something larger than themselves was deeply meaningful and empowering. A TA-in-training describes her shift from feeling disconnected to feeling like an important part of the universe:

> Well, first of all, I had never before considered a connection to the universe. It was more like I was an ant on this rock in this great expanse of nothingness, so I was all alone. And so BiSci reversed that. I am this, you know, blade of grass, connected and rooted into the earth, which is just this cell in this body of the universe. Instead of being all alone, it's like I am such an important part, even though I'm miniscule, I'm an important part of this entire living organism that is the universe. And it's just a wonderful feeling to not ever be alone.

A personal connection to nature, the strongest measured effect of BiSci 3, is one of the most desired outcomes for transformative environmental education from the perspective of ecological identity. Another desired outcome is a nature-focused worldview, which comprises the second subscale of Nature Relatedness.

Nature-Focused Worldview

Ecological identity is not only about an internal, personal connection to nature, but is also involves knowledge, beliefs, values, and attitudes that support nature and the environment. This external, nature-focused worldview is reflected in the NR-Perspective subscale. A sample (reverse-scored) NR-Perspective item is, "Humans have the right to use natural resources any way we want." Table 4.7 and 4.8 outline the changes in NR-Perspective for both groups:

Table 4.7: NR-Perspective Subscale

NR-Perspective Subscale	Pre-Test	Post-Test	Difference	Significance (paired)	Effect Size (Cohen's d)
BiSci F09 (n = 226)	3.73	3.93	+0.20	$p < 0.01$	0.35
Control F09 (n = 89)	3.78	3.78	0.00	not significant	
Control F11 (n = 55)	3.59	3.52	-0.07	not significant	

Table 4.8: Nature Relatedness-Perspective versus Control Groups

NR-Perspective vs. Control Groups	Control Group	BiSci F09	Difference	Significance (indep.)	Effect Size (Cohen's d)
…NR-Perspective*	0.00	+0.20	+0.20	$p < 0.01$	0.44
…NR-Perspective**	-0.07	+0.20	+0.26	$p < 0.01$	0.58
* = compared to Control F09 ** = compared to Control F11					

For BiSci participants, the magnitude of the difference and the effect size of the NR-Perspective subscale (+0.20 and 0.35, respectively) were very similar to those of the composite Nature Relatedness score (+0.21 and 0.38, respectively). Thus, the change to students' nature-focused worldviews in BiSci 3 very closely mirrored their overall development of ecological identity.

Adopting an informed nature-focused worldview first requires learning about nature and the environment. An increased knowledge of environmental issues was frequently cited by both interview and survey participants as a significant outcome of BiSci 3. A survey participant describes how this knowledge formed the basis for a new nature-focused worldview:

> I just learned a significant amount of new information that I either never put into perspective or never knew before this class. I feel like I have matured from this class and now look at life and earth in a whole new way.

In terms of environmental knowledge, it's worth noting that for the fall 2009 geography control group, "I am very aware of environmental issues" was the only item out of the 22 on the Nature Relatedness survey to show any statistically significant change from the

pre-test to the post-test[2], with a mean difference of +0.25. In contrast, 15 out of the 22 items showed statistically significant change for BiSci 3, including the item about awareness of environmental issues. Assuming that the geography students' self-reporting is an accurate assessment, this suggests that increased environmental knowledge is a likely outcome of a course designed to cover environmental issues (thankfully!), but that knowledge alone isn't enough. Environmental knowledge may be a necessary condition for transformative environmental education, but it is not sufficient.

In order to facilitate the kind of personal and societal transformation necessary for sustainability, environmental educators speak of the necessity of engaging *head, heart, and hands*, or knowledge, caring, and practical competence (Orr 1992; Sipos et al. 2008). The heart, or caring, component was particularly salient in participants' BiSci 3 experiences. During interviews, participants frequently illustrated how knowledge of the natural environment gained from BiSci was accompanied by love, care, or compassion. A TA-in-training illustrates this connection between knowledge and compassion in her discussion of anthropocentrism, or what in BiSci 3 is called "speciesism":

[2] Interestingly, for the fall 2011 control group comprised of alternate sections of BiSci 3, the only item to show significant change was +0.38 for "Animals, birds and plants should have fewer rights than humans". The positive change on this reverse-scored item means that the control group's anthropocentrism increased significantly after taking the alternate version of BiSci 3. It is also curious that the students in this control group did not report increased awareness of environmental issues; in fact, the mean difference for that item was exactly zero. The increased anthropocentrism is difficult to account for, but the lack of increased awareness of environmental issues might reflect the difference in emphasis between the geography course on sustainability (environmental issues) and the alternate sections of BiSci 3 (ecology).

> Speciesism was one of my favorite, yet least favorite, things to learn about, because it instills you with a sense of guilt. That like – it's just that humans think that because we can talk and speak and communicate with each other, that we have the *right* to just do what we will with any other species. Like obviously we – it's like this mentality that you're just so much more important and more prestigious than every other species, that you get to do whatever you want with them. Like, you know, they're just animals, I can control them, I can eat them, I can use them as pets. […] I feel like we're supposed to be living in this collective energy and respecting all the other species. Not being speciesist is, like, you respect other species and understand that they're made of the same things as you. Yeah, they don't speak and talk to you, but they speak and talk to each other, they have their own little world, and you don't see them trying to, like, put you on a leash and collar, and, like, put you pens and then kill you and eat you. So, yeah. Speciesism was really, really cool to learn about, but so, like, "Oh no, don't tell me about this," like "I feel so guilty."

While many participants spoke of their BiSci experience in emotional terms, this TA-in-training was among only a few participants who mentioned guilt as an outcome of the course. Among the few who did mention guilt, only one participant described guilt as a central motivating force in her new nature-focused worldview. For environmental educators, this reinforces the argument that shaming people into environmentally-responsible behavior is an ineffective tactic; rather, transformation involves developing a loving, caring, or compassionate connection with nature. Such a pro-nature orientation can be affirming and inspiring. A TA-in-training describes becoming more compassionate toward the whole of Earth as the central lesson of BiSci:

> GL: What was the course all about for you?
>
> TA-in-training: <long pause> I guess just becoming more fully who I was always intended to be, who we all are intended to be. Just, like, not a perfect human, but a compassionate one. And not just towards other humans, but towards everything. I mean, I've always been an animal person, I'm like that crazy person who's like, "Oh, a squirrel," like "I want to take you home." But not just animals, and not just the cute, like, "Oh, puppies," you know, but every animal is a being of the Earth, and the grass, and – it's really just, like, stepping up onto this podium of life. You're always just kind of wandering around, but it's like, okay now you need to step up, and you need to raise yourself up so you can look around and actually see everything that's going on instead of just looking at everything that's going on, really see it.

Adopting a nature-focused worldview is largely a matter of the heart. Care and compassion, embedded in connections with nature, suggest a relationality of emotion in transformative environmental education. This is the realm of emotional geographies, which I will return to later in this chapter.

As suggested by participants' experiences in BiSci 3, transformative environmental education can foster environmental knowledge and pro-nature beliefs, values, and attitudes. This nature-focused worldview is both cognitive and affective, engaging the head and the heart, but there is also an experiential component to ecological identity. The experiential component is represented by the third and final subscale of Nature Relatedness, comfort with nature.

Comfort With and Appreciation for Nature

Physical comfort and familiarity with nature is an important part of ecological identity. Individuals raised in modern, industrialized societies are very much indoor people, even to the degree of developing fear, discomfort, and disdain for the natural

world, or ecophobia (Sobel 1996). In contrast, a nature-focused identity and worldview implies a physical familiarity with the natural world, which is reflected in the NR-Experience subscale. A sample NR-Experience item is, "I enjoy being outdoors, even in unpleasant weather." Tables 4.9 and 4.10 outline the changes in NR-Perspective for BiSci 3 and the control groups:

Table 4.9: NR-Experience Subscale

NR-Experience Subscale	Pre-Test	Post-Test	Difference	Significance (paired)	Effect Size (Cohen's d)
BiSci F09 (n = 226)	3.20	3.31	+0.11	$p < 0.01$	0.13
Control F09 (n = 89)	3.70	3.65	-0.05	not significant	
Control F11 (n = 50)	3.26	3.20	-0.06	not significant	

Table 4.10: Nature Relatedness-Experience versus Control Groups

NR-Experience vs. Control Groups	Control Group	BiSci F09	Difference	Significance (indep.)	Effect Size (Cohen's d)
NR-Experience*	-0.05	+0.11	+0.16	$p < 0.01$	0.32
NR-Experience**	-0.06	+0.11	+0.17	$p < 0.01$	0.34
* = compared to Control F09 ** = compared to Control F11					

For participants, the magnitude of difference (+0.11) and the effect size (0.13) of the NR-Experience subscale were less than those of the other subscales and the composite Nature Relatedness score, though still statistically significant at the 0.01 level. This suggests that an increased physical familiarity with nature is not the strongest outcome of BiSci 3, but is an important part of the course and of ecological identity.

In interviews and open-ended survey responses, a moderate number of participants reported being more comfortable with nature, particularly going outdoors more often. A TA-in-training talks about her increasing comfort with nature as a work in progress:

> I guess that now I, you know, take time, and I smell different things. [Chris Uhl] ate a rose petal in front of us, I did not participate, but eventually I'll get there. I think it's different for everyone, I mean [a fellow TA-in-training] says she licks trees now. I think you have to have at least certain levels of – I'm not there yet. I assume that soon I will be licking trees and eating rose petals, but – definitely more open to the whole idea of being with nature, like camping outside, or like going into woods. […] [Before BiSci] I only went outside, even if it was a wonderful day, just to go to class. And now it's like, oh, let's go outside and play, and like talk to the earth.

Notably, the number of participants who reported being more comfortable with nature or going outside more often was not as high as the other outcomes of BiSci 3 discussed in this chapter. This corroborates the finding from the Nature Relatedness survey that an increased comfort with nature, as reflected by the NR-Experience subscale, is only a moderately strong outcome of BiSci 3. Perhaps many students, like the above TA-in-training, are still works in progress. If so, then an increased awareness of and appreciation for nature is likely the first step. Participants overwhelmingly reported a greater sense of awareness and appreciation regarding nature, both in general and in specific aspects that they previously took for granted. A TA-in-training describes this greater sense of appreciation:

> Even just if I'm really stressed out, taking a breath, looking what's around me, like when I drive home, maybe, appreciating the skyline, and just finding peace in that. Or we did a lot with breathing with trees, like, hey, there's something there that I'm not paying attention to that's really cool. There's so much more than what I'm being anxious about that can relax you, and again, find peace, like a broader perspective on my own trivial problems. And then that kind of goes into a sense of, like, play, like I want to be outside more. I want to play, I want to get dirty, I want to hear the birds chirping.

Appreciation for specific aspects of nature is especially important. Feminists have long warned against the dangers of turning the material world into an abstraction, and ecofeminists argue that it is essential for learners to develop specific, embodied

relationships with particular beings-in-nature, rather than a generalized appreciation for nature in the abstract (Plumwood 1991; Russell and Bell 1996). In this study, participants often did report an increased awareness and appreciation for specific, embodied beings and places. Guided by a BiSci field study, a former TA talks about her relationship with one particular tree:

> [For a BiSci field study] I did research about if a tree could feel, if a tree had feelings, so I spent time with the tree in front of my apartment. I remember, I got so connected with this tree. My neighbors would laugh at me, and call me all these – you know, hippie, and just kind of like, what are you doing, what class is this for, this is ridiculous. I just remember thinking, getting so connected, having such a connection with this tree, and realizing how many times I walk by this tree and I don't even recognize that I don't even give any kind of acknowledgement that it exists. So I think that assignment made me realize how selfish I am as a human being, that I can't even take time out for something so beautiful. At that point, that project kind of made me see things in a different light.

Through connections with particular beings and places, like this former TA's tree, BiSci 3 encourages students to engender an awareness of and appreciation for nature in their everyday lives. One of the recurring themes in the course is noticing and sharing "BiSci moments," or aspects of students' everyday life experiences that resonate with the spirit of BiSci. A TA-in-training describes the power of BiSci moments and her increased awareness:

> I was driving to school one day, it was probably last week, and I just looked up, I don't know why – do you know the birds that fly in the flocks? Like in the cornfield you walk by, and they like – it's amazing. But I look up and I just see this mass, but all of a sudden it like explodes. It just looked like a firework, it was beautiful. I was just like, wow, complete BiSci moment. That's what I said, I was in the car, I was just, wow, BiSci moment. You see beauty in things that you never really noticed before. Like after the spider video, I saw spider and I'm like – I don't know. I don't kill them but I stay away, I keep my distance. But I was like, what's the worst that could happen? I just got down and I was just examining the spider. I don't know if anybody saw me, but they would have been like, this girl is crazy. It's cool because BiSci, it opens your eyes. It opens your awareness, but it opens your eyes as well, literally. And I think about everything that I do. Like if I'm about to take the elevator, I need to go up four floors, I was like, nah, I shouldn't do that, that wouldn't be BiSci of me. And then I take the stairs, I'm just like, ah, I feel better, I'm awake now and everything. And it's just, I don't know, everything that you do could pertain to the environment, to something around you. And so it's like in everything.

"It's in everything" may well be the central theme of ecological identity. Transformative environmental education fosters comfort with nature, especially a greater sense of awareness and appreciation, which also informs learners' nature-focused worldviews and perceptions of self-in-nature. Everything is connected, including learners and the specific, embodied beings that surround them.

Through a discussion of the three components of the Nature Relatedness scale, the previous sections considered the transformation of students' relationships with nature. Fostering relationships with the natural world is an explicit goal of BiSci 3, and both survey and interview results from this study indicate that the course is successful in doing just that. I will discuss the implications of these findings later in this chapter, but now I continue the discussion of identity work in BiSci 3, using primarily participant interviews in an inductive approach. I draw from the most common themes expressed in participant interviews and surveys to explore how transformative environmental education affects

learners' sense of self beyond their relationship with nature. In other words, the following sections are about mapping the internal terrain of transformation.

Critical Self-Reflection

Amidst all the talk about ecological identity and relationships with nature, a super TA addresses what she thinks BiSci is about:

> [BiSci is] about coming to see ourselves as not separate from the earth, but a part of it. And also – actually, no, I wouldn't say that. I'd say it's about challenging our beliefs and being open to different beliefs, and becoming stronger in our beliefs for having challenged them. And there's a little bit of environmental science slash loving the earth stuff in there, just a little bit. And I'd also say it's really what you make of it.

In her about-face, the super TA gets to the core of what transformative environmental education is about: personal, critical reflection.

Decades of research in transformative learning has established that reflection is a key component of transformation, perhaps *the* key component (Mezirow 1990). In critically reflecting, learners analyze and question their own taken-for-granted beliefs and assumptions, and ideally reconstruct them to be more open and better justified. This study reinforces the centrality of critical self-reflection to transformative learning. Based on the open-ended survey responses, questioning one's own beliefs and social conditioning was

by far the most significant theme of BiSci for the class as a whole.[3]

In interviews and survey responses, participants reported thinking outside the norm, being open to new ideas, and seeing things differently because of BiSci. Course assignments, including a weekly course journal, active field studies, and introspective synthesis essays, consistently emphasized reflection and the questioning of one's own taken-for-granted beliefs and social conditioning. A TA-in-training reflects on this questioning process:

> I feel like BiSci just made you question. That was one of our assignments, was we had to write 100 questions and just stuff like that. And I feel like that's how everything got slowly but surely got connected, was you just questioned and continued to question. And it got further, further, further into your beliefs. So it could start off about something that you may have internalized as unimportant, but then you would ask, like, why don't I think that's important? And then you'd kind of answer to yourself and be like, well why do I believe that? And then we learn about a subject such as conditioning, where you'd really have to look yourself and be like, what have I been conditioned – what do I really believe and what have I been led to believe?

Questioning the self, critically reflecting on one's taken-for-granted beliefs and assumptions, plays a significant role in transformative environmental education. It prompts learners to deconstruct the assumptions about (un)sustainability that have previously gone unexamined in their lives, and provides them the opportunity to

[3] It is possible that the survey counts for questioning one's own beliefs and social conditioning are inflated because of the wording of the open-ended survey question upon which the counts are based. On the survey, a closed-response question asked, "As a result of taking BiSci 3, do you believe you experienced a time when you realized that your values, beliefs, opinions or role expectations had changed?" If the participant answered yes, a follow-up open-response question asked, "Please describe what happened." This open-ended question was used as the basis for the analysis of course-wide outcomes presented here. It might be that the disproportionately large number of responses coded for questioning one's own beliefs and social conditioning are because the question effectively asked for experiences that involved changing these beliefs and conditioning. However, participant interviews also consistently reported this kind of questioning as a key feature of BiSci 3, so it is clear that critical questioning of the self does play a significant role in transformative environmental education.

construct a more ecologically sustainable way of being. This, again, is about identity, or what may be conceptualized as a relationship with the self.

Relationship with the Self

Questioning the self is a process of identity work. Critical reflection provides the foundation for a stronger sense of who one is as a person, and a more knowledgeable, authentic, and caring relationship with the self. Relationships with the self, like relationships with nature and other beings, are a central focus of BiSci 3. Interview and survey participants consistently mentioned self-knowledge, self-development, and self-compassion as major themes in their experiences. Looking back, a super TA talks about what the course did for her sense of self:

> I just think BiSci helped me figure out who I am. Who I am, and how I want to be in the world, what I want to do. Everything has just come pieced together, like I said, everything has just fallen into place because of BiSci, which is kind of scary to think about. And it's really opened up everything for me.

As the super TA describes, BiSci prompted students to explore how the question of who they are is interwoven with the questions of who they want to be in the world and what they want to do. Many participants described how the course encouraged being true to oneself and doing what is meaningful. One TA-in-training called this the BiSci mindset:

> Like I was saying, just the need to experience things fully. And to be more connected with yourself and to truthspeak and say how you feel. And ask questions, like all those main segments of the course, they're so necessary, and I think that I'll be able to live a more complete, full, satisfying, exhilarating life if I'm approaching it with a BiSci mindset, instead of just going through it to get it done and trying to be successful. I think my priorities have shifted as a result of BiSci. It's just all about what I'm passionate about, instead of what's going to make me successful in the eyes of whoever, because who cares.

Shifting priorities, caring less about superficial success, and doing what is meaningful were frequently-cited outcomes participants' experiences. The BiSci mindset reflects a change from *having* material things to *being* in the world – to being authentic – which is an important part of transformative learning (Lange 2004). A super TA describes this continual search for authenticity:

> I don't think I've ever been as at peace as I am now. I mean, I still get really nervous, and I still have self-doubt and have my self-conscious ways, but I've been really trying to grow in my love for myself in all different ways. It's really hard. Sometimes I do things, and I'm like, this is not respecting myself. If I do this, then I'm not being true to who I am. I feel like in everything I do I've been trying to question, is this what I really want, and is this respecting me? Or is it for someone else, am I doing this for somebody else? I guess BiSci gave me the opportunity to do that, told me it was okay, go ahead, you can do that. Because you're worth it.

"You're worth it" speaks to the central role of self-compassion in the participants' experiences. Being true to oneself starts with caring for oneself. Looking back at her time in BiSci, a former TA reflects on the importance of caring:

> I wish I had it so much earlier in life, and I wish I still was in BiSci. I think the strongest thing about BiSci was that it just invited you to care about yourself, and to accept yourself, and I think that that's what makes it so important and so much more effective than any other environmental science class or anything, is that everyone genuinely cares about you, and teaches you how to care about yourself. I think that's really important.

For many participants, learning to care about themselves was not tangential to the transformative process; it was their starting point for transformation. Through being invited to care about themselves, participants became open to caring about the world and their place in it. This suggests an intriguing geography of care that begins with the self before extending to more relationally or spatially distant entities. A super TA talks about the importance of looking inward before trying to help the world:

> For me, I feel like if you're going to make any difference in helping the earth as a whole, you need to help yourself first. Because you're not going to be able to do much, or even really consider the problem, if you don't figure yourself as a wonderful, capable human being who is content where they're at in life, and are just happy with how their existence is going. Because if you're unhappy, still searching for some kind of meaning in your life, then helping the earth or even recycling is so far down on your list, you don't even care, you're not even considering your ecological identity or what problems the earth may have. Because first and foremost is, I'm really unhappy, stuff is just not going well, and maybe I can worry about recycling after my life's okay. So I feel like we have to be healthy ourselves, mentally, physically, emotionally, before we can even start helping the earth. [The personal aspect of BiSci] seemed like the prelude to the actual ecological stuff. It was, before we can worry about that, we need to worry about you, you're not totally okay right now, so once we get you happy and loving yourself, then we can worry about the big problems. The first step was looking inside, and then the next was looking outside, and to spread that inner love everywhere else, and apply the lessons you picked up to improve your life. And you spread them to other people, or just use it to help things in general. I feel like that initial feeling of self-worth needs to come before you can help anybody else.

Fostering relationships with the self, a primary goal of BiSci 3 along with fostering relationships with nature and other beings, is a significant part of participants' BiSci experiences. Moreover, as the super TA describes, there is an explicitly spatial dimension to transformation: BiSci involves looking inward first, then looking outside, then working to apply the lessons of BiSci elsewhere. The spatiality of transformation suggests a fruitful entry point for geographic analysis. In particular, emotional geographies provide an informative lens through which to view transformative environmental education.

Emotions and the Transformative Process

As the above discussion of love and caring suggests, transformation is not only a cognitive-rational process, but is also an emotive process. Although cognitive-rational reflection is consistently emphasized in the transformative learning literature, there is

increasing evidence that strong emotions and intense feelings play a prominent role in transformation, particularly for environmental activists and those committed to working for social justice (Kovan and Dirkx 2003). A learner's emotions are central, not peripheral, to the process of transformation; indeed, without strong emotions, transformation may be less likely to occur (Ball 1999).

The tradition of emotional geographies provides key insights into this link between emotion and transformation. From the perspective of emotional geographies, emotions are central to the transformative process because emotions are central to identity. Emotions and identity co-constitute each other, as "our sense of who and what we are is continually (re)shaped by how we *feel*" (Davidson and Milligan 2004, 524). Hence, cognitive-rational reflection can only go so far in shaping identity. Transformation is strengthened by, and perhaps even requires, an intentional focus on feeling and emotion.

Emotional geographies call for "recognizing the emotions as ways of knowing, being and doing in the broadest sense" (Anderson and Smith 2001, 8), a perspective that is essential for transformative environmental education. In this study, many participants described how BiSci 3 explicitly encouraged and validated emotions as a way of knowing. A TA-in training reflects on this emotive component of the course:

> I think this was the only space in my life that was open to emotion, and saying that it was okay. Because I personally am a sensitive person, and all my life have been told that wasn't okay. […] And to hear that it's okay to be emotional, that was the first time I'd ever heard it was okay to have strong feelings. And now I look back, and I'm like, why shouldn't you feel strongly? It was a complete switch in my mentality, like why shouldn't I be passionate about things, and open about how passionate I am, and do things about how I feel?

Here, again, emotions are explicitly spatial: the TA-in-training describes how BiSci created the only space in her life that was open to emotion. This suggests a geographic perspective on emotions and transformation; how the (material and immaterial) spaces where learning occurs shape the (material and immaterial) internal spaces of the self, and vice versa, is an intriguing question for emotional geographies.

Looking inward toward the self involves mapping the emotions most commonly associated with transformative environmental education. In this study, participants frequently reported happiness, excitement, passion, and feeling more alive as outcomes of their course experience. A TA-in-training talks about the passionate feelings that BiSci kindled for her:

> It gave me something to feel alive for again. It's so easy to get sucked into the grind of work and school and just the crap. But it gave me kind of a look at what my generation's revolution could be. Like I've been reading a lot about – I have a class called the history of punk rock, it's online, and so we've been doing a lot of reading on social movements in the 60s and 70s. And I'm realizing that, like, this is it. It's going to happen again. And that's my generation, and I want to be out there, and I want to do it. And I haven't felt passionate about something like that for a long time.

Notably, this TA-in-training frames her BiSci experience in terms of social movements, which evokes the strong connection between emotion, shared commitment, and social movements explored in the emotional geographies literature (Bosco 2007). This echoes the earlier themes of participants' searching for authenticity and doing what is meaningful in their lives, and demonstrates how happiness and passion are intertwined with this process. In addition, many participants spoke of how slowing down, taking the time to fully engage and appreciate life, was vitally important to their happiness. A TA-in-training speaks about this process of slowing down:

> I would have to say, the whole aspect of slowing down was a pretty central one for me. I'm an anxious person, I'm always thinking about what I have to do next, and it definitely hinders your ability to appreciate life and things that you don't normally pay attention to. So just breathing, slowing down, and then be able to appreciate those things, and how that kind of just can transform into happiness then. It's kind of crazy how that – just something so simple. And then how we very much are taught to just do everything at maximum efficiency, get from here to here, and you're never – and I still do it now, it's just something I'm a little more aware that I'm doing. In all of this I have a lot of room to grow. But at least being aware of the fact that, okay, I'm here now, let's enjoy this, let's do the best we can with this moment.

Happiness was not the only significant emotion for participants, however.

Sadness, fear, worry, and discouragement were also prominent in the participants' experiences. Transformative environmental education invites learners to care deeply about the natural world, to view their own identities as intimately intertwined with nature, which makes the sadness and discouragement associated with ecological destruction that much more acute. The same specificity that allows for relationships with particular beings and places, rather than with nature in the abstract, can intensify feelings of loss. To build a personal relationship with something is to make oneself vulnerable. A TA-in-training self-consciously tells the story of a particular tree that she cared for:

> This is probably something really, really stupid, actually. I don't know if this is what you're getting at. They're doing renovations in our apartment, and they were cutting down trees. And it made me really sad, because there's always this one tree across the street from the bus stop from me that was so pretty, it was *gorgeous*. In the fall it turned the brightest red, and I *loved* this tree. And a couple weeks ago they were installing new porches and patios on these apartments, and apparently they thought it was a "safety hazard" to the apartment. And I was walking, and they were cutting it down, and I heard their saws, their chainsaws and stuff, and I could hear the branches falling off. And normally I'd just sit there and stare, I'd be like, that sucks. But I was listening to it, and listening to the branches fall, and it was sad. I could feel – it was sad. And, I don't know, that to me – it kind of broke my heart. Because normally you'd hear the chainsaws and be like, eh, that kind of sucks, it's noisy. But I put that aside, and I just listened to the tree, I listened to every branch that fell off, and when it hit the ground, what it sounded like. And it was just – it was sad, because I was like, okay, these people clearly – I mean, it's their job, so I guess they really don't have a say in it. But, I don't know, it just seemed like they were so disconnected from it. And then here I was just watching it, and I was like, that tree just died. Like, they just took the life of this tree. It was kind of – it was heartbreaking, just listening to it, listening to the branches fall, and the leaves, the old leaves crunching and stuff. I was just like, this is really horrible. I don't know.

In a space like BiSci where emotions are valued and encouraged, the intensity of feelings like sadness and fear can be difficult for students. BiSci 3 is divided into three thematic parts, each with a different objective. The first part is designed to awaken a sense of care and connectedness to Earth, the second to honestly and unflinchingly face the severity of the current ecological crisis, and the third to foster empowerment and personal and planetary transformation (Uhl 2003). The second part, coming face-to-face with ecological realities, was particularly difficult for some participants. A super TA reflects on this part of the course:

> I wasn't expecting the second part of the course, and that was a really intense part for me. I remember, I was, like, depressed during and afterwards in BiSci, even into Bio 400, I think. I was asking all these questions and I didn't have the answers. And I still don't have the answers, really, but I'm more comfortable with that now. I know one part of it was the whole way I began to see my hometown and where I live, and even my family. I remember after the peak oil part, I called my mom, and I was like, <panicked> "Mom! We need to start growing vegetables in the back yard!" And she just told me to calm down, it's not a big deal, it's not going to happen in the next two years or whatever. But I was still freaking out about it. And even when I go home, all I see is separation. And that leads me to question, well, have I lived my whole life being separated from things and not even realizing it? […] Why am I even focusing on school, why is that the main part of my life? BiSci brought that to my attention, I had to go back and look at my whole life, and be like, have I really experienced what I want to experience? You know, this unity and connectedness. Or have I just been afraid of it, without even realizing?

For this super TA, asking difficult questions without answers and feeling the personal, emotional impact of course material were what prompted her to re-examine her life. Stories like this from participates indicate that intense, difficult emotions are likely intertwined with the very process of transformative environmental education. Emotional geographies illustrate how emotions are co-constitutive of identity; thus, in order to transform identity, the intensity of emotion matters. A TA-in-training reflects on the role that more difficult emotions play in the transformative process:

> Maybe I've always been really scared, that the world – like I watch all these crazy things on Science Channel, oh, they scare me to death about the world, just how it's in such a bad way. I never really let my body feel those things, and BiSci does let you feel *everything*. And that's – that can be really unpleasant. But ultimately it's for a good cause. Because, I mean, I can't think of a time when, you know, I've learned something or became a little bit of a better person without a struggle. If something isn't tough, then you don't really fight to get through it. And once you get through it, that's when you change. That's my personal experience, like how I think I've come to be who I am. And the same thing with BiSci; it is sort of a fight to get through it, because it can be scary, and you hear things you don't want to hear, even from within yourself. But then once you get through that it's like, wow, here's where I was supposed to be the whole time. Here's where everyone should be. And you so badly want to just shake everyone and be like, don't you know? Can't you see the things that I see?

In declaring that the difficult emotions are worth it, the above TA-in-training reinforces an important lesson for transformative educators: comfort is rarely transformative (Berger 2004). Transformation involves challenging and perhaps discarding ways of being that feel safe and secure, moving to the edge of one's understanding and meaning-making, and venturing out into the unfamiliar. This is what it looks like to reshape the internal terrain of the self.

In transformative environmental education, learners venture into this terrain without a map; it is an important ethical consideration for transformative educators whether they have the right to ask this of learners, and what responsibilities they have for providing support for learners going through an emotionally and socially difficult process (Baumgartner 2001; Moore 2005). With these concerns in mind, I asked the participants whether their experience was worth it, difficult emotions and all. Every participant I asked said it was worth it. A TA-in-training reflects, "Yeah, I mean, sometimes I forget it was just a three-credit [general education] course. But I'll never be the same after it, and I wouldn't change that, ever."

Transformation and Restoration

Coming full circle to the opening discussion about ecological identity, transformative environmental education is about a way of being, a part of themselves that learners will take with them into their everyday lives. As one TA-in-training describes the course, "It really is a whole way of life, it's not like a class, it's an adjective and a way of life."

Phrases like “way of life” and “life journey” often peppered participants’ responses. When asked about her ongoing journey, a super TA reflected on how worthwhile it has been so far, despite how much easier it would be to live in ignorance:

> Yeah, I don’t think [this journey] can ever stop, even if I tried to say I wanted it to stop. Because sometimes I get like that, when you’re just like, why can’t I just go on and do what I have to do, and not think this way, you know? It’s so much easier to live blindly, but, I mean, I don’t think it will ever stop or go away. Which is not a bad thing, but sometimes I’m just frustrated. I have a friend who took the class when I took it, and we would always talk about it, and then one time he was saying something about recycling, and I think I said, “Don’t give me your BiSci talk.” And he goes, “It’s not BiSci, it’s life.” I think about that a lot, too: it’s not BiSci, it’s life. This is just things that won’t ever leave me, and that I’ll keep growing with, too. I feel like every class, every conversation I learned something that I just keep taking with me.

Transformative learning is the difference between knowledge as mere information and knowledge that animates one’s very being. This may not always be a process of transformation as much as a process of rediscovery or awakening. A potential corollary of transformative learning is restorative learning, which involves restoring to prominence one’s deeply-held ethics and one’s important relationships to self and environment (Lange 2004). A few participants confirmed the importance of restorative learning by noting that they weren’t changed, per se, by the course, but rather were awoken to parts of themselves they couldn’t tap into before. A TA-in-training reflects on the central lesson of BiSci for her:

> Awareness, really. I didn't change from who I was before. I mean, I might have tweaked little things, like just being more conscious of – you know, I've always been the type to turn off lights or turn off the water, like I've never been one to have excessive waste, like energy and stuff like that. But I didn't – now I realize there's more to it than that. You can't just be ecologically aware in your own home, there's so much more to it. It's a state of *being*, instead of a state of mind. And I think before I thought of it as just a mindset, like remember to do this, remember to recycle. Now it's just kind of part of me instead of an aspect of my thinking. […] Like being able to feel the Earth and its distress with my whole being, instead of just noticing it. Because you can notice anything, but if you feel it, that's much, much different. So that's really what I mean by, like, now it's part of me, instead of just a mindset. But it's always been, I just couldn't tap into it.

For this TA-in-training, *feeling*, rather than simply noticing, is the hallmark of her transformative experience, the key link between her self and Earth. As conceptualized in emotional geographies, "emotions, then, might be seen as a form of connective tissue that links experiential geographies of the human psyche and physique with(in) broader social geographies of place" (Davidson and Milligan 2004, 524). Emotions are the ties that bind, the connective tissue that forms the basis of relationships between self and nature, the foundation of ecological identity. The difference the TA-in-training describes between feeling and merely noticing, between being and merely thinking, is the essence of transformative environmental education. Transformation it not just an epistemological process involving a way of thinking; it is also an ontological process involving a way of being and relating to the world (Lange 2004). It is an inherently emotional process that has the potential to reshape the terrain of the self.

The most telling moments for me in my interviews were when I asked participants to reflect on how they have changed because of BiSci. Instead of asking this question directly, I anticipated that I would get richer responses by asking it indirectly. The basic form of my question was, "Imagine that you had never signed up for BiSci. How would

your life be different now?"

The looks that crossed many participants' faces as I asked them to imagine their lives without BiSci said it all. They were dramatic looks of horror, sadness, and grief over something wonderful lost: wide eyes, furrowed brows, downturned mouths. As one TA-in-training said to me, "Greg, that's a horrible thought. Why would you say that?" Their exaggerated responses belied an important truth: this course was a deeply meaningful experience that had become a part of who they are. Even though a few participants pointed out that the course didn't necessarily change them, the majority of interview participants made it clear that they were changed, often in dramatic ways. In response to how their lives would be different without BiSci, former TAs replied:

> Former TA 1: It would be *so much different*. Because of BiSci I've kept sane, leaned to deal with life. I'm proud of doing it, I think my brain was rewired in healthier way, I'm more self-aware, pay attention to what really matters. I'm worried about going back to my old ways, but I'm still on better track. I'm so happy, I still don't know how they picked me [to be a TA].
>
> Former TA 2: It would *definitely* be different. I wouldn't be environmentally aware, or a vegetarian, or have gotten into local food, food rights, animal rights. I never would have put it together, the connection between me and nature, the earth/industrial economy diagram. […] Now I'm more willing to take opportunities, to go hiking and do activities. I take the time to stop and breathe, and listen, and lay down.
>
> Super TA: I'd probably be really unhappy. I don't think I would have nearly as many of the good friends I have now, because that's where most of them most of them come from, is BiSci. Definitely would have less faith in humanity in general, because I wouldn't have met all those wonderful people. So the standard would have been low on wonderful people, and really high on the people who suck. And I wouldn't have the self-confidence or the self-love I have now, so I probably would have been still searching externally for happiness and not finding it. I would probably not be doing great – I wouldn't know that I wasn't doing great, I'd probably just think I was doing average, because that's about where everyone's at. I guess it would have been the greatest opportunity I never knew I missed.

For participants, BiSci 3 is much more than a course. It is a way of life, a deeply meaningful experience that becomes part of their identities.

In addition to participants' increased connection to nature as measured by the Nature Relatedness scale, an inductive analysis of survey and interview responses reveals that the course also encourages a more caring and authentic relationship with the self, a transformative process that is intertwined with intense feelings and emotions. Like nature relatedness, this is an explicit goal of BiSci 3 successfully achieved. Through engaging head, heart, and hands, and particularly by creating spaces that encourage and validate emotion, transformative environmental education can foster a significant transformation in learners' identities.

Discussion

An exploration of the internal terrain of transformation, as shaped by the seismic shifts associated with emotion, makes it clear that that transformative environmental education can be a powerful force in shaping ecological identity. Even just a single 300-student general education course for non-science majors can significantly increase learners' affective, cognitive, and experiential connection with the natural world. In selecting future and former teaching assistants as the main population for the qualitative portion of this study, I did so on the assumption that they would be among the students who were most significantly affected – and perhaps transformed – by the course. Their rich, deep, and inspiring interview responses certainly support this assumption. Importantly, though, results from the course-wide survey demonstrate that transformation

was not limited to the future TAs alone. The statistically significant changes in all sub-scales of Nature Relatedness across the course-wide population indicate that the development of relationships with nature was a notable outcome for the class as a whole. Transformation is not limited to just the engaged few.

The shift in the NR-Self subscale, or a perception of one's self-in-nature, was particularly strong in this study, which is a promising result from an ecofeminist standpoint. These traditions suggest that modern, industrialized humans' very relationship with nature is flawed, and emphasize the importance of developing personal and socio-cultural identities that view humanity as an integral part of, not outside and above, the natural world. Transformative environmental education can help shape precisely the kind of identities required to transcend anthropocentrism and a dominator relationship with nature. Changes in the NR-Perspective subscale, which represents a nature-focused worldview, also support this conclusion, as do interview and survey responses. Love, care, and compassion for nature, a desire to enact principles of sustainability in everyday life, and an empowering sense of connection to something larger than oneself were all common themes from participants. These themes reflect a shift in ecological identity, of who one is and what is one's place in the world.

Although it was still statistically significant, the change in the NR-Experience subscale, which represents a physical familiarity with the natural world, was less than the other Nature Relatedness subscales. Interview and survey responses, too, mentioned comfort with nature less frequently than other outcomes of BiSci 3. The course did involve a number of outdoor field studies and field trips, but the study results seem to indicate a thoroughly indoor people still learning though a primarily indoor educational

paradigm. Perhaps outdoor and experiential education (Smith 2002; Sobel 2004) may prove to hold important contributions for transformative environmental education; this could an exciting direction for future research.

Nature relatedness was not the only aspect of participants' identities to change in BiSci 3. Corroborating prior transformative learning research, the results from this study reinforce the centrality of critical self-reflection to the transformative process. In surveys and interviews, participants overwhelmingly cited questioning their previously taken-for-granted beliefs and assumptions as central to their experience in the course. The questioning allowed participants to build a more self-aware and authentic relationship with the self. This is important on at least two levels. First, it fosters self-compassion through genuinely caring for learners and allowing them to learn to be less critical and more caring of themselves. From the perspective of a holistic educator, this goal is worthy in its own right. Second and even more important for sustainability education, though, is that building a more caring and authentic relationship with the self allows learners to discover and follow what is truly meaningful to them. Staying true to oneself and following one's deeply-felt life purpose or calling is often the basis of long-term environmental and social activism. With its constant emphasis on critical self-reflection, transformative environmental education can help learners develop this personal commitment to doing what is meaningful that is so important for lifelong activism.

Seen through the lens of emotional geographies, an important corollary to rational reflection is the emotional dimension of transformative learning. Emotions are co-constitutive of identity, and therefore are central to transformation. Classic transformative learning theory often overlooked or de-emphasized this emotional dimension, but more

recent work has increasingly emphasized the importance of emotion to transformation. Results from this study reinforce this newer orientation; transformative environmental education includes a strong emotional component that is intertwined with the transformative process. Indeed, developing love and care for the natural world, and fostering a personal connection to specific, embodied beings-in-nature, is unavoidably emotional. Transformative environmental education can explicitly create space for these emotions to be expressed, kindled, and supported.

Transformative environmental education represents a fundamentally different kind of learning, and a different kind of education. It's the kind of learning that shapes identities and remaps relationships, the kind that learners will take with them into their everyday lives. It's the difference between thinking about an idea and incorporating that idea into one's very being, between noticing the destruction of Earth and really feeling it. The difference, in short, is *feeling*: emotions are the connective tissue that forms ecological identity and is intertwined with the process of transformation.

This kind of learning provides for a deeply meaningful experience for learners. In this study, asking participants to imagine their lives without BiSci 3 was asking them to imagine their lives without a part of themselves. This is the promise of transformative environmental education: it can help shape who we are, and by extension, what kind of world we create.

Conclusion

We live in challenging times. Collectively, humanity's current way of life is profoundly unsustainable. In the midst of challenge, though, lies opportunity. A profoundly unsustainable status quo invites (and perhaps even requires) us to respond with an equally profound shift in our identities, worldviews, and ways of being. Through the development of ecological identity, including emotional and personally meaningful relationships with nature and authentic relationships with the self, transformative environmental education can encourage and foster these shifts. Transformative environmental education represents a significant way that higher education can engage the challenge of sustainability.

Ultimately, transformative environmental education is about the learners who are being invited to transform their identities and ways of being. I feel that it is only appropriate, then, for participants to have the final say in this chapter. In what I think is a stunning quotation that encapsulates nearly every theme in transformative environmental education, a former student discusses the main lessons she learned from BiSci 3. I conclude with her words:

Through BiSci I learned that, one of the main things [Chris Uhl] wanted you to learn, was we are a part of Earth. Everything is something, like we're the stardust, you know what I mean? So when I think about my actions and everything I do throughout the day, I think, how does this affect what I'm doing to me, to my environment, to where I live, to what supports me, to what keeps me living, and how can I improve that? Or how can I change what I'm doing in order to make this a better place? At first, I was like, this is a BiSci class about the environment, and he's having us meditate and hug trees, and I don't understand. But after you get through the whole class, and you just sit down and really think – like at the end of class, he had us write a paper about our overall experience, and when I was writing it, it really did connect the dots, because you just learn about all this stuff about you, and I almost learned to love myself so much more. And when you do that, I feel like you realize how important it is, this earth isn't just someplace that you have your house, this is all of us, we all have to be a part of this, keep it going, or it's not going to last forever. So I think that me loving myself, me wanting to experience so much more, and have a long, full life, and a happy life, you just want to protect the place that you live in and try to make it better.

Chapter 5

Transformation and Learners' Everyday Lives

Results from the previous chapter indicate that transformative environmental education can lead to a significant change in learners' identities. The next question is, what then?

The promise of transformative environmental education is that it can catalyze both personal and societal transformation. Personal transformation involves a change in identity, specifically ecological identity and a more authentic relationship with the self. The first step involves looking inward at the self, but the next step requires looking outward at the world. For transformative environmental education to make a difference on a broader scale, the effects of transformation must extend beyond the individual. Broader societal transformation builds from personal transformation and involves a change in behavior, action, and social relationships. This is the challenge of praxis in feminist pedagogy: how theory can inform action, and vice versa. Praxis is a matter of everyday life. Again using BiSci 3 as a case study, this chapter addresses the following research question: How does transformative environmental education affect learners' everyday lives? In other words, does a shift in identity lead to a shift in pro-environmental action, and how do these shifts influence learners' social networks?

Mirroring the two points of emphasis in the research question, this chapter is composed of two main parts. The first part discusses pro-environmental action and its

attendant beliefs and values. Beginning with a discussion of empowerment and active caring, I use qualitative interviews and quantitative survey results to examine the relationship between beliefs and behavior and the belief-action gap. The picture of pro-environmental action that emerges is complex and murky; transformative environmental education leads to empowerment, but not necessarily active caring, and it increases pro-environmental beliefs and action, but no more than more traditional environmental education, and perhaps not in ways that could make the most significant difference in the world.

The second part focuses on participants' social networks, discussing the presence and absence of support and social connectedness in their everyday lives. The clear themes that emerge include the mixed level of support that participants receive, particularly from their friends and peers, and the decline in social connectedness among participants who report being changed by BiSci 3. Fortunately, participants also report greater courage and confidence in the presence of others, and demonstrate a strong commitment to issues that have become important to them because of their BiSci experience. Drawing on insights from emotional geographies, I argue that transformative learning is inherently relational, with a particularly strongly social dimension. The social dimension of transformation, along with the findings on pro-environmental action, paint a complex picture of the effects of transformative environmental education in learners' everyday lives.

Empowerment

Empowerment can be described as the ability to make choices and act. It follows, then, that empowerment is a prerequisite for action, or at least for the kind of informed, committed action that transformative environmental education seeks to foster. Feminist scholars and educators often describe empowerment as the primary goal of feminist pedagogy (Webb et al. 2002), encouraging learners to develop confidence in their capacity to make a difference and become equipped to take action. Empowerment is similarly essential for the praxis of transformative environmental education.

For participants, empowerment is indeed one of the most significant themes of their BiSci 3 experience. Both interview and survey responses frequently mentioned the belief that their actions can make a difference. A TA-in-training describes how BiSci encouraged her to believe that she can change the world:

> I guess I've always viewed myself, conditioned-wise, as small. As, you know, I went to a very big high school, I was just a graduating number, and here I'm just Penn State ID number 934-whatever. But whenever we would write our reflections, I constantly would be writing about how I want to help. And finally at the end I was just like, I should just do that. If I want to do it so badly, then I should just go and do it. You only live once. […] It was just kind of a reinforcement of, you know what, I can do this, I can go and change the world if I really wanted to. Instead of sitting in a classroom and learning about, I don't know, how to teach, when I could go be doing it.

BiSci 3 explicitly seeks to empower students through an expansion of agency and personal possibility. This is also an expansion of identity, as students are encouraged to view themselves as change agents, as people who matter. A TA-in-training speaks of how powerful, and unique, this empowerment process was in her BiSci experience:

> It's no class you have ever taken before in all of your institutionalized learning, and most likely a class that you'll never take in all of your institutionalized learning. Call it hippie, call it <pause> life. But it's a class that allows you to trust yourself, and to trust in what you think and what you feel. And with that comfort and that trust, you're able to make a difference, and to be someone, to really be someone. And not necessarily in the, for example, JFK, Martin Luther King sense, or Gandhi, but you can be someone. *You can be someone*, you know? You can really stand out in the crowd and just be someone influential, be a guide. And this class, this class is the mantle of the portal getting there. I really believe that.

Empowerment is also a matter of desire. In addition to the belief that one *can* do something, taking action requires the belief that one *should*. Many interview and survey participants reported an increased desire to act, whether through inspiration or a sense of responsibility. A former TA describes her newfound hunger to help the world:

> There's work to be done, I don't think I even knew that before. [BiSci] gave me the tools to understand that, and this drive to want to fix the world. […] Tools, and more than anything, this hunger, like I just want to help, I want to do something, there's something to be done.

Through the desire to act, the belief that one's actions can make a difference, and an expansive sense of personal possibility, BiSci 3 encouraged a strong sense of empowerment among students. Empowerment is also closely related to self-esteem and a sense of belongingness, and together these three components comprise active caring.

Active Caring

Caring, both for nature and for oneself, was described in the previous chapter as a significant outcome of BiSci 3, and an important part of ecological identity. BiSci 3 takes this one step further: one of the foundational premises of the course pedagogy is that a love for Earth must precede the call to act on its behalf. Chris Uhl describes the journey that lead to this pedagogical premise in the required book for BiSci 3 (Uhl 2003). A TA-

in-training tells this story and illustrates the connection between appreciation and activism in her own life:

> I thought the idea of how [Chris Uhl] changed his teaching methods, like he explained it in his book, he used be like, "Well this is what's happening in the Amazon, and it's terrible, and it's sad, and what can we do about this?" And he discovered that it was kind of ineffective. Instead, the proper way to go about it was to make people *appreciate* Earth, and then from that appreciation will spawn activism. And I think that's totally true. Like if you can really get people to respect something, and love it, they'll defend it and care for it. Instead of just being like, <authoritative> "Oh, this is what's going on in the world. This is bad. You need to act." That's not as effective. And I think when he described that, his changing of teaching methods throughout his teaching years and experience, I thought, yeah, that's right. Because, you know, I love my family and I respect my family, and I would, like, kill anybody who tried to hurt that, you know what I mean? And so it's like the same approach with BiSci. And I think that's really – that gave me an epiphany. You know, when you have that appreciation and respect for something, you won't hurt it.

A few other participants also explicitly spoke of the connection between caring and action. E. Scott Geller (1995) describes this orientation as *active caring*, or caring enough about a particular problem or about other persons to take action that could make a beneficial difference. The hypothesis of active caring is that positive, large-scale, and long-term approaches for increasing pro-environmental behavior are only feasible if increasing numbers of people actively care enough to make behavioral changes. Active caring certainly seems to be a promising framework for understanding the process of transformation in BiSci 3.

Active caring consists of three major components: empowerment, self-esteem, and belongingness. To assess the course-wide development of active caring, I distributed pre- and post-test surveys to the fall 2010 semester of BiSci that included items correlating to these major components and their overlaps. An item that combines the three components of empowerment, self-esteem, and belongingness is "Together, we will

be able to rise to the challenge of making the world a better place." Like Nature Relatedness, these items were measured on a 5-point Likert scale and averaged together to create a composite active caring score ranging from 1.0 to 5.0. The surveys were also distributed to a control group consisting of fall 2010 sections of BiSci 3 designed and taught by someone other than Chris Uhl. The results are shown in Tables 5.1 and 5.2:

Table 5.1: Active Caring

Active Caring	Pre-Test	Post-Test	Difference	Significance (paired)	Effect Size (Cohen's d)
BiSci F10 (n = 125)	3.78	3.73	-0.05	not significant	
Control F10 (n = 40)	3.80	3.78	-0.02	not significant	

Table 5.2: Active Caring versus Control Group

Active Caring vs. Control Group	Control F10	BiSci F10	Difference	Significance (indep.)	Effect Size (Cohen's d)
Active Caring	-0.02	-0.05	-0.03	not significant	

Interestingly, results from the survey indicate that participants' active caring scores did not significantly change in BiSci 3, the control group, or any identified subgroup. The lack of measured increase in active caring is perhaps the most puzzling result of this study. The components of active caring seem to be significant themes in participants' interview and course-wide survey responses, particularly empowerment, but also self-compassion (self-esteem) and feeling like an important part of something larger than oneself (belongingness). When assessed by pre- and post-test surveys, however, it appears that these components did not increase because of BiSci 3.

There are a few possible explanations for these results. One is that active caring is not the proper model to describe participants' experiences. There may be a mismatch between what I have interpreted as participants' increased empowerment, self-esteem, and belongingness, and how these terms are used in the active caring model, or the model

itself may be underdeveloped. To my knowledge, Geller's active caring hypothesis has not been tested by many empirical studies; one exception is Allen and Ferrand (1999), which only provides tentative support. Another possibility is that the instrument I designed is flawed. Unlike the Nature Relatedness scale, the active caring measurement has not been tested or validated, and it may not actually measure what it was intended it to measure.

If the model and instrument are valid, however, it is difficult to account for why participants' interview and survey responses regarding active caring are not corroborated by the measurement, even for the subgroup who reported being changed by BiSci 3. In this case, the most likely explanation might simply be that participants' propensity for active caring did not change as a result of the course, at least not in a way that is measurable by a quantitative survey. Participants might have actively cared to the same extent before taking BiSci 3, and the course made them more aware of these beliefs, or deepened their convictions, or made some other qualitative difference. It could be that the sense of caring that BiSci evokes is more of an ephemeral feeling, one that is difficult to capture in a quantitative measurement. A former student describes something to this effect while discussing how BiSci informs his basic pro-environmental actions:

> I think it's been almost a feeling that I've gotten, because I was inspired by so much of what Chris [Uhl] had to say, just the different perspectives that I was opened up to. I really just felt like it was my – that's how I should be acting, and why else would I act any other way? I've been really actively trying to do that. It's almost become a – I *feel* like I need to do it, I'm not constantly telling myself, "I need to recycle, I need to recycle." I'm *going* to recycle.

Feeling again returns as the hallmark of transformation, underscoring the emotional dimension of transformation. For this former student, BiSci encouraged an emotive, pre-

rational orientation toward pro-environmental behavior. This is the potential of transformative environmental education: that a shift in identity and worldview can lead to a deep and long-term commitment to taking action. Active caring may not be a measurable outcome of BiSci 3, but the question of how well the course enables students to take action on environmental issues is still a salient one.

Pro-Environmental Action

For transformative environmental education to make a genuine difference in the world, it has to spark action. Taking personal steps to encourage and enact sustainability in one's own life, as well as taking collective action to encourage and enact sustainability on broader scales, is essential for actually creating a more just and sustainable society. Given that ecological identity, a more authentic relationship with the self, and empowerment are all major outcomes of BiSci 3, an important question is that of praxis: whether and how these outcomes translate to concrete action.

A consistent theme in participant interviews and surveys is a connection between an awareness of the environment and an awareness of one's own actions. That is, participants learned how their actions have an effect on a broader scale. A former student describes the difference in her awareness post-BiSci versus pre-BiSci:

> I think the biggest thing overall is just that this country is in this "going green" phase, and I always heard about it, how we're using resources too much or not correctly, and overusing them. I always thought about it, but never really actively tried to change what I was doing. And ever since [BiSci] I've paid attention to it more, I've done more of the simple things, like turning off light switches when I leave the room or whatever. Even though that's not a big contribution to a more sustainable lifestyle, the course taught me to think about what I was doing as I was doing it, rather than what I had done before, how it really wasn't right, but not doing anything about it. So I guess more actively paying attention to what I was doing overall.

An increased awareness of one's own actions lead to various changes in participants' lives. Many participants, like the above former student, reported an increase in minor pro-environmental actions, such as recycling and turning off light switches. The majority of participants who reported a change in behavior reported these kinds of minor actions. Some participants, however, took more dramatic action in their lives. In her response to the question of what she has changed in her life, a former TA mentions a long list of items:

> [I've changed] lots of things. I try and recycle all the time, not that I didn't before, but I really make an effort to. From the factory farming week and the food industry, I've become obsessed with pigs. I'm making a movie for [cultural geography] on the misconception of pigs, the stereotyping, and how they're affected in the food industry. So that's something I really care about. I don't eat pig anymore, so that's one step I've taken. I want to adopt a pig when I go home, like one of those mini ones <laughs>. All my friends know about that, and I've encouraged them not to eat pig, too. I've really connected the environment with the social aspect, which we touch upon in BiSci, so I love sociology, I'm minoring in it. I believe that as humans, if we understand ourselves in a sociological way, that will help the environment. Other than that, just in my dorm, all the sinks leak constantly, so whenever I'm brushing my teeth or washing my hands I make sure the sinks aren't leaking, it's really annoying, but it's like an obsession. I always make sure that the lights are turned out, just the small things. Right now I'm an intern at [a sustainability center]. I don't agree with everything they do – because it is a business, so they're not as sustainable as I'd like – but [without BiSci] I never would have thought of doing something like that. I really want to connect my communication skills to working for the environment.

This former TA's response weaves together all the most commonly-reported actions in this study. Excluding general, non-specific environmental actions (e.g., "I try to be more environmentally conscious"), the most common larger actions that interview and survey participants reported were eating partially or wholly vegetarian, changing one's career path or program of study, and influencing friends and family.

To more directly assess the course-wide influence of BiSci 3 on pro-environmental actions, the pre- and post-test surveys I distributed to the fall 2010 section of BiSci asked for (self-reported) frequency of eight personal and eight collective actions. The particular actions were based primarily on the priorities enumerated by the Union of Concerned Scientists (Brower and Leon 1999), but also contained items adapted from existent environmental behavior surveys. A sample personal item is, "Walk, bike, or use public transportation when possible, instead of driving," and a sample collective item is, "Join others in environmental service projects in your community." Each item was on a 5-point Likert scale, and all sixteen items were combined to produce a single pro-environmental action measurement ranging from 1.0 to 5.0. The results from the two populations are shown in Tables 5.3 and 5.4:

Table 5.3: Pro-Environmental Action

Pro-Environmental Action	Pre-Test	Post-Test	Difference	Significance (paired)	Effect Size (Cohen's d)
BiSci F10 (n = 125)	2.59	2.68	+0.09	$p < 0.05$	0.18
Control F10 (n = 40)	2.40	2.61	+0.22	$p < 0.01$	0.46

Table 5.4: Pro-Environmental Action versus Control Group

Pro-Env. Action vs. Control Group	Control F10	BiSci F10	Difference	Significance (indep.)	Effect Size (Cohen's d)
Pro-Env. Action	+0.22	+0.09	-0.13	not significant	

Because participants' behavior was self-reported, the findings must be interpreted with caution. The scores should not be understood as accurate measurements of actual levels of action; the scores represent only what participants *believe* and *report* about their levels of action. Additionally, the items asked for the relative frequency of particular actions (never, rarely, sometimes, often, and regularly), which may not have uniform meanings for all participants. For instance, regarding the item about walking when possible, one participant might consider walking to class every day to be a case of "regularly" walking at every practical opportunity, whereas another participant with the same transportation habits might also recognize that she could potentially use mass transit much more frequently while going around town or at home visiting family, leading to a score of "sometimes". If the goal is to understand how transformative environmental education influences actual levels of behavior, further research must utilize external measurements of participants' concrete actions.

Although self-reporting may not be reliable in terms of an absolute measurement of actions, it does provide information about the *relative* frequency of actions compared to each other. That is, the survey can address what kinds of actions participants are more or less likely to take than others. The hypothetical participant who answered "regularly" for walking might answer "rarely" for "Eat vegetarian or vegan," which is a strong indication that the participant recognizes that he walks far more often than he eats vegetarian. The same relative comparison can be made for categories of actions, like personal and collective. In addition to the composite pro-environmental action measurement, then, the personal and collective items were also separately combined to

produce personal and collective action subscales, each ranging from 1.0 to 5.0. Tables 5.5 and 5.6 outline the personal and collective action subscales:

Table 5.5**:** Pro-Environmental Action and Subscales

Pro-Environmental Action and Subscales	Pre-Test	Post-Test	Difference	Significance (paired)	Effect Size (Cohen's d)
BiSci F10 (n = 125)	2.59	2.68	+0.09	$p < 0.05$	0.18
…Personal Action	3.02	3.04	+0.02	not significant	
…Collective Action	2.15	2.30	+0.16	$p < 0.01$	0.24
Control F10 (n = 40)	2.40	2.61	+0.22	$p < 0.01$	0.46
…Personal Action	2.87	3.02	+0.15	not significant	
…Collective Action	1.92	2.20	+0.28	$p < 0.01$	0.56

Table 5.6: Pro-Environmental Action and Subscales versus Control Group

Action and Subscales vs. Control Group	Control F10	BiSci F10	Difference	Significance (indep.)	Effect Size (Cohen's d)
Pro-Env. Action	+0.22	+0.09	-0.13	not significant	
…Personal Action	+0.15	+0.02	-0.13	not significant	
…Collective Action	+0.28	+0.16	-0.12	not significant	

There are a few key observations to note from the results in the above tables. First, BiSci 3 and the control group show very similar results. Because the results are so similar, conclusions specifically pertaining to transformative environmental education cannot be drawn reliably. Thus, the discussion in this section likely applies to environmental education in general as much as it does to transformative environmental education specifically.

The second observation is more informative: participants in both BiSci 3 and the control group reported more increased collective action than personal, but collective action still lags much farther behind personal action in both pre-test and post-test scores. The difference between personal and collective action ranges from 0.74 for the BiSci post-test to 0.95 for the control group pre-test. On one hand, a strong commitment to individual environmental action is certainly important, and as a number of interview

participants pointed out, change begins with the individual. A TA-in-training was one participant among many to note that every little thing counts:

> I do all the little things, so I turn off lights when not using them, turn off the TV if I leave the room, shut off water when I'm not using it from the spigot. I do all the little things, that's why put every little thing counts, because I felt like I was being like – I was sort of contributing to it, but after learning in BiSci I started doing the little things like that. And even though I'm doing like a little part, it still helps Earth to recycle and stuff like that. Every little thing counts.

On the other hand, the near-exclusive focus on individual action is troubling for environmental educators concerned with effecting collective change. Some interview participants did stress the need for collective action, or for individual action to serve as a catalyst for wider change, but this collective awareness did not seem to be a significant theme for the BiSci population as a whole. For participants, pro-environmental action is a primarily individual pursuit. However, it is encouraging that participants' reported collective action increased more than their reported personal action increased, for both BiSci 3 and the control group. This suggests that environmental education, of many varieties, might be an effective driver of collective action.

Again, though, it is important to emphasize that these scores are not accurate measurements of actual behavior. Self-reported measurements are generally better suited for assessing beliefs, attitudes, and dispositions; the next section explores participants' pro-environmental beliefs.

Pro-Environmental Beliefs and the Belief-Action Gap

Praxis is about the connection between theory and practice, between belief and action. Although the relationship between pro-environmental beliefs and pro-

environmental behavior is complex, a belief in the importance of an action is important for long-term commitment to that action (Barr 2003). Some actions can certainly be personally or culturally habitual, and therefore commonly undertaken without any specific commitment, but on the whole, strong pro-environmental behavior is neither habitual nor culturally expected in the United States. Thus, pro-environmental behavior generally must be supported by a specific commitment or belief in its importance.

To assess the influence of BiSci 3 on pro-environmental beliefs, I also included items on the fall 2010 pre- and post-test surveys that asked participants to rate the importance of sixteen actions. The actions were the same eight personal and eight collective actions that were assessed in the prior section on pro-environmental action. For instance, in this section participants were asked to rate how important it is to "Walk, bike, or use public transportation when possible, instead of driving." Like the previous section, each item was on a 5-point Likert scale, and the items were combined to produce an overall pro-environmental beliefs measurement, as well as personal and collective subscales. The results from the overall measurement and the subscales are shown in Tables 5.7, 5.8, and 5.9:

Table 5.7: Pro-Environmental Beliefs

Pro-Environmental Beliefs	Pre-Test	Post-Test	Difference	Significance (paired)	Effect Size (Cohen's d)
BiSci F10 (n = 125)	3.50	3.71	+0.21	$p < 0.01$	0.32
Control F10 (n = 40)	3.45	3.74	+0.30	$p < 0.05$	0.38

Table 5.8: Pro-Environmental Beliefs and Subscales

Pro-Environmental Beliefs and Subscales	Pre-Test	Post-Test	Difference	Significance (paired)	Effect Size (Cohen's d)
BiSci F10 (n = 125)	3.50	3.71	+0.21	$p < 0.01$	0.32
…Personal Beliefs	3.73	3.93	+0.20	$p < 0.01$	0.30
…Collective Beliefs	3.27	3.49	+0.23	$p < 0.01$	0.29
Control F10 (n = 40)	3.45	3.74	+0.30	$p < 0.05$	0.38
…Personal Beliefs	3.79	3.92	+0.13	not significant	
…Collective Beliefs	3.17	3.54	+0.37	$p < 0.01$	0.47

Table 5.9: Beliefs and Subscales versus Control Group

Beliefs and Subscales vs. Control Group	Control F10	BiSci F10	Difference	Significance (indep.)	Effect Size (Cohen's d)
Pro-Env. Beliefs	+0.30	+0.21	-0.09	not significant	
…Personal Beliefs	+0.13	+0.20	+0.07	not significant	
…Collective Beliefs	+0.37	+0.23	-0.15	not significant	

Like pro-environmental action, both BiSci 3 and the control group showed a significant change in pro-environmental beliefs, which makes it difficult to draw specific conclusions about transformative environmental education in particular. It appears that environmental education, whether transformative or more traditional, can increase the perceived importance of taking pro-environmental action. The same proclivity for personal vs. collective action again shows up in participants' beliefs, with a difference ranging from 0.44 for the BiSci post-test to 0.62 for the control group pre-test. The magnitude of this personal/collective difference is less than it was for pro-environmental action, but nonetheless reinforces the idea that environmentalism is an individual pursuit for participants. Not only do participants take less collective action, they believe collective action is less important.

In order to foster pro-environmental action, it may be useful for educators and activists to understand which activities learners report doing more than others, which activities they perceive to be more important than others, and which activities have the

greatest gap between their implementation and their perceived importance. This last measurement, which can be called the belief-action gap, is particularly indicative for barriers to pro-environmental behavior. If participants believe an action is important, but do not report doing that action frequently, this points to some sort of deficit, whether in ability, opportunity, knowledge, empowerment, socio-cultural expectations, or similar. Pro-environmental behavior is difficult; even if one desires to be environmentally responsible, the physical infrastructure and soio-cultural values of one's immediate context may not support turning that desire into action. A TA-in-training reflects on this tension in the realm of transportation:

> GL: Can you tell me a little more about that [BiSci way of life], what that would look like?
>
> TA-in-training: That's a very good question, I've really been – I've been thinking about that, you know. So often I – okay, for example, there's a really, really wonderful opportunity down in DC for a women feminist conference and workshops to become leaders to promote, you know, to promote women's rights, and just getting back to that motherly harmony, you know? And that requires driving down there, so for me it's a constant internal battle. Well, look at all the opportunities I could learn and all the tools and teaching styles I could learn and ideas. Then again, I have to drive in a car that puffs out CO_2, okay, along a pavement road that is a – a cemented grave over the world. So it's just a constant internal battle, like what can we do, how much should you do, like how much do you need to give up, how much should you give up? You know, I really want to [travel internationally to visit family], but the airplanes – I read this somewhere, typical airplanes carry 13,000 gallons of fuel. I don't want to be a part of that, but I want to go [abroad] to meet my family so it's – I can't answer your question right now, that's something I'm still trying to figure out.

As illustrated by the struggles of this TA-in-training, the course-wide surveys show a large belief-action gap.

Figure 5.1 lists the mean scores for the actions and beliefs reported on the fall 2010 BiSci 3 post-test for each of the sixteen surveyed actions. Without exception, every

belief score was greater than its corresponding action score. The actions are listed in increasing magnitude of their belief-action gap, with [P] denoting personal beliefs/actions, and [C] denoting collective beliefs/actions:

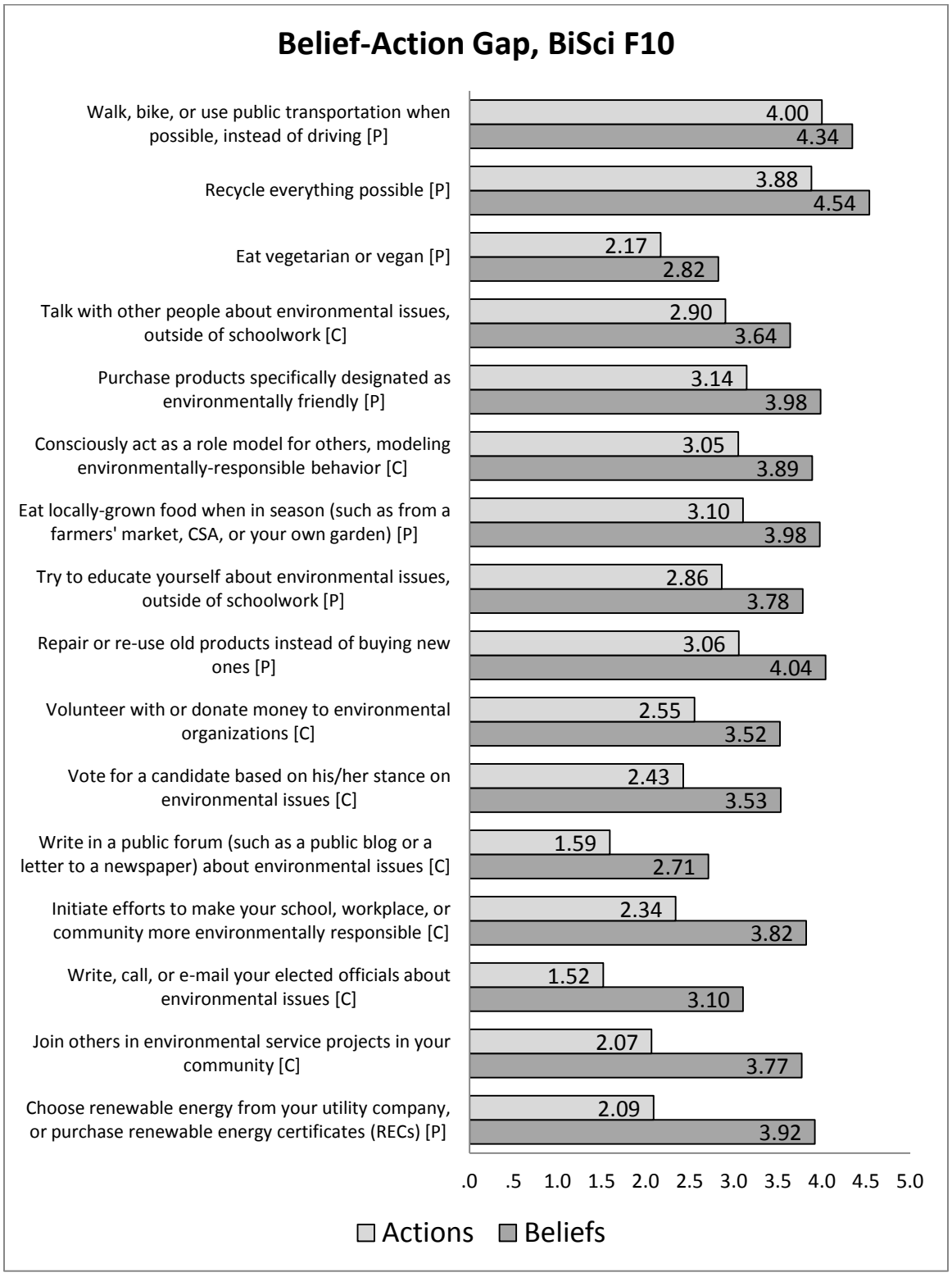

Figure 5.1: Belief-Action Gap, BiSci F10

As shown Figure 5.1, the three actions with the smallest belief-action gaps are all personal, perhaps reflecting a greater degree of agency that participants feel over their personal actions.

The smallest gap is 0.34 for "Walk, bike, or use public transportation when possible, instead of driving," which is also the highest action score, at 4.00. This number is likely artificially inflated due to participants' life situation at Penn State, which is a pedestrian- and bus-oriented space where many students live on-campus (especially first-year students, who comprise a large portion of BiSci 3) or in dwellings with convenient walking or bus access to campus. In future studies, a more informative item might assess the degree to which students walk, etc, to get around town or when at their permanent residences.

The second- and third-smallest gaps are very close in magnitude: 0.65 and 0.66, though the similarities end there. The item, "Recycle everything possible," has the highest belief score of all items, at 4.54. In contrast, the item, "Eat vegetarian or vegan," has the second-lowest belief score of all items, and by far the lowest among personal items, at 2.82. Recycling has a small gap because participants deem it important and report doing it; eating vegetarian has a small gap because participants deem it unimportant and report not doing it. This difference is significant for environmental educators; I will return to recycling and vegetarianism in the discussion at the end this chapter.

Interestingly, the largest gap is for a personal action: "Choose renewable energy from your utility company, or purchase renewable energy certificates (RECs) to guarantee that renewable energy is generated," at 1.83. This appears to be a promising

leverage point for environmental educators. Choosing renewable energy is the least time-intensive of all the pro-environmental actions: it only has to be done once, or perhaps once a year. The only practical barrier here is cost, which may be a real and significant hurdle for low-income households, but for learners (or parents of learners) who can afford the approximately $15 per month addition to their electric bill, choosing renewable energy is relatively simple way to take action on something that participants believe is important. For college-age learners, another barrier might be the socio-cultural expectations that deem matters of the household, either their parents' or their own, beyond the purview of college-age adults. This, then, returns to the discussion of transformative learning, where one of the objectives of transformative environmental education should be to challenge this limiting identity and empower young adults to take an active role in the major decisions in their lives.

The next six largest gaps are all collective. The items, "Join others in environmental service projects in your community," "Write, call, or e-mail your elected officials about environmental issues," and "Initiate efforts to make your school, workplace, or community group (such as a fraternity or sorority) more environmentally responsible," have gaps of 1.69, 1.57, and 1.49, respectively. Leaving the elected officials aside for now, the other two items again appear to be promising leverage points for environmental educators. There is perhaps never as fruitful a time to get involved in community groups and service projects as when attending college, where student groups and a spirit of involvement abound, especially for traditionally-aged college students like the participants in this study. Environmental educators have an opportunity to tap into and draw from this spirit.

Reiterating an earlier point, it should be noted that because the results from the control group were so similar to the results from BiSci, any conclusions about pro-environmental beliefs and actions likely apply to environmental education generally, not just transformative environmental education specifically. In fact, encouraging action might not be the strength of transformative environmental education, or at least not as it is embodied in BiSci 3. Bisci is primarily about developing relationships with nature and developing relationships with the self; learning how to take effective action might be an additional step. A super TA reflects on the difficulty of figuring out what practical steps to take after being transformed by BiSci:

> BiSci gives you the awareness, but then there's no, "Oh, well, sign up here to eliminate plastic from all grocery stores and all convenience stores," or whatever. So the bridge is figuring out how you're going to use your awareness to make a change. And the how is very important, because the why is already there. <aside> Oh, man. I wish it could just be the what, the how, and then the why. What if you had the how before you had the why? That would be cool.

As this super TA suggests, there is much more room for transformative environmental education to equip learners with the ability to take practical action. Also, the super TA's hypothetical musing – what if you could learn how to act before you learned why it's important – subtly suggests the need for transformative environmental education to foster wider socio-cultural change. Many of our day-to-day habits and assumptions are automatic and unexamined (indeed, this is a premise of transformative learning), and it may be that a sustainable world will not be achieved until pro-environmental behavior is internalized at this unexamined level. This is not to suggest that environmental educators should prescribe taking action without understanding why it's important – teaching the how before the why – but that transformation should not stop with the individual. The

ultimate aim of transformative environmental education is socio-cultural transformation, and part of this transformation involves shifting the unexamined habits of thought, feeling, and action as widely as possible.

Understanding transformation as a socio-cultural project implies understanding the contextual and interpersonal elements of transformative learning. The previous sections focused on participants as individual actors, but the following sections will emphasize the relational component of participants' lives and examine how transformative environmental education interacts with their social networks.

Relationships with Others

Transformation does not occur in a vacuum; learners come to a course with rich histories, connections, and social ties, and these contextual factors shape, and are shaped by, learners' experiences in the course. Emotional geographies allow us to understand the self as relational: identity is not only a matter of internal topography, but is also comprised of connections to the outer world. Drawing on the tradition of phenomenology, David Conradson (2005) describes the relational self as understood through emotional geographies: "In contrast to the tightly bounded autonomous formulations of personhood, the self is understood as emerging within and through its relations to other people and events." Learners' identities are thus embedded within and partially defined by social and communal networks, and their personal transformation must be understood in the context of these interpersonal relationships. Transformative learning theory in general has paid less attention to the contextual and interpersonal

dimensions of transformation (Taylor 2007), which therefore remains as an important frontier for transformative learning theory to explore through the lens of emotional geographies. I contend that the effect that transformation has on learners' social networks, and vice versa, is an integral part of understanding transformative environmental education.

In this study, I specifically asked interview participants about the effects of BiSci 3 on the people and social relationships in their lives, but I left the question open to interpretation. Some participants talked about how they themselves had changed in their personal interactions, others discussed the reactions of their friends and families, while others focused on their changing perceptions of people in general.

The most common theme among participants' interview responses was an increasing honesty in interpersonal relationships, especially through "truthspeaking," or openly communicating what they feel to be true deep in their hearts. A super TA describes the multi-layered components of truthspeaking:

> Truthspeaking was always my central [lesson from BiSci], I felt like that's was it was all about. […] Because you're being honest with yourself and with other people, and if you're honest with yourself, you can come to inner peace and see who you really are, make any changes you feel are necessary, cultivate that sort of self-contentment and self-love that a lot of people struggle to find. And if you're honest with others, you can be happy with your relationships, because it just puts it in perspective if you're always honest, you're not tricking yourself or them, you're just always letting them know how you're feeling instead of just masking anger or something like that. The other aspect of it, I guess, was in truthspeaking trying to see the truth around you, too. If you see something awful on the news or something, to accept that's a truth somewhere, it's really happening. As opposed to how we usually think of it, like, wow, that sucks, I wonder what's on another channel? It to me seemed like if you didn't have truthspeaking, or at least understand the concept, then you couldn't fully appreciate what the course had to offer. Because that kind of seemed how [Chris Uhl] taught it, truthspeaking on his part.

As this super TA indicates, truthspeaking is not just interpersonal, but represents a general orientation to oneself and the world.

The flipside of truthspeaking, being able to truly listen, was mentioned by some participants, as well. Honesty, truthspeaking, and genuine listening often formed the basis for stronger, fuller relationships with specific people participants' lives, such as family members and significant others. A TA-in-training tells the story about how truthspeaking made a difference in her relationships with her family:

> I've always loved my parents and my family, I've always been close, but now I feel even closer. Even with little things like, <affectionate> "Aw gosh," you know what I mean, truthspeaking little things that aren't even a big deal, it connects us even more. And just sharing what I feel. […] Just truthspeaking to [my dad] about why I do things, and why I decide to live my life the way I do, it made him – even though he still didn't agree with it, he at least had an understanding. So that really connected us. And really being open with my siblings, too. Like my brother [had a personal issue]. And I kind of forced him into truthspeaking, because if he wasn't going to be honest with me, there's no way I could assist him in any way, you know? […] But that was really hard for me to truthspeak, because I didn't want him to lose my trust. I still wanted him to come to me when there's a problem, but I didn't want to come off as scolding. So that was probably my most difficult moment in truthspeaking, but I think in the end, ultimately, it benefitted the situation a lot. So in all aspects of my family, it's been really helpful to truthspeak. And I just feel really closer with everyone. So that's definitely a central theme of BiSci, I think.

In addition to specific people, many participants also reported an increased sense of connection to generalized others. They spoke of increasing empathy and identification with others, particularly a sense of compassion and a reservation of judgment or labeling. A former student describes how compassion and understanding aided both her general and specific relationships with other people:

> I think I drove my boyfriend crazy for a while there, but I can't say that [BiSci 3] negatively impacted any of my relationships. On the contrary, just the awareness that it creates within yourself, and the compassion it creates, it's definitely a positive influence on all your relationships. It's looking at them, and giving their actions a new point of view. It's one thing to be like, oh yeah, what would I do in their shoes, but it's another thing to really understand where they are at that moment. That's one of the things it can help you look at, just where is this person at right now, and maybe not, well, I think this is what's going to be best for you, so my opinion is right for you. But understanding that people have to work through their own life and their own processes. I guess that's a more liberal way of viewing things, in a way. I guess it's giving people a chance, which is always positive in relationships. My mom is this person who is usually very conservative, and it's understanding that there are different levels of thinking, and that perhaps the reason why she doesn't understand this is because she's not there yet. But maybe one day she will get there. It's about understanding if there are people in your life who you don't understand, it's about understanding them, or if they don't understand you, to help them understand you, broadening people's minds. But I feel like it was a positive class, it's not about what is right and wrong, it's about what you can make work for you.

Truthspeaking and stronger relationships with specific and generalized others were significant themes for participants, and these relationships were often an important source of support for learners. However, not every relationship was positively affected in this way. Along with support, learners' social networks were also a source of dismissiveness and close-mindedness.

Support and Dismissiveness in Social Networks

BiSci prompts students to question: question themselves, question the status quo, question everything. A former student reflects on how BiSci encouraged questioning at every level:

> [BiSci taught us that we should] question everything, rather than just going with the social norm, or following the pack. Maybe think about our decisions and how they are affecting our life, rather than accepting it for what it is, like you do in other classes, putting the information on an exam and then it's over, and never questioning it, or never knowing why you're learning it.

Such multifaceted questioning is not easy. Going against the status quo involves facing resistance, and challenging one's previously taken-for-granted belief systems potentially involves rethinking one's entire worldview.

Support and encouragement from others can be a tremendous help in this difficult process. Indeed, interpersonal support is a well-established component of transformative learning (King 2009). A TA-in-training describes how helpful it was to take BiSci with a supportive significant other:

> My boyfriend took the course with me, and that was also extremely helpful, because we could talk through the ideas outside of class. Because 50 minutes is a really short time to get all this huge information and then go home and be like, <overwhelmed> "Uhhh," you know? So afterwards we did our reflections usually after class or the next day, and it was like, sit down, talk about it, and then be able to write a reflection about what – because it kind of helped to bounce ideas off, and like, okay, that's what you're thinking about it now, but this is what I'm thinking, and then you go write your reflection. I think it probably would've been a lot harder if I didn't have him with me, because I wouldn't – I could've talked about it to my roommate, but then it would have been like – I had to give her all the background information, everything that went on in class, and then told her like, "Okay, now this is what I'm thinking," you know? So it just wouldn't have been the same if I didn't have someone that was there to talk about it with.

This kind of continuous, unconditional support was actually fairly rare among participants' experiences. A TA-in-training talks about how essential her mother's support was for her BiSci journey, and how difficult it was to find support from her peers:

> Mostly my friends hindered [my BiSci experience], because sometimes you just want to talk to someone who is removed from the situation entirely, just to say like, am I sane still? You know, can you tell me if I'm being, like, totally ridiculous about this? It's just a class, you know? And some of them are like, <disapproving> "Wow, you're way too into that." But every time I talked to my mom about it, she would just say, "Tell me more." Tell me more; that's all she would say. […] But that's what I needed. I didn't need someone to say like, "Uh, okay, it's just a class." So the same way that BiSci lets you be free and just do whatever, my mom was giving me that outlet outside of class to talk about the things I didn't like or the things I did like. And, I mean, at first there were more things that I disliked, but they ended up being the things that I loved about the class. That really helped me to get through that. […] I don't think I'd be here [as a TA-in-training] if I wasn't able to talk about it outside of class. I would have still been holding it inside like, "That class is stupid; I'm glad it's over."

For participants like these, interpersonal support was absolutely part of their transformative experience.

Given the importance of interpersonal support, though, I think one of the most telling results from this study is the degree to which participants' peers and non-parent family members were not only unsupportive, but actively dismissive of the participants' BiSci experiences . Many participants reported being misunderstood or teased because of their excitement for BiSci. The word "hippie" came up in more than half of the participant interviews, primarily in reference to how participants were perceived by others. A TA-in-training tells the story of her dismissive roommates and friend:

> My roommates, I would come home, and they would be like, "What did you do in that weird class today?" And I would be like, "Well, this is what we did today." And they're like, "That's so weird." I was like, "Yeah, it's not that weird." I think you have to – me and [a fellow TA-in-training] were talking on Monday, and I told her, like, you have to be in this class. You have to take it, or at least put yourself really out there, to understand. Like I was sitting at my house the other day, I was really – I was having trouble piecing together the world and why people are the way they are and everything. And I just couldn't understand, so I said to my friend, "I just want to pick the whole world, the whole globe into my arms, and cradle it." And he's like, <dismissive> "You're such a hippie." I think you have to just be a BiScier to understand what that means. And I don't – I don't know. I think you definitely have to be a BiScier to understand a lot of what's going on.

This TA-in-training's story is an illustration of what it means to be a transformed person in a world that has largely remained the same. Other participants also echoed the claim that "you have to be a BiScier to understand," illustrating the gulf between those who experience a transformative course and those who do not. A super TA describes how this widening gulf plays out in her relationship with her family:

> GL: What do you think it was about BiSci that let you spread out into all these [social] networks and feel all this change?
>
> Super TA: Probably because you don't want to be alone, so you look for other people with similar interests and passions. It feels good to know that you're not the only one, and that it's not so much of a burden. Because sometimes it does feel like a burden. I mean, I get really frustrated with my family. To put it in perspective, my brother is a Marine, which is so one-way, sraight thinking. They all look the same, with the same haircut and military uniforms, and they all walk the same. So I'm like this freak little hippie and he's a jarhead, you know? I mean, how different can two people be? I just get really frustrated when I try to explain to him what I'm doing, because he's just "Oh shut up, you're a hippie." And that's how he treats me sometimes. And it's upsetting, not really because he's saying this about me, but because he's just being so close-minded about it. I just want to shake him, and be like, "No, listen! At least play with the concept that what I'm saying is okay, you know, you don't have to believe it."

Transformative educators should make no mistake: transformation, particularly when it involves questioning the status quo, can be a burden. As this super TA indicates, the

burden isn't just about holding beliefs and values that run counter to the mainstream, but about living in a social network that is close-minded and dismissive about something that is personally meaningful. Understanding the self as relational, as through emotional geographies, underscores just how much of a burden this can be.

Across the board, interview participants reported mixed support from their social networks. Roughly an equal number of participants mentioned only supportive relationships as mentioned only unsupportive relationships, with the majority reporting a mix of the two. Participants' families were the most likely to provide support, whereas their friends and peers were the least likely. The lack of support from friends and peers is particularly striking. Just two participants reported only supportive relationships with friends, even with "support" defined broadly enough to include simply acting as discussion partners. Figure 5.2 compares the distribution of supportive, mixed, and unsupportive relationships in the interview participants' lives, organized by relationship type. Note that not every participant mentioned every relationship type; the number in parenthesis indicates how many participants brought up that type of relationship in their interviews:

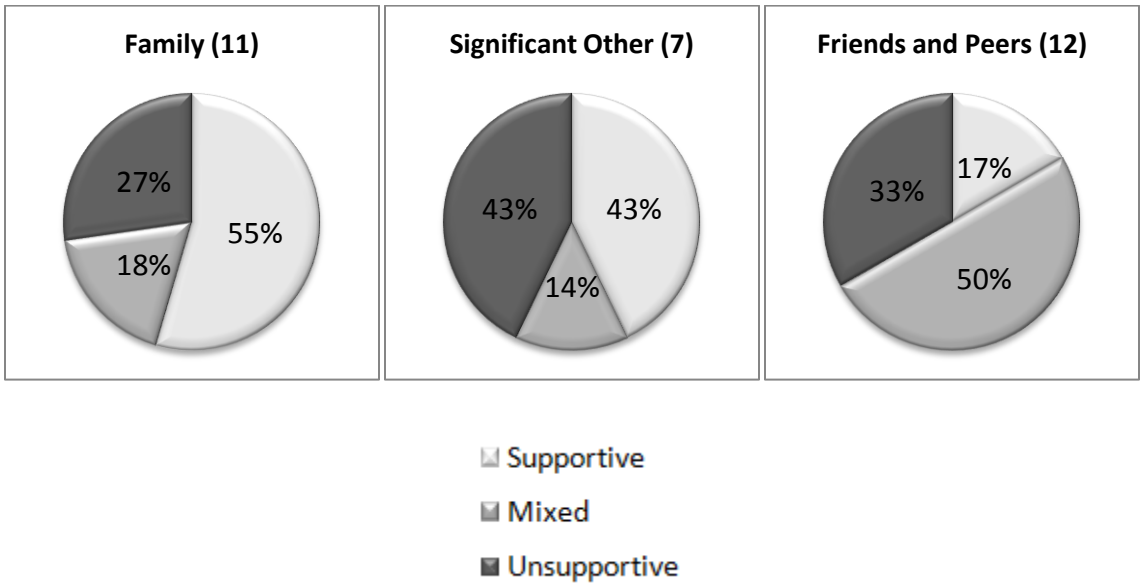

Figure 5.2: Support and Dismissiveness among Family and Friends

These distributions indicate a clear difference in the level of support that participants received from different relationships. Family members were largely supportive, friends and peers were largely unsupportive or mixed, and significant others were split right down the middle. These results point to a possible sticking point for transformative environmental education: support is important for transformation, yet many learners encounter just the opposite from their social networks. Because of this, it could be that transformative environmental education decreases learners' connectedness to others, rather than increases it.

Social Connectedness

Such strongly mixed levels of interpersonal support raise the question of whether transformative environmental education encourages a net increase in social connectedness or a net decrease. In this study, BiSci certainly strengthened some

relationships but it also strained others, increasing a sense of connectedness in some respects but decreasing it in others. Through the lens of emotional geographies, this is a matter of closeness versus distance in learners' social networks.

In order to gauge the overall effect of BiSci on participants' social networks, I included a subset of six items from the Social Connectedness Scale (Lee et al. 2001) on the fall 2010 pre- and post-test surveys. Social connectedness is "an attribute of the self that reflects cognitions of enduring interpersonal closeness with the social world *in toto*" (Lee et al. 2001, 310), or the perception of one's degree of connection to other people and society. A sample (reverse-scored) social connectedness item is, "Even around people I know, I don't feel that I really belong." Like the other survey scales, the six items were averaged together to produce a social connectedness score ranging from 1.0 to 5.0. Tables 5.10 and 5.11 show the results from BiSci 3 and the control group.

Table 5.10: Social Connectedness

Social Connectedness	Pre-Test	Post-Test	Difference	Significance (paired)	Effect Size (Cohen's d)
BiSci F10 (n = 125)	3.97	3.85	-0.12	$p < 0.05$	0.20
Control F10 (n = 40)	4.00	4.01	+0.01	not significant	

Table 5.11: Social Connectedness versus Control Group

Social Connectedness vs. Control Group	Control F10	BiSci F10	Difference	Significance (indep.)	Effect Size (Cohen's d)
Social Connectedness	+0.01	-0.12	-0.13	not significant	

The results indicate that BiSci students experience a moderately significant decrease in social connectedness, although this difference is not statistically significant when compared to the control group. More telling results are obtained by dividing the BiSci

population into two subgroups: students who reported being changed by the course, and students who reported not being changed.[1] These results are in Tables 5.12 and 5.13:

Table 5.12: Social Connectedness, BiSci F10 Subgroups

Social Connectedness, BiSci F10 Subgroups	Pre-Test	Post-Test	Difference	Significance (paired)	Effect Size (Cohen's d)
Changed (n = 76)	3.95	3.73	-0.21	$p < 0.01$	0.33
Unchanged (n = 49)	4.01	4.02	+0.01	not significant	

Table 5.13: Social Connectedness Between Subgroups

Social Connectedness Between Subgroups	BiSci F10, Unchanged	BiSci F10, Changed	Difference	Significance (indep.)	Effect Size (Cohen's d)
Social Connectedness	+0.01	-0.21	-0.23	$p < 0.05$	0.36

Dividing the population into changed and unchanged subgroups makes it clear that transformation in BiSci 3 leads to a significant decrease in social connectedness. Students who report being changed by the course report feeling increasingly distant or disconnected from other people and society. A TA-in-training speaks about this disconnect and the ups and downs associated with incorporating BiSci into her personal life:

[1] The division between changed and unchanged participants is described in greater detail in Chapter 6.

> I guess I'll start with my boyfriend, just talking about that, thinking it's really cool, and then he kind of reverts back to the, oh, well, you're just kind of weird, and, you know, just a little out of the box. And being frustrated with that, and thinking, okay, nobody's really getting me, I feel like you need to sit through this class to actually understand what I'm trying to say, what's important to me, as far as things like, you know, respecting things beyond human or rejecting that social conditioning in order to form relationships with your environment. So it was a little disconnect almost, like it wasn't a good thing in my relationships as far as being able to relate with each other. And then, on the contrary, my friends kind of get a little bit more into it, they're like, "Really? Wow!" Just talking about some of the problems and stuff in the world at this point. They share in kind of the fear, you know, just for instance, like peak oil crisis or something like that. So that makes it more real. And then as far as the conditioning part, seeing everybody go down their path, and I feel like it's a crucial time in our lives, and seeing some of my friends just worrying about, oh well, I have to get this grade to do this, to become that, to get this salary. And you kind of just want to, like, shake everybody. But there's no way of – or at least at this point, I don't know how to completely get across that message.

This TA-in-training illustrates very well that transformation is a double-edged sword. On the one hand, participants experienced positive personal change, such as authenticity and empowerment, and positive interpersonal change, such as more honest and full relationships. On the other hand, participants experienced disconnect and distance in their social networks. This again raises ethical questions for transformative educators, concerning whether educators have the right to ask learners to risk this disconnect, and what support and resources they are obligated to provide to learners if they do. Particularly for transformative environmental education, transformation often means inviting learners to swim against the current of prevailing social and environmental norms, to become, per Aldo Leopold, doctors living in a world of wounds that believes itself well and does not want to be told otherwise.

Confidence and Courage

Experiencing increasing distance in their social networks, facing resistance from those they care about, constantly questioning the status quo, and revising their fundamental worldviews, learners have a lot asked of them by transformative environmental education. Transformation requires much courage. Fortunately, BiSci 3 equips participants with precisely that. Echoing the idea of empowerment, a significant theme reported by participants was developing confidence in one's beliefs in the presence of others. A TA-in-training talks about gaining the strength to stand up for what she believes:

> I feel like such a strong person because of BiSci. Because I've learned that, yeah, not everyone's going to think that what you're thinking is right, but it doesn't mean you have to stop thinking it. Like if you believe something, you believe it, and you can change the world based on what you believe. It doesn't matter, you don't need anyone else. And if there's just, like, two other people who believe what I believe in the world, then great. But if there's not, then great, then I'm alone, and that's fine. But I really just – before, I think if someone was like, "Oh, that stuff's made up, that's stupid," I would have been like, "Yeah," just go along with it, because I didn't want to cause any tension. But now I'll cause all the tension I want. I know that the world is in a bad way, so I'm going to say it, and if you don't like it, too bad, then maybe you should do something about it. [Without BiSci] I think I'd be much more, like, feeble, just like <weakly> "Ehh," you know, "Sorry if I upset you."

Like this TA-in-training, many participants reported developing the courage to do what is right or meaningful in the face of criticism. One way BiSci equipped students to overcome resistance from their social networks was through commitment to a cause that is more important than worrying about what other people think of them. A TA-in-training describes this commitment in her decision to become a vegetarian:

> So after reading about the conditions [the pigs] were kept in, it was just – that's it. No more. And it wasn't like, all right, now I'm going to stop eating pork, because I knew whatever is going on with the pigs is going on with the chickens, is going on with the cows, and it's just like, everything. […] I think that that was one of those walking on water moments for me, because it was like, how are you going to change your diet? How are you going to – especially my whole family eats meat, and my cousins and my family on that other side, they're such advocates of meat eating, and if they saw me, being little vegetarian girl, like "What a white girl vegetarian over there, what are you doing?" <laughs> That doesn't matter anymore. It doesn't matter what people think about that. I think that was one of those things, being like, yeah, this is your family, and you do care what they think of you, but you're bigger than that now. You're bigger than bigger than thinking about – you're acting on behalf of these animals, you're not acting on behalf of your family who is going to accept you no matter what. They're just going to tease you.

"You're bigger than that now" could be the rallying cry of BiSci 3. The course invites students to think beyond their narrowly-defined selves to their more expansive relational selves, and to embody a more authentic, meaningful, and life-affirming way of being. Returning to my favorite interview question, asking participants to imagine their lives without BiSci, a former student tells about how BiSci made her a better, more confident person:

> [Without BiSci I would] probably be the way I was before. Honestly, my life is so different. I really didn't even think about it until now, how me now compared to me last semester, I had so much anxiety, I worried all the time, I just got mad over stupid little things, I judged people, I didn't have an open mind, like if it wasn't my way, then you're crazy. Now I just feel like such a better person. I just want to share it with everyone. My friends always make fun of me, because we'll be walking outside, and I'll just lay in the grass and look up at the sky, and they'll be like, "What are you doing, you look like an idiot." And I'm like, it doesn't matter! I just do things for me now, I'm not worried about what everyone else thinks of me. I know that if I'm being who I am, then if people don't accept that, then that's me, you can't change yourself for people. They should like you for who you are, and not for who they think you are and who you act around them.

Although transformation is difficult and potentially alienating, participants' experiences in BiSci demonstrate that transformative environmental education can also equip learners

with the courage and confidence to carry that transformation through. Part of the transformative process is learning to stand up for one's beliefs and to stay true to one's deeper sense of purpose. Through empowerment, more honest relationships, and courage and confidence, it seems that transformative environmental education can make a positive difference in learners' social lives.

Discussion

The effect of transformative environmental education on learners' everyday lives is complex. The results in this chapter alternate between encouraging and discouraging, straightforward and puzzling.

Extending the theme of ecological identity, one of the most significant outcomes reported by interview and survey participants was increased empowerment. Participants reported a more expansive sense of self, which included an increased desire to act and the belief that their actions can make a difference. Curiously, this increased empowerment was not reflected in the measurement of Geller's active caring construct, which showed no change in any identified subgroup of the main population or control groups.

Given the apparent contradiction between the qualitative interview and survey themes and the quantitative active caring measurement, I am more inclined to trust the qualitative themes. Importantly from a feminist perspective, qualitative methods are based on the premise that lived experiences are complex and multi-layered (Winchester 2005), which is precisely what the overall results from this study seem to indicate. The relationship between transformation and empowerment might be too layered to faithfully

reduce to a single quantitative measurement, at least by the active caring instrument included in this study. Participants' own words, on the other hand, resonate with a deeper and richer fullness of experience, and their words clearly indicate that empowerment, self-compassion (self-esteem), and feeling like an important part of something larger than oneself (belongingness) are notable outcomes of transformative environmental education.

An important question for transformative environmental educators is whether these outcomes are blended into praxis, such that learners take increased pro-environmental action in their everyday lives. While the self-reported nature of this study doesn't lend itself to fully answering that question in an absolute sense, much can still be said about the relative frequency of pro-environmental actions compared to each other. If the goal for environmental educators is to effect change that actually makes a significant difference in the world, this study presents some mixed results.

One worrisome result is the degree to which the perceived importance of collective action lags behind the perceived importance of personal action. Certainly, collective action is difficult, and it is understandable why fewer participants may choose to act collectively, but to not even believe in the importance of collective action is another issue entirely. The distance between the perceived importance of collective and personal action speaks to the pervasive individualism in U.S. American culture (Callero 2009). Informed by the feminist emphasis on relationships and the principle of building community in feminist pedagogy (Shrewsbury 1993; Webb et al. 2002), challenging this isolating individualism should fall within the purview of transformative environmental education. Just as the belief in humanity's separation from nature is problematic for a sustainable future, so, too, is the idea of atomized individuals disconnected from

community and collective action. Although much of transformative learning is necessarily individualistic, such as an emphasis on personal reflection and introspection, transformative environmental education must also maintain a collective focus. Such a collective focus might include connecting learners to their communities much in the same way nature-centered transformative environmental education connects learners to nature.

Even among purely personal actions, though, the importance participants' associate with an action seems to have little to do with the magnitude of its impact. For instance, compare recycling, which participants deemed more important than any other action, and eating vegetarian, which participants believed to be the least important personal action, by far. In reality, recycling is, at best, a band-aid on the top of unsustainable resource use (Fairlie 1992; McDonough and Braungart 2002). On the other hand, eating vegetarian or vegan, particularly in a context where meat animals are fed grain from fossil-fuel intensive agriculture, is one of the most dramatic ways individuals can reduce their ecological footprints through personal action (Stehfest et al. 2009).

This is greenwashing at its best. The issue is not that so few participants eat vegetarian – after all, the social, cultural, political, and practical pressures to eat meat are very strong in the United States – but that so few participants believe eating vegetarian is important. Like believing that collective action is less important than personal action, this requires a mental sleight of hand that disconnects the perception of an action's importance from its actual consequences. If transformative educators hope to foster action that makes a significant difference, this disconnect must be engaged head-on. Beyond simple ignorance, there are almost certainly complex psychological and socio-cultural factors behind the mismatch between an action's perceived importance and its

consequences. Transformative environmental education is precisely the kind of education to challenge these identities and cultural scripts and encourage a more informed and empowered way of being.

Transformative environmental education also has the potential to lead to deeper, more long-term behavior changes than more traditional environmental education. The main premise here is that transformation, particularly as it affects learners' identities and worldviews, can lead to a fundamental shift in the thoughts and feelings that underlie pro-environmental behavior, rather than effecting superficial behavior change that might not last. However, right now this is only potential and premise; further research is needed to assess if the behavior changes encouraged by transformative environmental education are indeed more permanent. This calls for longitudinal study, and it also calls for objective measurements of pro-environmental behavior, rather than self-assessment.

The effect of transformation on learners' everyday lives is not limited to beliefs and actions; learners' social networks play an especially significant role in the transformative process. Truthspeaking, which is in many ways an extension of the authentic self, provided for stronger relationships with participants' families and friends. For those who were able to find it, interpersonal support was also an important part of their transformative journey. This, then, is why I think it is so striking how strongly dismissive many participants' friends and peers were of their BiSci experiences.

Pessimistically, it seems that the role of family members is to provide love and support, whereas the role of friends and peers is to enforce the status quo through pressure and ridicule. Learners in a transformative setting are not just being asked to go against the grain of cultural expectations, but to open themselves to resistance and

criticism from those whose approval means the most to them. As their measured decrease in social connectedness indicates, learners who experience transformative change likely do not have a social network that changes with them. Transformed learners feel a disconnect from the status quo, which is experienced viscerally in their increasing distance from their friends and peers. From the perspective of transformative environmental education, this disconnect from the status quo is probably an encouraging result, and perhaps even a necessary one, because the status quo is precisely what is in most need of transformation. However, a break from the status quo can come at a high interpersonal cost.

Taken together, the lack of support from peers and the decreased social connectedness demonstrate that not only is transformative environmental education about transforming learners' identities, but it is also about transforming learners' social relationships. In addition to personal transformation, transformative environmental education is also a process of social transformation. Transformative educators should not neglect this insight. As shown by the results of this study, transformative environmental education can instill learners with the courage and confidence to stand up for their beliefs in the presence of others, and to stay true to their deeper sense of purpose. Recognizing that transformation is social means recognizing that learners are not alone in the classroom. Learners carry with them the relationships, support, discouragement, and expectations of their social networks, and every moment spent learning is a moment that will be enhanced or resisted by those connections.

Insights from emotional geographies, geographies of care, and feminist philosophy remind us that social relationships constitute who we are and how we relate to

the world, as "care ethics begins from a relational social ontology, understanding our world in terms of connections that bind us together" (Lawson 2007, 4). At heart, then, transformative environmental education is a matter of relationships. From the perspective of the relational self, transforming relationships *is* transforming the self, and vice versa.

Conclusion

In the pursuit of praxis, the question of whether a shift in identity leads to a shift in behavior and action does not have a straightforward answer. The prerequisites for action, particularly empowerment, are significant outcomes of transformative environmental education, though not as conceptualized by the model of active caring. Pro-environmental beliefs and action increase significantly as a result of transformative environmental education, but they also seem to do so as a result of traditional environmental education, and further research is needed to determine whether transformative changes are indeed deeper or more long-term. Either way, the pro-environmental beliefs and behavior reported by participants heavily favor personal action over collective action, and the perception of an action's importance doesn't always match the magnitude of its effects. There is much room for improvement regarding pro-environmental action, both for learners taking more effective action and for educators better understanding the relationship between transformative environmental education and behavior.

The relationship between transformative environmental education and learners' social networks is more clear, and suggests a strongly social dimension to transformative

learning. Emotional geographies and the relational self underscore the importance of interpersonal connections, as transformation can be supported by and/or resisted by important people in learners' lives. This must be considered part and parcel of the transformative process. In particular, the degree to which participants' friends and peers were dismissive of their transformative experiences is one of the more striking results of this study. The decline in social connectedness among participants who report being changed indicates just how strong this disconnect between learners and their social networks can become, and demonstrates that transformation is inherently social. Transformative educators should see this as an opportunity rather than a hindrance; transformative environmental education can provide learners with the basis for increased honesty in personal relationships and courage and confidence in the face of others. Such learners are well-equipped to engage resistance from the status quo wherever they find it, and can hopefully begin to act as empowered change agents working for societal transformation. In order to make a larger difference, learners will have to be able to draw support from honest and fulfilling relationships, and have the strength to stand behind their convictions. This is precisely what transformative environmental education can provide.

Like the previous chapter, I conclude this one with a participant's words. The two quotes that follow are from the same former TA answering two separate questions over the course of an interview. The former TA's responses beautifully demonstrate how empowerment, pro-environmental action, and social relationships are all intertwined in transformative environmental education:

GL: How do you think your life would be different now [if you had never taken BiSci]?

Former TA: Oh gosh, I don't even know. It's scary to think about, because this course has taught me *so* much, as far as just the environmental things. I've taken that and I think I've run with it, my family calls me the little green machine in the family now, because I'm always recycling, and turning off lights, and using less water, and all this stuff, composting, and organic, and whatever. I do as much as I can, I mean, I still admire [Chris Uhl and my former TA], who are really, really into it and know their stuff, and I aspire to be like that, but I just do what I can. But I wouldn't be like that if I hadn't had this experience. I would probably be – I want to say, materialistic, in a sense, because I kind of was before. I didn't really care about that kind of stuff, my life centered around what I had and what I possessed, rather than relationships, which is another thing that I learned about through working with this team of TAs. Just the relationships that I formed with them taught me a lot about people and how to connect with them, and that that we're all different, but we're all the same. It's really affected how I interact with people and everything around me. So, gosh, I don't know, everything would be different.

GL: […] [With BiSci out of the equation, do you think that information, by itself, would be enough for you to adopt pro-environmental behavior in your life?]

Former TA: Um, I don't know. I think it would, but not as strongly as it has with BiSci. I care, so if I'm walking by a recycling bin, I would certainly throw in an empty bottle or paper or whatever. I would certainly do that, but I think BiSci has just made it that more intense. I have an awful problem with people who just throw stuff in the garbage that can be recycled. I will go and I will pick it out and put it in recycling bins. So I think that's what BiSci has done for me; it's given me that motivation that, you know, I can do this, and it's just made it that much more important to me. Whereas without it, I would still do it, but it wouldn't make me - if I walked by a bottle I wouldn't really think about going to pick it up, because it's not mine. But with BiSci, I absolutely would.

Chapter 6

Implementing Transformative Environmental Education

The previous chapters established what transformative environmental education can do. Now the question for educators is, how to do it?

Transformative environmental education is a promising framework for helping shape more sustainable personal and collective ways of being. Educators in many disciplines – geography, environmental studies, ecology, earth sciences, sociology, psychology, and others, as well as educators in contexts other than higher education – can fruitfully incorporate transformative learning into their own work. However, in order to create a transformative learning environment, educators must have a sense of the principles and practices that will be most effective. Continuing to use BiSci 3 as a case study, this chapter addresses the following research question: How can environmental educators best implement transformative learning in their own teaching? In other words, what general attributes and specific activities are most important for encouraging transformation?

This chapter discusses the specific and general components of BiSci 3 that resonated most strongly with participants. The findings draw from two main sources. The first is the Learning Activities Survey (King 2009), an end-of-semester survey that asked direct questions about the course attributes and activities that contributed to learners' transformative experiences. The second is an inductive analysis of the themes that

emerged from participants' interview and open-ended survey responses. Integrating these findings with the results from pervious chapters, I conclude with a list of specific lessons for environmental educators who are interested in implementing transformative learning in their own teaching. The lessons reinforce the importance of reflection, peer guidance, active learning, the whole self, and taking action to transformative environmental education.

Course Activities: Overview

A concrete, practical consideration for educators is understanding what specific activities contribute most strongly to transformation. BiSci 3 features course assignments and activities organized around the principles of reflection, active learning, and discussion. This section examines the particular activities in BiSci 3 and how strongly they contribute to participants' transformative experiences.

In order to assess the course activities that contributed most to participants' transformation, I distributed a course-wide survey based on the Learning Activities Survey (King 2009) at the end of the fall 2009 and fall 2010 semesters of BiSci 3. The LAS is designed to assess learners' transformative experiences, particularly the learning activities that contributed most to them. The first and most important characteristic to assess is whether a participant had a transformative experience. The survey asked, "As a result of taking BiSci 3, do you believe you experienced a time when you realized that your values, beliefs, opinions or role expectations had changed?" In order to validate that this question actually distinguishes participants who had a transformative experience

from those who did not, the measurements from previous chapters can be used to compare the participants who answered yes to the question to the participants who answered no. Tables 6.1, 6.2, and 6.3 outline the differences between the participants who reported being changed by BiSci 3 and the participants who reported not being changed:

Table 6.1: Changed Participants

Changed Participants	Pre-Test	Post-Test	Difference	Significance (paired)	Effect Size (Cohen's d)
Nature Relatedness*	3.49	3.79	+0.30	$p < 0.01$	0.72
Active Caring**	3.85	3.84	-0.01	not significant	
Pro-Env. Action**	2.69	2.89	+0.20	$p < 0.01$	0.37
Pro-Env. Beliefs**	3.60	3.88	+0.28	$p < 0.01$	0.46
Social Connectedness**	3.95	3.73	-0.21	$p < 0.01$	0.33
* = BiSci F09, changed (n = 119) ** = BiSci F10, changed (n = 76)					

Table 6.2: Unchanged Participants

Unchanged Participants	Pre-Test	Post-Test	Difference	Significance (paired)	Effect Size (Cohen's d)
Nature Relatedness*	3.26	3.29	+0.03	not significant	
Active Caring**	3.68	3.56	-0.11	not significant	
Pro-Env. Action**	2.43	2.35	-0.08	not significant	
Pro-Env. Beliefs**	3.34	3.45	+0.11	not significant	
Social Connectedness**	4.01	4.02	+0.01	not significant	
* = BiSci F09, unchanged (n = 52) ** = BiSci F10, unchanged (n = 49)					

Table 6.3: Comparison Between Changed and Unchanged Participants

Changed/Unchanged Comparison	Unchanged	Changed	Difference	Significance (paired)	Effect Size (Cohen's d)
Nature Relatedness*	+0.03	+0.30	+0.27	$p < 0.01$	0.67
Active Caring**	-0.11	-0.01	-0.10	not significant	
Pro-Env. Action**	-0.08	+0.20	+0.28	$p < 0.01$	0.55
Pro-Env. Beliefs**	+0.11	+0.28	+0.17	not significant	
Social Connectedness**	+0.01	-0.21	-0.23	$p < 0.05$	0.36
* = BiSci F09 ** = BiSci F10					

With some exceptions, notably active caring, the tables demonstrate that there is a strong difference in measurements between the participants who reported being changed and the participants who reported not being changed. Nature relatedness, pro-environmental action, and social connectedness, in particular, are the measurements that show a statistically significant difference between changed and unchanged participants. These results validate both the question about transformative experience (participants who reported being changed actually did change) and the particular measurements chosen for this study (other than active caring, the measurements actually do capture some of the changes that participants experienced). The division between changed and unchanged participants is useful for assessing which course activities contributed the most to transformation, as the changed group can be asked more specifically about the factors that contributed to their change.

For participants who reported being changed by BiSci 3, the next question on the LAS asked about the course activities that helped influence the change. Following the format of the original LAS, the fall 2009 survey asked participants a binary yes or no question about whether particular BiSci activities helped influence the change. In addition, to provide a more robust understanding of how strongly each activity contributed to transformation, this approach was modified for the fall 2010 survey, which instead asked participants to rank on a 5-point Likert scale the importance of particular BiSci activities in helping influence the change. The results from the two surveys are shown in Table 6.4, listed in order of importance:

Table 6.4: Course Activities

Course Activities	Activity helped influence your change*	Importance in helping influence your change**
Lab Section Discussion/Activities	67.7%	4.02
Lecture Presentations/Activities	63.9%	3.69
Field Studies/Activities	67.1%	3.35
Journal Reflections/ Synthesis Essays	45.6% (journals) 44.3% (essays)	3.18
Course Readings	41.1%	3.05
BiSci Film Fest/ Other	37.3% (films) 3.2% (other)	2.89
* = BiSci F09, changed (n = 119) ** = BiSci F10, changed (n = 76). Some items were combined for this version of the survey.		

Considering the frequency of influence (middle column) and importance of influence (right column) together, the table can be divided into three tiers. The first three activities – lab section discussion, lecture presentations, and field studies – are the strongest contributors to participants' transformative experiences. Setting aside the lecture presentations for now, the lab sections and field studies constitute what might be called the reflective action component of the course. The next three activities – journal reflections, synthesis essays, and course readings – do not contribute as strongly as the first tier. These might be called the reflective reading and writing component of the course. The last activity, the BiSci Film Fest, contributes the least, but it is also an optional extra credit opportunity that only some students regularly attended. The following sections discuss the activities in the top two tiers, starting with the reflective action component.

First Tier: Reflective Action

As the single strongest contributor to participants' transformative experiences, the BiSci lab section ranks at the top of all course activities, with 67.7% of participants citing its influence and an importance score of 4.02. The same general conclusion holds for the open-ended survey responses and participant interviews, as well: the lab section consistently emerged as the most powerful contributor to transformation.

In BiSci 3, each lab section is led by a TA (TAs often lead two different sections per semester), and meets once a week. The labs are not about performing scientific experiments or reciting lecture material, but about creating a space for open dialogue and active, and often creative, group activities. Enrollment is capped at 13 in each section, which creates a small, intimate atmosphere for discussion where learners get to know each other personally.

Discussion plays a particularly important role in transformative learning. Along with self-reflection, active dialogue with others to better understand the meaning of an experience is a cornerstone of transformation (Mezirow 2000a). Reflective, non-argumentative dialogue allows learners to collectively search for common understanding and critically assess cultural norms and assumptions. In this process, learners are encouraged to engage with an open mind and adopt other points of view. A former student describes this openness as the best lesson of BiSci:

> I really liked the lab the best, because that's when the class was split into smaller groups and we could all interact. There's not a certain one that stuck out, but I really liked how you could hear everyone else's point of view. The class taught me how to have a really awesome open mind, because you hear all these different point of views, and you learn how to accept that, even though they don't have the same point of view as you do, but it's two different people, having two different thoughts, believing in two different things. I think the most important or the best lesson I learned from the whole class was just how to be open and how to accept new things, be open to learning things that you wouldn't really consider.

Discussion also provides a space for learners to openly and honestly engage the course material. There is a strong parallel between critical self-reflection and active, reflective dialogue with others: both are essential for allowing learners to engage and process material on a personal level. Particularly in a course that questions the status quo and challenges taken-for-granted personal and societal assumptions, at least some degree of confusion, skepticism, and resistance from learners is to be expected. A weekly discussion with peers provides learners an opportunity to voice these concerns and make meaning out of their experiences. A former student talks about how the lab sections allowed her group to understand the course material in a way that wasn't possible in the large lecture class:

> I really liked the Friday labs, because I thought we were more honest with each other than in [the big] class about how we were really feeling about the class. As a small group, were able to talk about what was going on, and if we thought it was ridiculous, we could say that, and discuss why, and it brought us to a better understanding of everything. […] Whereas in [the big] class, it was interactive, but I think everyone was kind of afraid to open up to each other.

Making meaning from experiences is also about moving from the abstract to the concrete, from the hypothetical to the actual. Small group discussions not only allow learners to adopt different points of view, but also to adopt different ways of being. Lab sections provide learners the opportunity to try out course ideas and to share their experiences

with putting those ideas into practice. A former student describes how her lab section turned abstract principles into concrete, lived examples:

> [The small groups] gave us time to voice our opinions and get to know each other a lot better. And it was a time to see if somebody actually lives out any of these things that [Chris Uhl] is saying, like truthspeaking, we heard about it in class, but that's where we did it. That's where we learned more about it, that's where we found out, hey, do people actually do this, or is this just an abstract principle?

She continues:

> I feel that our small group started coming more together after [the field trip to Walnut Springs]. I remember, none of us wanted to be there, which is great, I feel like we had a common enemy <laughs>. […] But we were there in nature, and we started doing things together, and we ate weird things, and we did a group push-up, and at the end of the day when we walked backwards out of the forest, it was just really cool that we all kind of bonded. We learned a lot about each other and about nature, and we just felt more together as a group. It was really interesting, because I think that if you are learning about nature, it's really good that we actually went out and saw some nature.

This former student's account of the Walnut Springs field trip illustrates another important characteristic of the weekly labs: active learning. Active learning, defined in opposition to passive learning wherein learners primarily listen to an instructor, involves learner participation in the learning process through activities, hands-on exercises, case studies, and the like. The weekly lab is certainly one course activity to feature active learning; another important activity is the field study, where active learning takes on a decidedly outdoors, immersive characteristic. Depending on whether course activities are ranked by frequency or importance of influence, field studies are the second or third most powerful contributor to participants' transformative experiences.

Field studies in BiSci 3 involve going to a location (usually outdoors) and completing a reflective activity there. Through the lens of emotional geographies, doing the field studies on location is important because it evokes the emotive and

transformative characteristics of place. Joyce Davidson and Christine Milligan describe the centrality of emotions in interactions between people and places:

> [E]motions are understandable – 'sensible' – only in the context of particular places. Likewise, place must be *felt* to make sense. This leads to our feeling that meaningful senses of space emerge only via movements *between* people and places." (Davidson and Milligan 2004, 524)

These movements between people and places imply that changing location – developing a relational encounter with a different place – has the potential to encourage one to think and act differently (Conradson 2005). This is the transformative potential of place. Especially because relational encounters with places can be emotionally charged, "particular kinds of environments have the capacity to transform people's (emotional) lives" (Bondi et al. 2007, 8). For transformative environmental education, these are largely outdoor places. A TA-in-training describes the intensity that accompanied an outdoor field study:

> The field studies all for me were really good experiences, I think. Like the one where we had to go and do some kind of field trip around that big construction site. And I really got into it, and it was a windy day, one like today, sunny and bright, pretty, and I was just so appreciative – the color and the nature, and then hearing clanking, it was just so, like, intense, because the juxtaposition of the two is so real. Like a ladybug came in and landed on my paper, and I was like, "Oh, that's a sign, that's BiSci!" So just moments like that that kind of made it more realistic and personal, I think, were really effective.

Here, active learning means going on location and developing relational encounters with new places. Much like the lab sections, though, action alone isn't enough to encourage transformation. The key is *reflective* action. Every BiSci field study has a reflective component, and this kind of post-activity reflection is when the bulk of learning tends to occur (Cranton 2006). A TA-in-training describes how important reflecting on her field studies was for her transformative experience:

> I think the field studies helped a lot with the conditioning, because I was hearing all this stuff, and then you're just kind of sitting in a class, but then when you actually have to fill up two or three pages, and it does make you think, like, oh, I'm really going to have to relate this to myself. And then it got there, I would say around that time.

Reflective action, whether enacted in open discussion or hands-on assignments, is the foundation upon which transformative course activities are built. The lab section and field studies were the activities that contributed the most to participants' transformation in BiSci 3; they are also intriguing activities for transformative educators because of their wide applicability to many courses and approaches. Regardless of the subject matter or level of the course being taught, learners will likely benefit from participating in open dialogue with their peers and engaging in active, hands-on assignments. These activities should have a central place in transformative environmental education.

Second Tier: Reflective Reading and Writing

The second tier of course activities is organized around reflective reading and writing. BiSci 3 features weekly readings, including assorted articles, chapters from Chris Uhl's *Developing Ecological Consciousness*, and other book chapters. Students are tasked with reflecting on the readings in their course journals. Each weekly journal entry is typically four handwritten pages; the journals are a major part of the course and accrue a substantial amount of reflection over the duration of the semester. Lastly, in lieu of exams, BiSci students complete three synthesis essays, reflecting on and weaving together the lessons that they have personally learned from the course so far.

In working to foster transformation, there is great utility in having learners to

write down their thoughts on paper. Writing allows learners to formulate their thoughts and clarify their beliefs, and to later return to what was written and re-examine it. A TA-in-training describes this reflective process as uncomfortable, but essential for making meaning out of the course material:

> I think the reflections really helped with that. Because it was, like, getting it out of your head about what you're thinking about it and onto paper. You could really just make a decision – not a decision, but make a conclusion about it, I guess. About like, okay, this is a belief that I had before, now what I've seen now shows me that I was really close-minded before. And I know it's uncomfortable to break out of that, but, like, it's happening, I just saw it, I know it happens. So I had to really, really break out of my comfort zone. The reflections really helped. I think if I didn't have the reflections, then it would be just, like, muddled up, just all up in there, like "I don't know what to do with this information." So the reflections definitely helped get through that.

Re-examining her beliefs and breaking out of her comfort zone, this TA-in-training is essentially describing the process of transformative learning. Again, reflection emerges as a key ingredient of transformation. A former student likewise speaks about how writing journal entries, in particular, was a process of self-discovery:

> I think the journaling [was most important]. It was probably the best way for me to even realize what I was thinking and how I was feeling, and I got to put it down on paper. And having my TA comment on what I had to say, if they said something like, "good point," I'd realize that maybe I said something there that actually holds weight, it mattered. It caused me to think more about my words, just in everyday conversation, because I realized what I'm writing down here is really how I feel, so I got to see how I felt about things. It was interesting. I discovered myself in the process.

Reflection, both through dialogue and introspection, is an undeniably important part of transformative environmental education. Interestingly, though, the results of the LAS show a moderately-sized gap between the reflective action components of the course – lab section and field studies – and the course activities designed around written reflection: journal entries, synthesis essays, and course readings. These reflective reading

and writing activities, while central to many participants' transformative experiences, were not rated as frequently or importantly as the reflective action components.

These results seem further emphasize the important intervention of emotional geographies in transformative environmental education. Emotional geographies demonstrate that emotions are situated in and co-constitutive of everyday life, as "[e]motions are vital (living) aspects of who we are and of our situational engagement within the world; they compose, decompose, and recompose the geographies of our lives" (Smith et al. 2009b, 10). Understanding that emotions are vital to identity and everyday life means understanding that the same is true of emotions and transformation. Reflective reading and writing is primarily cognitive, and activities like journal writing exemplify the kind of cognitive-rational reflection celebrated by classic transformative learning theory. In contrast, social and experiential learning, as exemplified by the lab section and field studies, not only involve cognitive reflection but also allow learners to engage the material in ways that are kinesthetic, active, and embodied. This kind of learning is also relational, and, like emotions more generally, arises from the interactions between people and other beings and places (Bondi et al. 2007; Bosco 2007). The results from this study indicate that course activities that involve these relational, extra-rational dimensions contribute more strongly to transformation than activities that involve cognitive reflection alone.

However, neither do the results suggest that educators should jettison course readings from their syllabi. Reflective action implies something substantive to be reflective *about*; by engaging course ideas at a depth not otherwise possible in a lecture or discussion, readings can be part of the foundation upon which further reflection and

exploration are built. Additionally, encouraging mindful reading has the potential to be a transformative act in itself, challenging the broader cultural antipathy that perhaps makes reading less resonant for some learners in the first place.

Lastly, the numbers cited in this section should be kept in perspective. Even though participants indicated that the reflective reading and writing activities were less powerful contributors than the reflective action activities, they were still integral parts of many participants' transformative experiences. Reading challenging ideas, writing down and clarifying one's thoughts, re-examining previously-held beliefs – all these have great utility for encouraging transformation. In fact, even the least powerful course activity, reading, was still significant for over 40% of transformed learners and rated above the median importance score of 3.0, numbers that are higher than all but one of the factors discussed in the next section.

Teaching Assistants and Support

When considering the factors that contribute to learners' transformative experiences, interpersonal support is a key element. The previous chapter established the importance of support for transformation, and showed that interview participants received decidedly mixed levels of support from the people in their lives. Friends and peers, especially, were the least supportive, frequently teasing or ridiculing participants about their BiSci experiences.

In order to more widely assess the kinds of support (or lack thereof) that participants received for their transformative experiences in BiSci, I included questions

about support on the course-wide LAS that was distributed at the end of the fall 2009 and fall 2010 semesters. Participants who reported a transformative experience as a result of BiSci were then asked about people who helped influence the change through giving support and/or encouragement. Like the question about course activities, the fall 2009 survey followed the format of the original LAS and asked a binary yes or no question about whether particular people helped influence the change, and the fall 2010 survey instead asked participants to rank on a 5-point Likert scale the importance of particular people in helping influence the change. The results from the two surveys are shown in Table 6.5, listed in order of importance:

Table 6.5: Personal Support

Personal Support	Gave support or encouragement*	Importance in helping influence your change**
Your TA	64.3%	3.86
Your Instructor	37.4%	3.64
A Classmate	27.0%	3.10
A Friend or Family Member/ Other	14.8% (friend or family) 6.1% (other)	2.85
* = BiSci F09, changed (n = 119) ** = BiSci F10, changed (n = 76). Some items were combined for this version of the survey.		

Starting at the bottom of the table, one telling result is how infrequent and unimportant support was from friends and family. While participant interviews indicated that family members were more supportive than friends, it is clear that, taken together, friends and family members simply did not provide significant support for participants' transformative experiences. This means that for learners to be supported in their transformative journey, support must come from someone else.

That someone else is former students who return as teaching assistants. As shown in the table, TAs provided the most frequent and most important support to participants,

by far. In BiSci 3, TAs are much more than graders or assistants. TAs create and maintain the open atmosphere of the lab sections, lead group activities, read and respond to written reflections, push students to dig deeper, and serve as relatable and nonjudgmental guides through the course. A TA-in-training speaks glowingly about the role her TA played in building relationships with, inspiring, and transforming her lab section:

> Many of my TAs, like in my art history courses and stuff, you never see. They're never around, they just are there strictly to grade your papers, and you don't know them. I can honestly say I don't know any of my TAs this semester. Like none. And I just liked how [Chris Uhl] didn't make them seem like just people that graded your papers, or read your papers and stuff. They were actually a core part of the course. […] When I walked into my section, I saw how [my TA] was really enthusiastic about it, and how she developed a relationship with all of us, and how she transformed this section of thirteen people. And there was probably, like, ten of them that hated BiSci in the beginning. They were just absolutely weirded out by it, they were considering dropping the course for like a month. And [my TA] just held their interest, and was like, "Why do you feel this way?" And she would just, like, inspire them. And they all stuck with it, and at the end, everybody loved BiSci, and one of them is actually a TA [in training] now. So it just was really inspiring to see how another student could transform other students who were so gung-ho against the course, and get them into it, and in the end, they were sad when it was over.

As this TA-in-training describes, TAs are major transformative agents in BiSci 3. Their support, encouragement, and guidance are invaluable to learners. They also act as role models, modeling pro-environmental behavior or simply a general BiSci mindset. One super TA says of her former TA, "I've never met anybody so enlightened and aware of just everything. I could walk into lab, and she'd be like, 'What's wrong?' And it's just because I wasn't smiling or something. […] I want to be her. She's my biggest role model."

One of the most important characteristics for a TA, as emphasized by many interview participants, is a willingness to give learners the space to engage the material

on their own terms. Former students, TAs-in-training, super TAs, and former TAs alike recognized that BiSci cannot be forced on people. A super TA describes that as the most important lesson she hopes to impart the TAs under her guidance:

> [I want to be able to help the TAs] know they can't change people. They need to accept them for who they are, you can't make anyone do anything. That's the biggest thing that I want to help get through to them. Because I know how that excitement is, to be like, "I can't wait, we're going to have such a great lab, and everyone's going to love it, and they're all going to open up, and be like me." And "I want them to be like me." But it doesn't always happen. And to help them not blame themselves for that.

As nonjudgmental role models and teachers, TAs are the individuals who provide the most support to learners, but they are also responsible for crafting a supportive network for learners in the weekly lab sections. Discussions in lab provided participants with open, supportive listeners who had the common experience of BiSci, something that was certainly not available to many participants in their outside social networks. A TA-in-training speaks about how helpful the spirit of sharing was in her lab section:

> I think that it was my section that really helped me. Because I had [a fellow TA-in-training] in my section, and a few other people who were always willing to speak and to share, and so we all became comfortable as a result, because you don't want to be the only one speaking when everyone else obviously doesn't care about it, because whatever you say just ends up kind of sounding stupid, if you're not getting that response. But I was lucky in the fact that we all were willing and able. So I think that really rounded out my experience and helped me to open up, because there were people who were interested and who were willing to listen and were appreciative of what I have to say. And listening to people's ecological identities was awesome, as well. Yeah, I think that played a major role. Because anyone can just sit in a lecture and listen to [Chris Uhl] talk, but the sharing part of the section was really important to me.

In essence, TAs are tasked with creating spaces of support and transformation. From a geographic perspective, a useful conceptual framework for understanding these spaces is the idea of a heterotopian space. Drawing on Foucalt's idea of heterotopias, Emma Jones

and SPEECH (2001) describe heterotopian spaces as spaces in which the rules are different from everyday life, where the outside status quo can be challenged. This is precisely the role that lab sections play in BiSci 3, and the TAs are the primary leaders and role models in these heterotopian spaces.

Whether directly through encouragement and feedback, or indirectly through leading the weekly lab sections, TAs were the primary locus of support in BiSci 3. This underscores the central lesson regarding support in transformative environmental education: support must come from the course. Learners' social networks, including friends, family, peers, and even individual classmates, do not provide consistent levels of support for transformation. Thus, support is the responsibility of the transformative instructor and teaching assistants, and must be built into the very structure of the course. In this sense, the whole course, not just the discussion sections, should be conceived as a heterotopian space.

The previous sections drew from the Learning Activities Survey to assess which specific activities and people contributed most strongly to transformation. Reflective action, some components of reflective reading and writing, and support from TAs emerged as important contributors to participants' transformative experiences. I now turn to the more general characteristics of BiSci 3 that contributed to transformation, drawing primarily on participant interviews in an inductive approach. Some of the following themes were explored in earlier chapters, but here they are distilled and made more concrete from a practitioner's point of view.

Learning About Life

A personal, genuinely learner-centered approach characterizes the pedagogical foundation of BiSci 3. Because the course emphasizes personal, introspective learning, students are consistently able to approach the material in ways that are most meaningful to them. In this sense, the course is essentially customized to each student. This allows for a learning experience that is potentially richer than simply learning the subject matter. A former TA describes how she would explain what BiSci is about to someone unfamiliar with the course:

> It's different for everyone. […] It's really hard to answer that question, because on the surface it's an environmental course, and a course in alternative ways to better the environment. But for me it was way deeper. Like I said, kind of a journey to finding yourself. I did tell my students that that's what it was for me, and it might be that way for them, too, and it might not. But the ones who came back, I think they had a similar reaction. Something about contemplating your life and where you fit into the world. Maybe not finding all the answers, but getting a little bit down that that road. It's worth it to try and take it and see if it happens.

When learning is personal, it is often more meaningful. A transformative environmental education course like BiSci 3 is a journey to finding the self, an exploration of life. Such an approach is immediately – and for those who fully engage it, deeply – relevant for learners. A TA-in-training describes how powerful it was for BiSci to be about life and self-discovery:

> I never thought about my own thinking process, I think until BiSci. I didn't really think about it until I was being interviewed [to become a TA], but just about how I feel like I've learned so much in BiSci that's relevant to life compared to my other courses. Where I feel like this course is actually about life, and is actually going to help me in further courses. Where after I'm done with, like, macroeconomics, I'm done. I'm never going to have to learn about macro ever again, I'm just going to have to keep my notes so if I ever have to reference it, I have it. Whereas BiSci is more like a life journey type of class, where you can reference it whenever. It's more of a self-discovery type of class than, all right, we're going to learn these facts and memorize them for the exam, because the exam is what tells me that you know you're doing.

Transformative environmental education, as exemplified by BiSci 3, is about life, not about memorizing facts soon forgotten. There is a qualitative difference between the kind of education that occurs in BiSci and the kind of education in which most of us, learners and educators alike, typically participate. Test-taking and a focus on grades topped the list of characteristics that participants described as distinguishing features of empty, meaningless learning soon forgotten. Indeed, participants were quite consistent in their critiques of traditional education, drawing frequent comparisons between the superficial learning of their typical courses and the more rich and meaningful learning of BiSci.

A TA-in-training tells the story an activity in the TA training course, in which the TAs-in-training created a "people machine" on the subject of public education. (The people machine started by asking one participant to repeat a short gesture and sound having to do in some way with public education, and then one by one other participants joined in with their own public education gestures and sounds.) Her story dramatically illustrates the difference between the life-oriented personal approach of BiSci and traditional approaches to education:

> The advantage of [the personal approach], I think, is it kind of lets you be you. You don't feel confined to be this robot who goes to class, sits there, takes notes. Like how [a fellow TA-in-training], when she was doing, like, I remember when we did that interactive thing, where we had to repeat that thing over and over about what public schools did, and she pulled me, and she's like, "This will be on the test! This will be on the test!" And I dreamed about that for like a week. <laughs> But she just kept doing that, and I was like, that's exactly what we are. We go to class with our notebooks and our pens and our laptops, we take notes, we raise our hand, "Will this be on the test?" No. Don't need to learn it. Will be on the test? Need to know that. But then we don't *learn* it, you just remember it, and then spill it out on a piece of paper, walk away, take *nothing* from it. And I think the personalized approach is, you're learning about yourself, so you can't forget what you learn about yourself. It's always something that's going to stick with you, and it's going to be an experience you remember.

The TA-in-training makes a very important point: that when the subject is yourself, it's difficult to forget what you've learned. This is the core of transformative learning. Regardless of the title of the course, be it ecology or economics, the primary subject of transformative learning is always the self. As an educator, I know it is very tempting to get caught up in the importance of the course subject matter ("They have to learn XYZ, don't they?"), and attempt to fill up the course with more information rather than allowing space for reflection. But reflecting and connecting course material to the self is how deep, transformative learning happens. A TA-in-training describes this process as the central theme of BiSci:

> I think [the whole point of BiSci] was really just maybe to find yourself. Because it wasn't ever really – there were some general facts and everything, but it was more of, like, the book and his lectures, they were all really about you. You interpreted everything from the presentation and stuff. You interpreted that as yourself, like, what do I feel about this, what do I think about that. And so it was barely anything about the general. It was more, take it into your personal sense and then develop what you think is right or wrong. […] I felt like [Chris Uhl] wanted to give you a start, but then you could do whatever you want with it. It's up to you. So I think you just really needed to take the class into your own hands.

Allowing learners to take the class into their own hands, to engage the material in ways that are personally meaningful and relevant, should be one of the central organizing principles of transformative environmental education. This again reinforces the importance of creating spaces where emotions are encouraged and validated. From an emotional geographies perspective, learning about life, learning about the self, and making personal connections to course ideas are all emotive processes. Emotions are the spark that kindles personal interest, the fire that fuels meaningful learning. A TA-in-training describes emotions as what made BiSci *real*:

> GL: So that "something more" [that you mentioned], it sounded like that's what BiSci was for you.
>
> TA-in-training: Yeah, yep. It was just not having to go to my classes in that, like, zombie mentality, like <unenthusiastic> "All right, get to the class, here we go, psych 100, okay, take down notes, then go do the reading." It was something more. There was feeling in it, there was emotions in it, there was *real*, genuine, like, I'm learning something. Not just about material, but about myself. I really liked that. It was almost like a – like a life class, you know, you learned so much about yourself in the class, and what you think, what you feel, what you want to do. So I think that's the "something more".

Life – emotionally-charged real life – is what transformative environmental education is about. Meaningful, transformative learning has only a passing similarity to the exam- and grade-centered emphasis of traditional education. While content knowledge is certainly important, transformative environmental educators should never lose sight of the most important and meaningful topic for learners to engage: themselves.

The Landscape of Transformation

One risk with such a strongly personal approach is that it could potentially encourage self-absorbed narcissism. Young people, in particular, increasingly demonstrate narcissistic beliefs and behavior, mirroring the trend of growing narcissism in Western culture more broadly (Twenge and Campbell 2009). If not crafted carefully, a course that is built around personal knowledge, identity, and reflection could exacerbate this trend.

Here is where emotional geographies can be particularly helpful for transformative educators. Geographic and feminist conceptions of emotion argue that emotions are not just internal expressions of subjective identity, but are inherently relational, emerging from the intersection between the personal and social (Sharp 2009). Viewing emotions as relational breaks down the boundaries between the interior self and the exterior world. As Liz Bondi, Joyce Davidson, and Mick Smith describe,

> [B]eaches of our psycho-social boundaries are suggested by experiences of 'being moved' by others, and by music, art, literature or landscapes: such experiences show how what appears to be outside impacts profoundly on our emotional interiors, getting *through* (across our boundaries) to us. […] [E]motions help to construct, maintain as well as sometimes to disrupt the very distinction between bodily interiors and exteriors. (Bondi et al. 2007, 7)

Returning to the idea of the relational self, the permeability of the interior/exterior boundary demonstrates that the self is not a fully-enclosed, separate entity. Instead, the self is a "somewhat centered entity, emerging through a reflexive and relational interplay with other people and events" (Conradson 2005). As conceptualized by emotional geographies, the landscape of the self extends from the individual outward to other beings and places.

The key insight here for transformative educators is that transformation is not just about the bounded self, but the self-in-relation. Transformative reflection is Janus faced, looking both inward at the individual and outward at the world. Hence, we can describe the landscape of transformation, like the landscape of the self, that extends from the individual outward to other beings and places. In addition to relationships with the internal self (identity, authenticity), transformation is also about relationships with others (connectedness, the social dimension of transformative learning) and relationships with nature (nature relatedness, pro-environmental behavior). These relationships are very much situated in the external world, and actually require an *expansion* of the self that is directly opposite that of the narrow, self-absorbed, narcissistic self. This is the political potential of feminist geographies of care, as care ethics "challenges us to be attentive and responsive to our own location within circuits of power and privilege that connect our daily lives to those who are constructed as distant from us" (Lawson 2007, 7). Relationships of care therefore require an expansion of the wholly personal conception of transformation. In bridging the internal/external boundary, the landscape of transformation demonstrates that transformative environmental education cannot only be about looking inward. Transformative educators should work to ensure that looking outward at the world always accompanies looking inward at the self.

Being mindful of the internal/external landscape of transformation means understanding that who we are is intertwined with what we do. Transformation is not just about redefining oneself, but about redefining one's role in the world. In the context of transformative environmental education, combining self-reflection with a critical analysis of real, pertinent issues allows learners to transform both their inner and outer ways of

being. A TA-in-training describes how the focus on everyday issues in BiSci encouraged her to ask deep questions about the unsustainable status quo and what can be done about it:

> Well, maybe it's just because I have an aversion to biology, that term, but I feel like this Bio, BiSci stuff, it's not exactly science, it's more just like living. Because what we're discussing is just stuff that we have to contend with on a daily basis. Like driving a car versus walking, or buying a box of Cheese-Its at McLanahan's or going to the farmer's market a few blocks down and buying apples. […] With BiSci you got the effect of all these environmental concerns and issues, and you saw how that, how all of that is affecting who we are as people. So now I think it's more important for me to understand, like, okay, so why are we so wasteful with water? And how can we try to push ourselves in the right direction? And what's with this dependency on the overly-inefficient meat industry? And how can we fix that?

For this TA-in-training, BiSci was an exploration of who we are and how we can change. Note, too, her use of the first-person plural, "we". Her questions are not those of a self-absorbed "I", but of an expansive self that understands collective responsibility. This is the landscape of transformation: who we are and how we fit into the larger world are two sides of the same question.

Venturing into one's own internal/external landscape of transformation, feeling committed to something larger than oneself, is a particularly important outcome for learners in transformative environmental education. Transformative experiences in the lives of environmental and social activists suggest that their activist orientation is a calling, a moral imperative they feel compelled to enact (Ball 1999; Tisdell 2000). In this study, many interview participants mentioned that BiSci 3 is responsible for a similar dynamic in their lives. A former student describes how her personal transformation was intertwined with the recognition of her importance to the world:

> It's an environmental class, […] but it's more than just the environment how we see it, it's learning a new whole perspective about the environment and about the way you live. It's about really finding who you are, and finding how you can make a difference, and how important you are to everything. And how, you know, the earth kind of revolves around you. Not in a sense of "Oh, everything should be about me." The earth needs you, so you learn your importance in the world. For me, I was like, "Oh, I'm just another person, if I throw this plastic bottle in the recycling bin, five thousand other people are not going to, so what difference does it make?" For me, this class really put a whole new perspective, I don't think that anymore. I think change starts with someone, you have to know who you are and what you want to do, and not what others are doing or what others say you should do, you should follow your own self, and just be you. And the class teaches you how to do that.

Participants like this former student who reported feeling like a part of something larger than themselves, or who dedicated themselves to a cause that transcended their concern for materialism or social status, demonstrate the importance of viewing transformation as a landscape that transcends the interior/exterior boundary. Transformation, like emotion, like the self, is not just an interior state, but emerges from relationships between beings and between beings and places.

Heterotopian Spaces: Beyond a Single Course

All in all, BiSci 3 was a transformative, deeply meaningful experience for many participants. Some specifically mentioned how amazing it is that just one semester-long course could be so powerful. Marveling about the progress of her former students, a former TA reflects, "I think the most important thing might be hope. And to see my young kids, who most of them just thought I was freaky and weird the first week, to watch them all blossom. I'm just like, well, that's all it takes? One semester?"

The depth of transformation achieved in such a short timeframe is certainly

impressive, but the course's relatively short duration is also limiting. The stages of transformation, from a disorienting dilemma through an exploration of new roles to a reintegration of the new perspective into one's life, not to mention learning how to take concrete pro-environmental action, is a lot to ask for in one semester. Emotions, too, are not necessarily clear and conclusive at the moment of experience (Jones 2007). Some interview participants reported not recognizing or even experiencing a transformative moment until BiSci was over. A former TA, empathizing with her students who viewed the course only as an instrumental means to a grade, describes how she was the same way as a student:

> But that's how I was, too, when I took BiSci, I did not care about the experience I was supposedly going to get. I was just like, when are my assignments due, how are they graded, am I going to get an A in this class? Not even by the end, but afterwards, I was like, oh, wow. It was kind of a retrospective wow moment, like BiSci moment, when I was like, oh man, something cool happened and I sort of missed it at the time. And I thought afterwards, I was like, <falsely confident> "Oh yeah, I knew I was totally changed." But I couldn't even comprehend it at the time. Whereas now I can look back and think, jeez, I'm totally different now.

Transformation is a long process that involves much reflection, exploration, learning, and experimentation. The creation of heterotopian spaces allows for this long process of transformation to be nurtured, but these spaces can be "pushed-in-on" by outside forces (Jones and SPEECH 2001). Pressures from learners' social lives, education and work responsibilities, and the myriad other ways in which the habits and values of the status quo reassert themselves, can push against transformation. Participants interviewed after their BiSci experience was over sometimes reported that their newly-acquired identities and worldviews were particularly vulnerable now that BiSci was no longer a part of their lives. A former TA describes the difficulty of facing post-BiSci pressures:

> There's that conventional pull, where it's harder, especially being removed from BiSci, where everybody else is really aware of all this stuff. Being removed from that, I've definitely seen myself slip back into either old habits, or what the people I spend all my time with are doing. So my principles aren't as well-supported, when I don't have my support group. So I think that has a lot to do with it. And then, I mean, just everyday stress, you know, thinking about what I need to be doing, school. So I'd like to find a way where I can integrate that, but it'll take time, I guess.

As this former TA illustrates, a consistent theme from participants interviewed post-BiSci is support, or lack thereof. Having a support group, being in the presence of others who are at least open to discussing BiSci ideas, is something that these participants feel is lacking in their lives. A former TA talks about what it means to not have the encouragement or inspiration of his BiSci peers:

> It's harder to continue keeping it up when there's not a close group around you. I find that what I'm doing is a little different than when we were having a class last spring and last fall, you don't see those people around. Just having little bits of encouragement or inspiration here or there, it's different when it's not around. I mean, I'm able to draw on all of it, but it's not like I'm living it, like I was earlier.

Just as transformative educators should consider how to build support into the very structure of a course, providing learners with support after the course is over is also an important consideration. The difference this former TA describes between drawing on his BiSci experience and actually living it might be the key lesson here for educators: transformative environmental education should involve more than one course. When learners are enrolled in a course, connected to a supportive group and actively reflecting on and engaging the material, they are living the course ideas to a degree that will be hard to match once the course is over. Thus, in order to foster transformation, it seems advisable to maintain learners' participation a supportive, transformative heterotopian space as long as possible.

This could mean, for instance, offering a transformative environmental education course as a multi-semester sequence. Although BiSci 3 is a one-semester course for a majority of students, it does provide some with the opportunity to engage it across multiple semesters. TAs extend their BiSci experience to three semesters: BiSci, the TA training course, then assisting BiSci. Super TAs extend this to five semesters, assisting the TA training course and assisting BiSci a second time. Even though only a portion of the class can take advantage of these opportunities, interviews with TAs-in-training and former TAs point to how powerful such a multi-semester sequence can be. A super TA looks back on her five-semester BiSci experience and how much it means to her:

> It's really just one class, you know, it started from one class, and then it grew into a different opportunity and a different opportunity, but it was all because of one class. When you think about it, a class, you just sort of go through the motions, you know? But I think BiSci was just different. It was more of an exploration, an adventure, and it just grew. You just don't expect that out of one class. It's seriously been, what, a good two and half years of my life, somewhere around there. It's been a major part. I guess [imagining what my life would be like had I not taken BiSci is] just intimidating to think of, you don't want to think about that. It happened, it happened for a reason, so great, you know? I have so much to thank BiSci for. It's changed you.

Offering a multi-semester sequence is not the only way to extend a heterotopian space beyond a single course. Another possibility is weaving the principles of transformative learning into the wider department or program curriculum, such that transformative emphasis of one course builds on the transformative emphasis of its prerequisites. More informally, heterotopian spaces could also be established in the form of student groups that meet regularly after the course is over. Regardless of the method chosen, providing the time, resources, and support necessary for transformation is important. Transformative environmental education is about fostering deep, lasting changes in

identities and relationships, and deep, lasting change is not something that can be rushed. Provide space for transformation, and transformation can flourish.

Discussion and Five Lessons for Educators

The specific activities and general attributes of BiSci suggest a number of ways that environmental educators can best incorporate transformative learning into their own teaching. The discussion so far about teaching practices has been relatively diffuse, but specifically and concretely, what should environmental educators do to make their courses transformative? Drawing from the above themes and findings, as well as the results from previous chapters, I have compiled a set of five lessons for educators interested in implementing transformative environmental education. The lessons are outlined below:

The five lessons:

1. Reflection, reflection, reflection
2. Former students make the best guides
3. Engage learners as whole beings
4. Make it active, make it relational
5. Move from intention to action

In the following subsections, I detail each of these five lessons and provide specific suggestions for educators. Throughout, I use “educators” as shorthand for transformative environmental educators, but many of these suggestions can apply to educators in general, as well.

Reflection, Reflection, Reflection

As emphasized and revisited throughout, reflection is absolutely essential to transformative environmental education. Critical self-reflection, questioning and reconstructing one's taken-for-granted assumptions and beliefs, was the most commonly-cited theme in course-wide surveys in BiSci 3. As the head component of head, heart, and hands, reflection allows learners to develop a more caring and authentic relationship with the self, and is the very center of transformation. For transformative educators working to change personal and social values associated with (un)sustainability, reflection is one of the most powerful tools in their repertoire. The process of reflection is necessarily personal and learner-centered, inviting learners to engage course ideas in ways that are meaningful and relevant. Reflection also provides learners with the necessary space to process and accept or reject course ideas on their own terms. Transformation cannot be forced; it must be freely chosen. Transformative environmental education is a process of reflection, not prescription.

Crucially, though reflection is necessarily personal, emotional geographies and the relational self demonstrate that reflection should not be exclusively inward-looking. Transformative environmental education must challenge learners to not only question who they are, but who they are in relation to the world. This is the landscape of transformation, transcending the internal/external boundary. The landscape of transformation implies that educators should design their courses in a way that encourages learners to make explicit connections between their everyday lives and the material. *Life* is the true curriculum. From the perspective of transformative

environmental education, transformation does not happen unless looking outward is joined by looking inward, nor is transformation meaningful unless looking inward is joined by looking outward.

Regarding the question of which specific course activities should feature reflection, the answer is very simple: all of them. Reflection should be the central organizing principle of transformative environmental education, the process around which the entire course or curriculum is designed. As demonstrated in BiSci, content-oriented material like course readings should be accompanied by reflective journal entries. Hands-on activities like field studies should be accompanied by reflections on the experience. Written assignments like essays should be about reflective topics and ask reflective questions. Lectures, too, and other informational components should be accompanied by reflective discussion. Reflection is how meaningful learning and transformation happen; reflection provides learners the opportunity to make meaning from their experiences and build a personal connection to the material. Without a personal connection, course material is often mere information quickly forgotten. Reflective learning is learning that endures.

Former Students Make the Best Guides

The single most important logistical element of BiSci 3 is inviting former students to return as teaching assistants. TAs allow for the creation of small lab sections and the kind of open, reflective dialogue that is so important for transformative learning. As demonstrated by the LAS results and corroborated by surveys and interviews, these lab

sections were the most powerful contributors to participants' transformation. For a large class like BiSci 3, the lab sections are absolutely essential in providing for intimate dialogue, but even small classes where discussion is more feasible can benefit tremendously from the leadership of TAs. Groups like the lab sections are not just about discussion; they are about establishing heterotopian spaces where the rules are different than everyday life and the status quo can be challenged. Through shared activities and experiences, small groups allow learners to get to know each other personally, and provide a supportive environment guided by a relatable peer who is open and nonjudgmental. Indeed, TAs emerged from the LAS as the most supportive transformative agents in participants' lives, far eclipsing the level of support offered by friends, family, and classmates. All in all, designing a course around students-turned-assistants creates the opportunity for a number of deeply meaningful, transformative experiences for learners.

The experience of revisiting a course as a teacher is meaningful for TAs, as well. The old adage that one does not truly know something until one can teach it certainly seems to hold true, as interviews with former TAs revealed a wide range of lessons learned from their second time through BiSci. Primarily, former TAs reported developing a greater sense of confidence and empowerment, a deeper understanding of course ideas, and a stronger commitment to their beliefs as a result of their teaching experience. Notably, too, returning as a TA also meant enrolling in the semester-long TA training course the semester before teaching BiSci. Participants who were currently or had been enrolled in the training course indicated that it was an integral part of their BiSci experience. This also connects back to the discussion about extending transformative

environmental education beyond a single course, as the opportunity to return to BiSci is an opportunity to remain immersed in its heterotopian space, to develop a stronger, deeper, more durable transformation than would be possible in a single semester.

While it may not be practical in all situations to create a TA training course, inviting former students to return as TAs is a powerful and intriguing model of education that can be applied to many settings. Regardless of the subject matter or level of the course, learners can almost certainly benefit from the discussions, support, and guidance provided by their teaching assistant peers. Ultimately, inviting former students to return as TAs is a win-win situation for all involved: students benefit from the support of the TAs, TAs benefit from revisiting course ideas and guiding others through them, and the department or program (if applicable) benefits from increased enrollment and a volunteer teaching force. Educators, transformative and traditional alike, should absolutely consider this educational model in their own teaching.

Engage Learners as Whole Beings

Among head, heart, and hands, traditional education most often overlooks the heart. However, the lens of emotional geographies clearly shows that emotion is integral to the process of transformation. This is particularly true for transformative environmental education, where personal struggle, an emotional connection to nature, and a deep sense of life purpose are key features. Transformation has powerful extra-rational dimensions; transformative environmental educators should therefore be sure to engage the extra-rational in their courses, creating spaces where emotions are expected,

encouraged, and valued. Holistically understood, transformative education not only asks the question, "What do you think?", but also "How do you feel?" Engaging learners as whole beings with emotions, fears, and desires is a key part of fostering transformation.

This is not only a guideline for transformative environmental educators, but a warning. Educators are people who value education enough to make it their vocation; by and large, they are people for whom education has *worked*. However, they should be careful not to assume that cognitive-rational inquiry, academic reading and writing, and other components of traditional education resonate as strongly with learners as it did for them. The course readings in BiSci 3 are a great example of this, at least from the point of view of my own personal history. I find the relative unimportance of the course readings to participants' transformation surprising, in large part because of the centrality of reading to my own transformative experiences. Reading Derrick Jensen's *A Language Older Than Words* (2000), in particular, was an incredibly powerful, life-changing event for me, and is the very reason I chose environmental education as my vocation. When I took BiSci 3 as a student, then, imagine my delight upon discovering that the book's first chapter ("Silencing") was featured as a course reading. "Silencing" was one of many amazing, potentially life-changing readings in BiSci 3, and it is difficult for me to imagine a set of introductory readings that could be more powerful or thought-provoking. Yet, despite the quality and character of the BiSci readings, participants who report being changed by the course rank the course readings at the bottom of all the required assignments.

The point here isn't specifically about reading – after all, I argued previously that reading still plays an important role in transformative learning – but about the wide

variety of learner preferences, abilities, and learning styles. Educators must be careful not to focus exclusively on particular modes of learning at the expense of others, particularly when, as with reading or other cognitive elements of traditional education, those modes are personally effective for the educator. Taking a holistic view means understanding the multifaceted nature of human experience and the extra-rational dimension of transformation. Transformative environmental education is not just cognitive, but also emotional, relational, kinesthetic, and experiential; it engages learners as whole beings.

Make it Active; Make it Relational

Transformative environmental education is active and relational. Active learning, representing the hands component of head, heart, and hands, means breaking the habits of passive learning inculcated by years of traditional education (either as a learner or educator) and making the learning process hands-on, experiential, and engaging. When well-designed and implemented, active learning allows learners to experiment and gain experience with new ideas firsthand, an important part of the transformative process. In addition to the crucial reflective component, educators should design major course assignments to feature an active role for learners.

In transformative environmental education, active learning also implies a degree of outdoor learning. Fostering self-identification with nature, pro-nature beliefs and values, and comfort with nature – in other words, ecological identity – cannot be done effectively in the abstract. This is a matter of concrete, relational experiences. Relationships with nature are necessarily embodied and specific, grounded in lived

experiences of place. To the extent possible within logistic and geographic constraints, educators should draw upon the emotional and transformative potential of places and incorporate outdoor experiences into their transformative courses. In this endeavor, transformative environmental education can learn much from the traditions of outdoor and place-based education (Smith 2002; Sobel 2004).

Active and relational learning also builds on the understanding that learners' everyday lives are strongly social. There is a significant social dimension to transformative learning: learners are not just isolated individuals, but carry with them the support, censure, expectations and pressures of their social networks. Educators must be mindful of this social dimension, which is not often nurturing for learners' transformative experiences, and build social support into the very structure of the course. The heterotopian spaces of TAs and lab sections are an effective example of this, but TAs and lab sections do not extend beyond the duration of the course. Educators should consider how they can extend these heterotopian spaces to provide learners with support that persists after the course is over, such as through student organizations, online social networking groups, and the like. Transformation is a long process; learners should have the opportunity to continue the journey they began with their first transformative environmental education course.

Move from Intention to Action

Based on this study, the number one suggestion I have for BiSci 3 in its current form is to place more emphasis on praxis, translating beliefs into action. The data aren't

wholly definitive on this point without objective measurements of behavior and longitudinal studies, but there does seem to be much unrealized potential for learners to engage in more pro-environmental action, especially collective action. The large belief-action gap and/or low perceived importance of effective pro-environmental behaviors point to the existence of strong barriers to action. Whether through a lack of practical skill, knowledge, confidence, or time, or through simply continuing to acquiesce to and follow existing socio-cultural norms and expectations, participants on the whole do not seem to have made the leap from ecological identity to environmental activism. This reflects a wider trend in transformative learning where taking action doesn't necessarily follow transformation (Hicks et al. 2005). There is much need in transformative environmental education, and transformative learning more broadly, for educators to emphasize praxis and guide learners in the shift from intention to action.

Empowerment, confidence, and courage are important prerequisites for action, and should continue to be emphasized as outcomes for transformative environmental education. The missing ingredient, though, is an intentional, specific focus on translating newfound beliefs into action. Educators should directly prompt learners to explore possibilities for action, and, importantly, provide resources and hands-on experiences that allow them to make those possibilities real and concrete. This involves not just asking learners, "What are you going to do?", but providing the tools that say, "Here's how to do that."

Perhaps, though, making a significant lifestyle change and actually taking action congruent with a newfound worldview simply takes time. This is yet another argument in favor of extending transformative environmental education beyond a single course; a

two-semester sequence, for instance, could focus on identity and critical self-reflection in the first semester, and deliberately moving from intention to action in the second. Regardless of how it is implemented logistically, however, the need for transformative environmental education to foster concrete action is clear. Transformation without action may be a positive experience for individual learners, but in order to make the more widespread changes necessary for a more sustainable world, learners must be able to take action. This is the promise of transformative learning for sustainability: that it has the power to transform both individuals and broader society.

Conclusion

Transformative environmental education has a number of features that distinguish it from traditional education. It is about the self, it is about life, and the combination of the two provide for a deep, meaningful learning experience that transcends the interior/exterior boundary and prompts learners to examine who they are and how they relate to the world. For educators looking to implement transformative environmental education, the results from this and previous chapters point to the importance of reflection, peer guidance, the whole self, active learning, and taking action. These five lessons are key for creating a heterotopian space with the power to transform individual and collective ways of being along more sustainable pathways.

The above lessons are important, but they are not enough by themselves. Transformative environmental education is an underlying approach to education, a paradigm. More than any particular set of practices, it involves an orientation to teaching

and learning that is fundamentally transformative in spirit. The transformative spirit is open, curious, welcoming of change, honest, and engaged. I conclude with the words of a TA-in-training, who underscores many of the lessons for transformative environmental educators and illustrates the full educational experience of a course saturated with transformative spirit:

> I think that I've definitely learned to apply this stuff to my life more, the stuff that I'm getting in the classroom. Like I wrote in my synthesis essay, I mean it was at the end of the semester, so I'm like, I'm leaving behind a bunch of courses, and if it doesn't affect my life or a class I want to take in the future, then I'm probably just going to forget about it. And that's so true of a lot of the information that I've learned over the years. It comes and then it goes. And the full experience, the full education that I'm looking for, is one that's going to impact me personally, and I'll feel that deeper connection with it. And then I'll retain it, because it's meaningful. And I think BiSci was a course like that, where you could apply it however you chose to who you were.

Chapter 7

Conclusion

To better understand the process and potential of transformative environmental education, this dissertation used a case study approach to examine the outcomes of BiSci 3, a college-level transformative biology course. I employed a mixed-methods mode of inquiry, combining qualitative semi-structured interviews with quantitative measurements of participants' values and behavior, to explore transformative environmental education from the perspective of learners' lived experiences.

This dissertation addressed the following research questions:

1. How does transformative environmental education affect learners' sense of self? In other words, what aspects of learners' identities change, and in what are the key aspects of this transformed identity?
2. How does transformative environmental education affect learners' everyday lives? In other words, does a shift in identity lead to a shift in pro-environmental action, and how do these shifts interact with learners' social networks?
3. How can environmental educators best implement transformative learning in their own teaching? In other words, what specific activities and general attributes are most important for encouraging transformation?

The following section summarizes the major ideas and findings of this dissertation, organized by theme.

Summary and Findings

Ecological Identity and Nature Relatedness

The power of transformative learning is that it can go beyond merely imparting knowledge, and can actually shape learners' identities. Transformative environmental education invites learners to develop and shape their ecological identity, which includes being mindful of and celebrating one's embeddedness within nature, holding pro-nature beliefs and values that are meaningful on a personal level, and having awareness and appreciation for the wonder of life. In short, ecological identity is about developing relationships with nature.

As measured by the Nature Relatedness scale, BiSci 3 encouraged a strong and demonstrable development of ecological identity, above and beyond what might be expected from a more traditional environmental science course. The most salient aspect of participants' growing ecological identities was their sense of personal connection to the natural world, their perception of their self-in-nature. A more nature-focused worldview was also a significant outcome of the course. This was not just about acquiring environmental knowledge, but about engaging the heart, developing a loving, caring, or compassionate connection with nature. Increased physical familiarity with nature, an important part of ecological identity, was not the strongest outcome of BiSci 3, but it was still significant and generally involved a greater sense of awareness and appreciation for nature. All together, the changes in Nature Relatedness across the course-wide population indicate that the development of relationships with nature was a

notable outcome for the class as a whole. Transformation is not limited to just the engaged few.

Self-Reflection, Self-Compassion, and Transformative Emotions

Critical self-reflection is the core of transformative learning. In transformative environmental education, critical reflection prompts learners to deconstruct the assumptions about (un)sustainability that have previously gone unexamined in their lives, and provides them the opportunity to construct a more ecologically sustainable way of being. Self-reflection also provides the foundation for a stronger sense of who one is as a person, and a more knowledgeable, authentic, and caring relationship with the self. For many participants, learning to care about themselves was not tangential to the transformative process; it was their basis for transformation.

This points to how transformation is strengthened by, and perhaps even requires, an intentional focus on feeling and emotion. Prominent emotions in BiSci included happiness and passion, but also sadness and loss. In a space where emotions are valued and encouraged, the intensity of feelings like sadness and loss can be difficult for students, but intense, difficult emotions are likely intertwined with the very process of transformative environmental education. Transformation involves challenging and perhaps discarding ways of being that feel safe and secure, moving to the edge of one's understanding and meaning-making, and venturing out into the unfamiliar. Moreover, *feeling* is the hallmark of transformation. Emotions are the ties that bind, the connective

tissue that forms the basis of relationships between self and nature, the foundation of ecological identity.

Empowerment and Pro-Environmental Actions and Beliefs

For transformative environmental education to make a genuine difference in the world, it has to spark action. The emphasis on praxis and empowerment from feminist pedagogy is particularly important in this pursuit. Empowerment is a prerequisite for action, or at least for the kind of informed, committed action that transformative environmental education seeks to foster. BiSci encouraged a strong sense of empowerment among students through an expansive sense of personal possibility, the belief that one's actions can make a difference, and the desire to act. Although active caring appeared to be a promising model to illuminate transformative environmental education, an increase in active caring was not an outcome of BiSci 3.

In terms of taking action, the majority of participants who reported a change in behavior reported minor pro-environmental actions like turning off light switches and recycling. Some participants, however, took more dramatic action in their lives, including changing their career path or program of study, and eating partially or wholly vegetarian. Surveys assessing pro-environmental actions and beliefs indicated that transformative environmental education and traditional environmental education were indistinguishably similar; they both led to increased collective action, though collective action still lagged far behind personal action. This same dynamic surfaced in pro-environmental beliefs, reinforcing the idea that environmentalism was mainly an individual pursuit for

participants. An analysis of the belief-action gap demonstrated points of difficulty as well as points of possible intervention for educators. Overall, these findings suggest that there is much more room for transformative environmental education to emphasize praxis and equip learners with the ability to take practical action.

Support, Social Connectedness, and the Social Dimension of Transformation

Emotional geographies advance the view of the relational self, where identity is not only a matter of internal topography, but is also comprised of connections to the outer world, including other people. This is the social ontology of connection as conceptualized by feminist geographies of care, and transformation must be understood in this context. Through honesty, truthspeaking, and genuine listening, BiSci 3 encouraged participants to foster stronger relationships with specific and generalized others, and these relationships were often an important source of support for transformation. However, BiSci was a double-edged sword, strengthening some relationships but straining others. Despite the importance of support for transformation, many learners encountered just the opposite in their social networks, especially from friends and peers.

As measured by social connectedness, participants who reported being changed by BiSci 3 also reported feeling increasingly distant or disconnected from other people and society. Experiencing increasing distance in their social networks, facing resistance from those they care about, constantly questioning the status quo, and revising their fundamental worldviews, learners have a lot asked of them by transformative environmental education. Transformation, which can be a burden, requires much courage.

Fortunately, transformative environmental education can also equip learners with the courage and confidence to carry that transformation through. All together, these results show that not only is transformative environmental education about transforming learners' identities, but it is also about transforming learners' social relationships. This takes seriously the social ontology of relation, demonstrating that transformation is unavoidably social.

Transformative Course Activities and Heterotopian Spaces

Results from the Learning Activities Survey indicate that lab sections were the course activity that contributed the most to participants' transformative experiences, followed by field studies. Notably, these activities are active and reflective. Reflective action, whether enacted in open discussion or hands-on assignments, is the foundation upon which transformative course activities are built. Reflection associated with reading and writing is also helpful for transformation, though not as much as reflective action. These results suggest that course activities that involve extra-rational dimensions, such as emotive, experiential, or relational learning, contribute more strongly to transformation than activities that involve cognitive reflection alone.

Because learners' social networks are generally not supportive of their transformative experiences, support in transformational environmental education must come from the course. This is a matter of creating heterotopian spaces: spaces where the rules are different than everyday life and transformation can be nurtured. The Learning Activities Survey demonstrated that TAs were the people who provided the most support

and encouragement for participants' transformation, by far. The TAs acted as role models and guides, establishing heterotopian spaces that could "push-out-on" the status quo. However, transformation is a long process, and outside forces can "push-in-on" these spaces. Therefore, in order to foster transformation, educators should think beyond the duration of a single semester, working to maintain learners' participation in a supportive, transformative heterotopian space as long as possible.

Real Life, Real Learning and the Landscape of Transformation

A personal, genuinely learner-centered approach characterizes the pedagogical foundation of BiSci 3. Transformative environmental education is not about tests, grades, or memorizing facts soon forgotten; regardless of the title of the course, the primary subject of transformative learning is always the self. Reflecting and connecting course material to the self is how deep, transformative learning happens. Life, in all its emotional intensity, is what transformative environmental education is about.

One risk with such a strongly personal approach is that it could potentially encourage self-absorbed narcissism. The key insight here for transformative educators is that transformation is not just about the bounded self, but the self-in-relation. This evokes the landscape of transformation, which extends from the individual outward to other beings and places. In bridging the internal/external boundary, the landscape of transformation demonstrates that transformative environmental education cannot only be about looking inward. This evokes the political dimension of feminist care ethics: transformative educators should work to ensure that looking inward at the self is always

accompanied by looking outward at the world. Transformation is not just about redefining oneself, but redefining one's role in the world.

Five Lessons for Transformative Educators, Revisited

For educators looking to implement transformative environmental education, synthesizing the above results points to the importance of reflection, peer guidance, the whole self, active learning, and taking action. These five lessons for transformative educators are revisited below:

1. Reflection, reflection, reflection. Reflection should be the central organizing principle of transformative environmental education, the process around which the entire course or curriculum is designed. Transformation does not happen unless looking outward is joined by looking inward, but the landscape of transformation also implies that transformation is not meaningful unless looking inward is joined by looking outward.

2. Former students are the best guides. The single most important logistical element of BiSci 3 is inviting former students to return as teaching assistants. Inviting former students to return as TAs is a win-win situation for all involved: students benefit from the support of the TAs, TAs benefit from revisiting course ideas and guiding others through them, and the department or program (if applicable) benefits from increased enrollment and a volunteer teaching force.

3. Engage learners as whole beings. Transformation has powerful extra-rational dimensions, so transformative environmental educators should be sure to engage the extra-rational in their courses, creating spaces where emotions are expected, encouraged,

and valued. Transformative environmental education is not just cognitive, but also emotional, relational, kinesthetic, and experiential; it engages learners as whole beings.

4. Make it active, make it relational. Active learning allows learners to experiment and gain experience with new ideas firsthand. In transformative environmental education, active learning implies a degree of outdoor learning, drawing upon the emotional and transformative potential of relationships with specific places. Understanding that transformation as relational also involves being mindful of the social dimension of transformation. Learners' social networks are not often nurturing for their transformative experiences, so educators should build support into the very structure of their courses.

5. Move from intention to action. Informed by feminist praxis, there is much need in transformative environmental education for educators to guide learners with an intentional, specific focus on translating newfound beliefs into action. Transformation without action may be a positive experience for individual learners, but in order to make the wider changes necessary for a more sustainable world, learners must be able to take action.

Limitations and Future Research

The primary limitation of a case study approach is generalizability: how widely the results might apply to contexts other than the chosen case. BiSci 3 inhabits a particular niche in education, as a 300-student college-level introductory course for non-

majors at a large, relatively expensive[1] public university in the northeastern United States. Transformative environmental education might manifest itself differently in different contexts, whether in smaller advanced courses, smaller liberal arts colleges or community colleges, different regions of the United States or the world, or learning environments outside of higher education. Exploring different contexts can only strengthen the understanding of transformative environmental education, and such explorations provide for many possibilities for future research.

Similarly, the demographics of this study population were limited to a very particular set of characteristics. A large majority of participants were aged 18-20 and self-identified as white. It may be that transformative learning has a strong synergistic effect with the existent search for identity and social roles in this age group; transformative environmental education may play out differently among younger or older learners. The age of the participants would likely be similar in most higher education settings, but the study of transformative environmental education would benefit greatly from more perspectives from people of color. Transformative learning in general is largely a Eurocentric tradition (Brookfield 2003), and exploring multicultural learning and life experiences within and outside the United States stands as one of the most significant frontiers for transformative learning theory and research (King 2009).

This is where feminist conceptions of power and difference can make an important intervention in transformative learning research. According to bell hooks (1994), the classroom is typically a site of erasure of difference, where teachers exercise

[1] With in-state tuition and fees totaling $15,250 in 2010-2011, The Pennsylvania State University ranks as the most expensive public college for in-state students in the U.S. (Burnsed 2011).

power and authority that reinforce existing systems of domination. Most teachers, she argues, learned to teach emulating this model, and so continue to reproduce it. From a feminist perspective, then, I would contend that understandings of power and difference are essential for education to be truly transformative. The same critical light that transformative learning shines on personal and societal assumptions should be used to illuminate transformative learning itself. Even the building of relationships through ecological identity should be subject to critical analysis, as "social relations of love, connection, mutuality, commitment, and so on are not idealized terrain, rather they are fraught with power relations that are worked out in specific contexts" (Lawson 2007, 4). Transformative learning raises the question of who determines what should be transformed and what should be the goal of transformation, and this is a question of power. Wide societal transformation is unlikely to be possible if transformative environmental education is based on and responds to only the life experiences of the U.S. white middle- and upper-class. Thus, weaving an analysis of power and difference into both the scholarship and practice of transformative environmental education is one of the more important directions for future research.

As described in the chapter on transformation and learners' everyday lives, a more specific limitation of this study is its use of self-reported pro-environmental action. To better understand the relationship between identity and action, further work is needed that utilizes objective measurements of actual behavior. Likewise, one of the most promising features of transformative environmental education is that, because it is about identity, it can lead to deeper and more lasting behavioral changes than traditional education. Right now this is only an untested premise; longitudinal studies are needed,

especially in conjunction with objective measurements of pro-environmental action, to assess whether transformative environmental education does indeed lead to long-term change.

Beyond work based on its limitations, I believe this dissertation raises interesting questions that provide fruitful points of departure for future research. One question is how the transformation of identity can be translated to specific contexts. In other words, instead of a connection to the natural world as exemplified by ecological identity, what role can transformative education play in more local environmental and civic engagement? Can transformative environmental education adopt a place-based emphasis and empower learners to act in their home communities? What is the relationship between ecological identity and sustained, engaged citizenship?

Returning to the idea of longitudinal studies, there may be some benefit to employing a more holistic and less temporally-bounded definition of transformation. Transformation is sometimes only clear in retrospect, which is an important consideration that I built into this study's design. I interviewed participants months after the official end of BiSci, but even so, some former TAs mentioned not realizing the full affect of BiSci until even later than that. What if transformation is not conceptualized on the scale of semesters, but on the scale of years or even decades? Would this imply an understanding of transformation not as a single, bounded event, but as a continual, iterative process that unfolds over time? How would this iterative process be distinguished from ordinary change?

Lastly, an extension of this work that I am currently investigating is the gendered dimension of transformative environmental education. According to the Nature

Relatedness scale and other measurements, female students tend to experience more significant transformation in BiSci 3 than male students do. This gender dynamic raises a number of questions. Is transformative learning itself a gendered process? Can transformative environmental education be made more accessible to male students? Are the values of traditional masculinity in some ways incompatible with sustainability? I hope to address these questions and more in my continuing work on transformative environmental education.

Implications

This dissertation most directly draws from, and contributes to, the traditions of nature-society geography, transformative learning, feminist pedagogy, feminist environmentalism, and emotional geographies. Importantly, it can also serve as a guide for environmental and sustainability educators, as part of an ongoing conversation with educators across disciplines who are concerned with helping bring about a sustainable world.

Nature-society geography is fundamentally about relationships, foregrounding the study of the connections between humans and the environment. As such, it provides the entry point for this work, and also provides a fruitful context for this study's implications. This dissertation extends the concerns of nature-society geography into the realm of identity, querying how personal and societal relationships with the natural world are formed, shaped, and changed. Through the study of ecological identity and nature relatedness, it address two questions central to the study of nature-society relationships,

one empirical and one ethical: what is our relationship with nature, and what ought it to be?

Although I have specifically situated this dissertation in the tradition of nature-society geography, I think it is a paradigm case of Noel Castree's hypothetical green human geography, which focuses on people's attitudes toward and relationship with the non-human world. Similarly, it is in line with Karen O'Brien's vision for a new age for human geography. Here the "adaptive challenge" of sustainability is brought to the forefront, a challenge that requires "questioning of the assumptions, beliefs, values, commitments, loyalties and interests that have created the structures, systems and behaviors that contribute to […] environmental problems in the first place." (O'Brien 2011a, 2). Sustainability is perhaps the most significant issue facing humanity today, and this dissertation demonstrates one way that geography educators, and the field of geography more broadly, can make challenging these destructive systems and fostering sustainable relationships a central practice. Borrowing Paul Robbins' metaphors for political ecology, transformative environmental education is thus a hatchet that breaks down unsustainable beliefs and values, and a seed that gives rise to more sustainable ways of being.

This dissertation likewise represents an important extension to the field of transformative learning. Most fundamentally, it serves as an existence proof for transformative environmental education: this kind of education can indeed lead to significant development of ecological identity. In contrast to classic transformative learning theory and in support of more recent work, this study also demonstrates the centrality of emotion to the transformative process. Transformation, particularly in

transformative environmental education, is intertwined with intense emotion, from feelings of happiness and passion to sadness and loss. The relational self as understood by emotional geographies provides for what might be the most significant contribution to the field of transformative learning: an understanding of the landscape of transformation. The landscape of transformation extends from the self outward through relationships, such that transformation transcends the interior/exterior boundary of internal self and external world. This landscape manifests itself in a number of ways, including through transformative relationships with particular places and in the connections between individual self-reflection and reflective dialogue. However, the most important implication for transformative learning theory and practice is that transformation must involve both looking inward at the self and outward at the world. Who we are and how we fit into the larger world are two sides of the same question. It is through the landscape of transformation, furthermore, that it becomes clear that transformation is unavoidably social. Transformation does not occur in a vacuum; learners come to a course with rich histories, connections, and social ties, and these are all features on the landscape of transformation.

Transformative environmental education has much in common with feminist pedagogy. Feminist pedagogy includes a commitment to learner empowerment, building community, privileging the individual voice, and challenging traditional views, all of which are central to transformative environmental education. Where this dissertation makes the greatest contribution to feminist pedagogy, then, is through providing a pedagogical framework that links social and environmental concerns. As Irene Diamond asserts, “there is no such thing as a struggle for women’s rights separate from a struggle

to repair the living systems of the earth that sustain life" (Diamond 1994, ix). To speak of rights or justice without considering environmental (un)sustainability is to ignore an enormous component of long-term health, security, and well-being. This dissertation shows how feminist pedagogy can enact its commitment to goals like learner empowerment through education that keeps a commitment to environmental sustainability at the forefront; namely, transformative environmental education.

The overlap of feminist and environmental concerns also suggests some of the implications of this dissertation for feminist environmentalism. Ecofeminism, in particular, has long critiqued the pervasive anthropocentrism and perception of human separation from nature in Western thought. Transformative environmental education demonstrates how this perceived separation can be challenged, concretely and on the ground, through the building of relationships. Fostering relationships with nature through transformative environmental education prompts learners to view nature as a dynamic web in which humans are embedded as co-inhabitants, rather than an abstraction above which humans stand as dominators. More than just a generalized connection to nature, the transformative potential of place illustrates the importance of developing relationships with particular places and particular beings. This also draws on the feminist ethic of care and geographies of care. As illustrated in this study, love and care are important prerequisites for transformation, and love and care are rarely developed in the abstract. Transformative environmental education encourages care for home, care for particular places and beings, and this dissertation demonstrates how educators can foster these caring relationships.

As implied by the discussion of love and care, emotional geographies play an important role in this study. Emotional geographies link geography, transformation, and feminism, illuminating how emotions are co-constitutive of everyday life, emerging through relationships and shaping the self. This dissertation extends the tradition of emotional geographies in a few key ways. First, building on the ethic of care and the idea of transformation as an emotional process, this study demonstrates that care and compassion for oneself provide an important basis for transformation. This suggests an intriguing geography of self-care, where caring for the nearest and most immediate entity, the self, might necessarily precede caring for more geographically or relationally distant entities. However, as emphasized by the geographies of care, caring cannot stop at this personal level. Caring responsibly means caring on a spatially extensive, structural, and long-term level, as well (Lawson 2007).

Second, this dissertation can be seen as one entry point in the emerging study of the emotional geographies of teaching and learning. Even though "teaching and learning are *irretrievably* emotional in nature" (Hargreaves 2001, 1056), a systematic understanding of teachers' and learners' emotional contexts and relationships remains a relatively unexplored terrain. Third, from a more general geographic perspective, this dissertation advances the conceptual framework of the heterotopian space, demonstrating that the emotional, physical, temporal, and transformative characteristics of these spaces are important considerations for nurturing widespread and long-term change.

Lastly, and perhaps most importantly, this dissertation contributes to the pedagogy and practice of environmental educators across disciplines. I hope my work will prompt educators to consider implementing transformative environmental education

in their own teaching, and will serve as a guide for educators who do so. By distilling the insights from this study into five lessons for educators, this dissertation highlights the importance of reflection, peer guidance, the whole self, active learning, and taking action. These five lessons are key for creating a learning environment with the power to transform individual and collective ways of being along more sustainable pathways. Sustainability presents an immense challenge, but also an opportunity, to us as educators. The question is, how will we respond?

As in the previous chapters, I believe it is fitting to close this dissertation with the words of a participant. This is a poem written in fall 2009 by a BiSci student who did not seek to return as a TA. Her poetry speaks to the promise and potential of transformative environmental education. I conclude with her words:

In the beginning
I was a stranger
In my own body
Two separate parts
That needed to come together as one
I walked into the classroom
And came out amazed
The semester ahead
Would be full of surprises
I reflected, read, and talked it out
And slowly but surely and without a doubt
I was learning more and more about myself
My life wasn't just about me
But the trees, animals and the sea
I need to help them
Whenever I can
Because I have destroyed them
And if I don't turn back
There will be an attack
On our comfortable lives
Hoping we can survive
I learned to Truthspeak
Which has help me become
True to myself and realize what's important in my life
I've been taught by social conditioning
But this class helped me realize what life is truly about
So recycling items and taking the steps
Is something I can do to relieve some stress
Inside a permanent change has occurred
A realization you might say
That I can't live a life using more than my fair share of resources
I have learned so much
My journey has just begun
Even though this class is done
I'm still growing every day
I will never look at a tree the same way again.

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Appendix A: Most Common Interview Codes

This appendix outlines the most common codes produced from the largely bottom-up analysis of participant interviews. All codes that apply to greater than 20% of the 32 total interview participants are included, with the exception of coding themes that are outside the purview of this study's research questions (e.g., why participants initially enrolled in BiSci).

Table 0.1: Codes for Outlooks and Outcomes

Codes: Outlooks and Outcomes	Participants	Percent
Empowerment (Overall)	27	84.4%
...Can make a difference	16	50.0%
...Desire to act, inspired	12	37.5%
...Doesn't matter what other people think	11	34.4%
...Confidence in beliefs	7	21.9%
Relationship with Nautre (Overall)	21	65.6%
...Part of nature	13	40.6%
...Compassion for animals, nature	9	28.1%
Awareness	19	59.4%
Less stress, slowing down, living in the moment	17	53.1%
Self-knowledge, self-awareness	17	53.1%
Critical Questioning (Overall)	16	50.0%
...Question conditioning, beliefs, own life	13	40.6%
...Question status quo or culture	7	21.9%
Do what is meaningful, true to self	14	43.8%
Knowledge of environmental issues, important	14	43.8%
Appreciation	12	37.5%
Compassion for self	12	37.5%
Unaware without BiSci	12	37.5%
Openness	11	34.4%
BiSci as part of you, life, way of life	11	34.4%
Awareness of own actions	10	31.3%
Awakening	7	21.9%
Success, money, things less important	7	21.9%
Everything is connected	7	21.9%

Table 0.2: Codes for Emotions

Codes: Emotions	Participants	Percent
Happiness, enjoyment	15	46.9%
Excitement, passion	11	34.4%
Emotions as way of knowing or feeling vs thinking	9	28.1%
Calm, relaxation, peace, coping, balance, harmony	9	28.1%
Fear, worry	8	25.0%
Sadness, depression, discouragement	8	25.0%
Frustration, disappointment	8	25.0%

Table 0.3: Codes for Actions

Codes: Actions	Participants	Percent
Pro-environmental behavior	15	46.9%
Career choice	9	28.1%
Vegetarianism	8	25.0%
Other lifestyle change	7	21.9%
Actions limited	7	21.9%

Table 0.4: Codes for Relationships with Others

Codes: Relationships with Others	Participants	Percent
Support or Dismissiveness (Overall)	28	87.5%
...Support from lab section	12	37.5%
...Support from BiSciers	11	34.4%
...Support from TA or TATA	10	31.3%
…Support from family*	7	21.9%
…Dismissiveness from friends*	7	21.9%
Truthspeaking, honesty in relationships	14	43.8%
Connection with specific person, people	10	31.3%
Compassion for others	9	28.1%
Nonjudgmental, labeling	9	28.1%
Share meaning of BiSci	9	28.1%
Connection with generalized others	8	25.0%
Listening to others	7	21.9%
* = See Figure 5.2 in chapter 5 for a more detailed breakdown of support and dismissiveness among family, significant others, and friends		

Table 0.5: Codes for Course Characteristics

Codes: Course Characteristics	Participants	Percent
Learning - deep vs shallow	15	46.9%
Personal, what you make of it	14	43.8%
Yourself as theme	12	37.5%
No tests, less focus on grades, less structured	12	37.5%
Don't have to agree, can't force it on people	12	37.5%
Different viewpoints, see things differently	10	31.3%
BiSci as non-science, more than facts, information	8	25.0%
Challenging, thought-provoking	8	25.0%
Connection to other classes	7	21.9%

Table 0.6: Codes for Course Activities

Codes: Course Activities	Participants	Percent
Lab activities	15	46.9%
Field studies	14	43.8%
Lectures	14	43.8%
Readings	13	40.6%
Reflection, journals	13	40.6%

Table 0.7: Codes for Participants' Second Time Through BiSci

Codes: Second Time Through BiSci	Participants	Percent*
Didn't understand until after	4	33.3%
Difficult outside of BiSci	4	33.3%
* = Only 12 participants specifically discussed their second time through BiSci (as TAs). These percentages are based on that total.		

Appendix B: Surveys and Instruments

2010 Pre and Post Survey

DISAGREE STRONGLY	DISAGREE A LITTLE	NEITHER AGREE NOR DISAGREE	AGREE A LITTLE	AGREE STRONGLY	**PART 1: BELIEFS.** For each of the following, please rate the extent to which you agree with the statement, using the scale from 1 to 5 as shown below. Please respond as you really feel, rather than how you think you "should" feel.
1	**2**	**3**	**4**	**5**	**Do you disagree or agree that…**
☐	☐	☐	☐	☐	All my actions, big and small, make a difference in the world
☐	☐	☐	☐	☐	I am able to relate to my peers
☐	☐	☐	☐	☐	Considering all the world's problems, the future looks bleak and hopeless
☐	☐	☐	☐	☐	I catch myself losing a sense of connectedness with society
☐	☐	☐	☐	☐	If I put my heart into it, I can help bring about positive change in the world
☐	☐	☐	☐	☐	I am able to connect with other people
☐	☐	☐	☐	☐	I feel understood by the people I know
☐	☐	☐	☐	☐	Environmental issues are beyond my control
☐	☐	☐	☐	☐	I feel like an important part of something larger than myself
☐	☐	☐	☐	☐	I am a valuable and worthy person, at least equally with others
☐	☐	☐	☐	☐	Environmentally, I don't think we'll be able to change the direction we're heading
☐	☐	☐	☐	☐	I feel distant from people
☐	☐	☐	☐	☐	I'm not really capable of helping with environmental issues
☐	☐	☐	☐	☐	Even around people I know, I don't feel that I really belong
☐	☐	☐	☐	☐	Together, we will be able to rise to the challenge of making the world a better place
1	**2**	**3**	**4**	**5**	

1 DISAGREE STRONGLY	2 DISAGREE A LITTLE	3 NEITHER AGREE NOR DISAGREE	4 AGREE A LITTLE	5 AGREE STRONGLY

Figure 0.1: 2010 Pre and Pre and Post Survey, Part 1: Beliefs

PART 2: ACTIONS. For each of the following, please rate how often you engage in the action, using the scale from 1 to 5 as shown below. Please respond as you really act, rather than how you think you "should" act.

1 NEVER	2 RARELY	3 SOMETIMES	4 OFTEN	5 REGULARLY

NEVER	RARELY	SOMETIMES	OFTEN	REGULARLY	
1	2	3	4	5	**How often do you…**
☐	☐	☐	☐	☐	Volunteer with or donate money to environmental organizations
☐	☐	☐	☐	☐	Write, call, or e-mail your elected officials about environmental issues
☐	☐	☐	☐	☐	Walk, bike, or use public transportation when possible, instead of driving
☐	☐	☐	☐	☐	Eat vegetarian or vegan
☐	☐	☐	☐	☐	Choose renewable energy from your utility company, or purchase renewable energy certificates (RECs) to guarantee that renewable energy is generated
☐	☐	☐	☐	☐	Recycle everything possible
☐	☐	☐	☐	☐	Repair or re-use old products instead of buying new ones
☐	☐	☐	☐	☐	Initiate efforts to make your school, workplace, or community group (such as a fraternity/sorority or church) more environmentally responsible
☐	☐	☐	☐	☐	Talk with other people about environmental issues, outside of schoolwork
☐	☐	☐	☐	☐	Vote for a candidate based on his/her stance on environmental issues
☐	☐	☐	☐	☐	Eat locally-grown food when in season (such as from a farmers' market, CSA, or your own garden)
☐	☐	☐	☐	☐	Purchase products specifically designated as environmentally friendly
☐	☐	☐	☐	☐	Write in a public forum (such as a public blog or a letter to a newspaper) about environmental issues
☐	☐	☐	☐	☐	Join others in environmental service projects in your community
☐	☐	☐	☐	☐	Try to educate yourself about environmental issues, outside of schoolwork
☐	☐	☐	☐	☐	Consciously act as a role model for others, modeling environmentally-responsible behavior
1	2	3	4	5	

Figure 0.2: 2010 Pre and Pre and Post Survey, Part 2: Actions

Not Important	A Little Important	Somewhat Important	Moderately Important	Very Important	
1	2	3	4	5	**How important do you feel it is to…**
☐	☐	☐	☐	☐	Volunteer with or donate money to environmental organizations
☐	☐	☐	☐	☐	Write, call, or e-mail your elected officials about environmental issues
☐	☐	☐	☐	☐	Walk, bike, or use public transportation when possible, instead of driving
☐	☐	☐	☐	☐	Eat vegetarian or vegan
☐	☐	☐	☐	☐	Choose renewable energy from your utility company, or purchase renewable energy certificates (RECs) to guarantee that renewable energy is generated
☐	☐	☐	☐	☐	Recycle everything possible
☐	☐	☐	☐	☐	Repair or re-use old products instead of buying new ones
☐	☐	☐	☐	☐	Initiate efforts to make your school, workplace, or community group (such as a fraternity/sorority or church) more environmentally responsible
☐	☐	☐	☐	☐	Talk with other people about environmental issues, outside of schoolwork
☐	☐	☐	☐	☐	Vote for a candidate based on his/her stance on environmental issues
☐	☐	☐	☐	☐	Eat locally-grown food when in season (such as from a farmers' market, CSA, or your own garden)
☐	☐	☐	☐	☐	Purchase products specifically designated as environmentally friendly
☐	☐	☐	☐	☐	Write in a public forum (such as a public blog or a letter to a newspaper) about environmental issues
☐	☐	☐	☐	☐	Join others in an environmental service project in your community
☐	☐	☐	☐	☐	Try to educate yourself about environmental issues, outside of schoolwork
☐	☐	☐	☐	☐	Consciously act as a role model for others, modeling environmentally-responsible behavior
1	2	3	4	5	

PART 3: OPINIONS. For each of the following, please rate the importance of the action, using the scale from 1 to 5 as shown below. Please respond as you really feel, rather than how you think you "should" feel.

1 Not Important	2 A Little Important	3 Somewhat Important	4 Moderately Important	5 Very Important

Figure 0.3: 2010 Pre and Pre and Post Survey, Part 3: Opinions

PART 4: CONCLUSION.
Please describe a little bit about yourself.

1. What is your age?
   - Below 18
   - 18-20
   - 21-24
   - 25-29
   - 30-39
   - 40-49
   - 50 or over

2. What is your gender?
   - Female
   - Male
   - I do not identify with either of these categories

3. How do you describe yourself? (check all that apply)
   - American Indian or Alaska Native
   - Asian
   - Black or African American
   - Hispanic or Latino/Latina
   - Native Hawaiian or Pacific Islander
   - White
   - Other ethnicity not listed

4. In what college is your current major? (check all that apply)
   - Agricultural Sciences
   - Arts and Architecture
   - Business, Smeal College
   - Communications
   - Earth and Mineral Sciences
   - Education
   - Engineering
   - Health and Human Development
   - Information Sciences and Technology
   - Liberal Arts
   - Nursing, School of
   - Science, Eberly College
   - Other college not listed

5. Counting this semester, how many semesters have you been enrolled in college?

2010 Post Survey

1. On a scale from 1 (very low) to 7 (very high), please rate the overall quality of BiSci 3:

    - Very Low
    - Low
    - Somewhat Low
    - Moderate
    - Somewhat High
    - High
    - Very High

2. Thinking about your experiences in BiSci 3 this semester, check off any statements that may apply.
   Note: "role expectations" refers to your ideas about how people should act in certain situations (such as what it means to be a student, a citizen, a human being, etc).
    - I had an experience that caused me to question the way I normally act.
    - I had an experience that caused me to question my ideas about social roles (how people should act).
    - As I questioned my ideas, I realized I no longer agreed with my previous beliefs or role expectations.
    - Or instead, as I questioned my ideas, I realized I still agreed with my beliefs or role expectations.
    - I realized that other people also questioned their beliefs.
    - I thought about acting in a different way from my usual beliefs and roles.
    - I felt uncomfortable with traditional social expectations.
    - I tried out new roles so that I would become more comfortable or confident in them.
    - I tried to figure out a way to adopt these new ways of acting.
    - I gathered the information I needed to adopt these new ways of acting.
    - I began to think about other people's reactions and feedback from my new behavior.
    - I took action and adopted these new ways of acting.

3. As a result of taking BiSci 3, do you believe you experienced a time when you realized that your values, beliefs, opinions or role expectations had changed?
    - Yes
    - No

-If you answered "No" to the above question, please skip to the next survey section

-If you answered "Yes" to the above question, please continue in this section with question #4

4. How major/significant do you feel this change was, in terms of its effects on your everyday life?

    - Very minor, not at all
    - Minor, a little significant
    - Moderate, somewhat significant
    - Major, notably significant
    - Very major, very significant

5. Please describe what happened:

For the following set of questions, please rate how important each activity or person was in helping influence your change.

< Questions 6-15 were followed by a Likert scale with the following choices>

- Not at all influential
- A little influential
- Somewhat influential
- Moderately influential
- Very influential

6. Journal reflections/synthesis essays
7. Field studies
8. Course readings
9. Lecture presentations/activities
10. Lab section discussions/activities
11. Other class assignments/activities (such as BiSci Film Fest)
12. A classmate's support or encouragement
13. Your section leader/TA's support or encouragement
14. Your instructor's support or encouragement
15. Another person's support or encouragement (such as a friend or family member)

16. (Optional) Please comment on the activities, people, and/or events that helped influence your change:

2009 Pre and Post Survey

Survey Instructions: For each of the following, please rate the extent to which you agree with each statement, using the scale from 1 to 5 as shown below. Please respond as you really feel, rather than how you think "most people" feel.

1 DISAGREE STRONGLY	2 DISAGREE A LITTLE	3 NEITHER AGREE NOR DISAGREE	4 AGREE A LITTLE	5 AGREE STRONGLY

	DISAGREE STRONGLY 1	2	3	4	AGREE STRONGLY 5
1. I enjoy being outdoors, even in unpleasant weather.	☐	☐	☐	☐	☐
2. Some species are just meant to die out or become extinct.	☐	☐	☐	☐	☐
3. Humans have the right to use natural resources any way we want.	☐	☐	☐	☐	☐
4. My ideal vacation spot would be a remote wilderness area.	☐	☐	☐	☐	☐
5. I usually think about how my actions affect the environment.	☐	☐	☐	☐	☐
6. I enjoy digging in the earth and getting dirt on my hands.	☐	☐	☐	☐	☐
7. My connection to nature and the environment is a part of my spirituality.	☐	☐	☐	☐	☐
8. I am very aware of environmental issues.	☐	☐	☐	☐	☐
9. I take notice of wildlife wherever I am.	☐	☐	☐	☐	☐
10. I don't often go out in nature.	☐	☐	☐	☐	☐
11. Nothing I do will change problems in other places on the planet.	☐	☐	☐	☐	☐
12. I am not separate from nature, but a part of nature.	☐	☐	☐	☐	☐
13. The thought of being deep in the woods, away from civilization, is frightening.	☐	☐	☐	☐	☐
14. My feelings about nature do not affect how I live my life.	☐	☐	☐	☐	☐
15. Animals, birds and plants should have fewer rights than humans.	☐	☐	☐	☐	☐
16. Even in the middle of the city, I notice nature around me.	☐	☐	☐	☐	☐
17. My relationship to nature is an important part of who I am.	☐	☐	☐	☐	☐
18. Wilderness conservation is unnecessary.	☐	☐	☐	☐	☐
19. Nature is strong enough to recover from any human impact.	☐	☐	☐	☐	☐
20. The state of non-human species is an indicator of the future for humans.	☐	☐	☐	☐	☐
21. I think a lot about the suffering of animals.	☐	☐	☐	☐	☐
22. I feel very connected to all living things and the earth.	☐	☐	☐	☐	☐

Figure 0.4: 2009 Pre and Post Survey

2009 Post Survey

1. This survey helps us understand the experiences of students in BiSci 3. Only with your help can we learn more about this. This survey only takes a short time to complete, and your responses will be confidential. Thank you for being part of this project; your cooperation is greatly appreciated!

2. Thinking about your experiences in BiSci 3 this semester, check off any statements that may apply. *Note*: "role expectations" refers to your ideas about how people should act in certain situations (such as what it means to be a parent, a student, a human being, etc).
   - ☐ I had an experience that caused me to question the way I normally act.
   - ☐ I had an experience that caused me to question my ideas about social roles (how people should act).
   - ☐ As I questioned my ideas, I realized I no longer agreed with my previous beliefs or role expectations.
   - ☐ Or instead, as I questioned my ideas, I realized I still agreed with my beliefs or role expectations.
   - ☐ I realized that other people also questioned their beliefs.
   - ☐ I thought about acting in a different way from my usual beliefs and roles.
   - ☐ I felt uncomfortable with traditional social expectations.
   - ☐ I tried out new roles so that I would become more comfortable or confident in them.
   - ☐ I tried to figure out a way to adopt these new ways of acting.
   - ☐ I gathered the information I needed to adopt these new ways of acting.
   - ☐ I began to think about other people's reactions and feedback from my new behavior.
   - ☐ I took action and adopted these new ways of acting.
   - ☐ I do not identify with any of the statements above.

3. As a result of taking BiSci 3, do you believe you experienced a time when you realized that your values, beliefs, opinions or role expectations had changed?
   - ☐ Yes
   - ☐ No

   -If you answered "Yes" to the above question, please go to question #4 and continue the survey.
   -If you answered "No" to the above question, please go to question #8 to continue the survey.

4. Please describe what happened.

5. Did a BiSci 3 class assignment help influence the change? If yes, what was it? (check all that apply)
   - ☐ Journal reflections
   - ☐ Synthesis essays
   - ☐ Field studies/activities
   - ☐ Ecological identity project
   - ☐ Assigned readings
   - ☐ Lecture presentations/activities
   - ☐ Friday lab activities
   - ☐ Personal reflection
   - ☐ Verbally discussing your concerns
   - ☐ Writing about your concerns
   - ☐ Deep, concentrated thought
   - ☐ BiSci Film Fest
   - ☐ Nontraditional structure of the course
   - ☐ Other (please briefly describe in the text box for question #7)
   - ☐ No BiSci 3 class assignment influenced the change

6. Did a person help influence the change by giving you support and/or encouragement? If yes, was it... (check all that apply)
   - ☐ A classmate's support
   - ☐ A friend or family member's support
   - ☐ Your TA's support
   - ☐ Your teacher's support
   - ☐ Other (please briefly describe in the text box for question #7)
   - ☐ No person helped influenced the change through support or encouragement

7. Were there other activities, people, or events that influenced this change? If yes, please briefly describe them:

For questions #8 and #9, please rate the extent to which you agree with each statement, using a scale from 1 to 5:
1: Disagree strongly
2: Disagree a little
3: Neither agree nor disagree
4: Agree a little
5: Agree strongly

8. I am someone who usually thinks back over my previous decisions or past behavior.

9. I frequently reflect upon the meaning of my studies for myself, personally.

10. What is your age?

11. What is your gender?

12. What is your marital status?

13. How do you describe yourself? (check all that apply)
    - American Indian or Alaska Native
    - Asian
    - Black or African American
    - Hispanic or Latino/Latina
    - Native Hawaiian or other Pacific Islander
    - White
    - Other

14. In what college is your current major? (check all that apply)
    - Agricultural Sciences
    - Arts and Architecture
    - Business, Smeal College
    - Communications
    - Earth and Mineral Sciences
    - Education
    - Engineering
    - Health and Human Development
    - Information Sciences and Technology
    - Liberal Arts
    - Nursing, School of
    - Science, Eberly College
    - Other

15. Counting this semester, how many semesters have you been enrolled at Penn State (including branch campuses and online)?

CURRICULUM VITAE

Greg Lankenau

EDUCATION

Doctor of Philosophy in Geography and Women's Studies
The Pennsylvania State University, defended May 7, 2012
Master of Science in Systems Science; Certificate in Computer Modeling and Simulation
Portland State University, 2006
Bachelor of Science in Computer Science and Mathematics; Minor in English
Colorado State University, 2004

RESEARCH

Lankenau, Greg. "Feminist Pedagogy and Environmental Education for Sustainability: Six Guiding Principles." (under review)

TEACHING

Teaching Awards
Harold F. Martin Graduate Assistant Outstanding Teaching Award, 2011-2012
James T. Meyer Outstanding Graduate Teaching Assistant Award, 2010

Courses Taught (The Pennsylvania State University)
Introduction to Women's Studies, Summer 2012, Spring 2012, and Fall 2011
Geography of the Developing World, co-taught Spring 2010
Geographic Perspectives on Sustainability & Human-Environment Systems, Spring 2009
Effective Public Speaking, Summer 2008

Courses Assisted (The Pennsylvania State University)
Cultural Geography, Fall 2010
Geographic Perspectives on Sustainability & Human-Environment Systems, Fall 2010 course design, Fall 2009, and Fall 2008

GRANTS AND FELLOWSHIPS

Sustainability Seed Grant, Penn State Institutes of Energy and the Environment, with Dr. Lorraine Dowler, 2010-2012
Academic Enrichment Awards, Department of Geography, multiple awards, 2010-2011
University Graduate Fellowship, Penn State University, 2007-2008
Anne C. Wilson Award, College of Earth and Mineral Sciences, 2007-2008
Boettcher Foundation Scholarship, Boettcher Foundation, 1998-2002