Environmental Education:
One teacher's journey

by

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Abstract

This study describes the research conducted into my teaching practice as an Environmental Educator in a Manitoba High School. The study employs a self-study methodology and systematically examines evidence gathered on my practice in teaching a Grade 11 subject entitled Current Environmental Topics in Science. I kept a reflective journal of my teaching during the course and retrospectively and systematically examined, with the support of a critical friend, what informed my teaching of the subject. Further, I used written accounts of my students' learning to identify evidence of learning and understand how my teaching influenced learning. Using Bronfenbrenner's bio-ecological model of human development as a means of analysis, I was able gauge what personal and environmental factors were influencing the teaching and learning process. Using Derek Hodson's four levels of sophistication (Interest, Impact, Values and Action) alongside Elliot Eisner's orientations to curriculum (Development of Cognitive Process, Academic Rationalism, Personal Relevance, Social Adaptation, and Curriculum as Technology), it was found that there were many layers informing my planning and delivery of curriculum, especially in regards to how I responded to students' interests when teaching the course. Outcomes of this study suggest that the largest barrier to responding to an intended curriculum that aligns with Hodson's Call to Action as Environmental Educators may lie with the teacher herself rather than school-based and other external constraints. Drawing upon the findings from this study, possibilities for further research are considered. As well, personal applications of the study are considered, primarily in regards to problematizing of my current practice in the delivery of the Grade 11 Environmental Topics in Science, as well as other subjects I currently teach.

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Chapter 1 - The journey ahead

1.1 Introduction

I invite you to read my story as an environmental educator, even though it continues to unfold. I would like to tell the story of my experiences as a Manitoba high school teacher who is continuously attempting to develop a responsive and reflective course, both for my students and myself based upon the values I believe are imperative for developing students' who live their lives mindful of how their actions can work for the environment. This development occurs within the context of a subject entitled Current Environmental Topics in Science. My story will tell you about the opportunities and the challenges I have faced and, sometimes missed, in the planning and implementing of the course, and, in response to this, the personal reflection associated with the course. In brief, it describes and investigates the tension that exists between curriculum "intended" and curriculum "enacted". On the basis of this reflection on action, I describe how I see myself moving forward in this area in the future. I see a mandate to move forward differently, especially in being mindful of the tensions experienced in my practice and how I navigate these tensions, sometimes succumbing to elements that are seemingly innocuous. In brief, this reflection causes me to question my previous practice and humbly and critically move forward with a greater awareness of both personal and environmental influences on practice. Although this is the story of my journey, I hope you have the opportunity to pause and consider your own practice, especially in teaching for the environment. It is my belief that my journey, which focuses on a critical evaluation of my practice, has potential for causing environmental educators to reconsider their own practice, at least in being more

mindful of the influences on curriculum intended and the subsequent reality and potential disconnect with curriculum enacted.

Before reading any further, you should know two important pieces of information. First, this thesis is a narrative of how I came to be the teacher I am today and the Teacher I hope to be in the future. I capitalize the word Teacher because I want my teaching to have consequence. I want students to experience transformation as a result of their learning through my teaching. The thesis provides insight to my past and, most specifically, one semester of my teaching as an educator for the environment. Being a teacher was never really a clear, well-lit direct road for me, and I invite you to read further to find out why. Second, my life, both on my personal and professional path, has been fraught with indecisiveness, yet, despite this, there has been one constant: my spiritual and emotional connection to the natural world. I often gaze in wonder at how a near full moon could be in the purple hues of a North-western Ontario sunset. I am humbled by the 180° skies of the prairies where you can watch summer storms rolling towards you. I pause to watch the squirrels harvesting seeds for the winter. It is these experiences that strongly inform who I am personally and who I wish to be professionally. As John Loughran (2007), a prominent scholar in Self-Study research reminds us, it is difficult to isolate the personal from the professional. What contributes positively to my well-being is aligned strongly with what I want my students to similarly experience. For this reason, understanding this connection between the personal and professional will be developed in the section that follows.

1.2 Being a Teacher

My path to being a teacher was not a direct one. I have always had a personal connection to the natural world. As a child I spent a great deal of time outside, whether it

was at our family's secluded cabin on a lake in the boreal forest, cross-country skiing in Manitoba's provincial parks, and going on long canoe trips from my house outside a small North-western Ontario town during high school. This connection to the natural world developed in my youth and was the foundation for developing my views and attitudes towards the environment, its importance to us and other creatures we share it with.

When I graduated from high school, like many youth, I did not know what I wanted to "do with the rest of my life". I returned to Winnipeg, and enrolled in a French-English translation program. Partway through I had a critical experience that set me on the path to study the environment. It was while I was working as a lifeguard and swimming instructor at the town beach in Sioux Lookout, Ontario. One of the other lifeguards was washing the dock and dumped the soap filled pail of dirty water in to the lake. It occurred to me that this was a problem. If we, a population who lived so close to these seemingly pristine bodies of water, did not recognise that our actions could have far reaching consequences, how could people who live in cities disconnected from the environment see their value and importance? It was after that day that I started the process of changing from the language translation program to the Environmental Sciences Program at the University of Manitoba.

While working through that degree I had the opportunity to take a course in Churchill, Manitoba. The course had a strong focus on connecting the people and cultures to the ecology of the area, which was an idea that I connected with on a personal level. The idea of studying ethnoecology was appealing and brought back what I felt that day on the dock with the bucket of soapy water.

The turning point towards being a teacher occurred when I was looking through a book I had picked up during my Bachelor of Science courses, *The Dictionary of Environmental Quotations* (Rodes & Odell, 1998) and came across a quotation from Sir

Peter Scott, founder of the World Wildlife Fund. He said, "The conservationist's most important task, if we are to save the earth, is to educate" (37-5).

Reading the quotation was an epiphany for me. I realized that the best way to ensure awareness of our actions and disconnect from the natural world was to take advantage of how impressionable high school students' are. They are at the age when they are starting to cultivate their own views, opinions and, ultimately, courses of action. This can be a consequential stage in their life as young adults.

It took putting the series of significant events together – my growing up connected to nature, the bucket of soapy water, the course in Churchill and finally the quotation –for me to enrol in a Bachelor of Education program to become a teacher. I now am a teacher in an urban high school and I seek to be a Teacher. I want my teaching to have consequence. I want students to learn and behave differently as a result of my teaching. This though is enigmatic. I am not teaching in North-western Ontario. The disconnect for me, both personally and professionally, has been in teaching in an urban school where many, if not most, of the students have not had the same experiences in the natural world that I did at their age. I want my teaching to have consequence on my students beyond the classroom and into their lives as educated decision makers. I want to be a Teacher.

1.3 Purpose of this study

In order to be the Teacher that I want to be, and to have the biggest influence on my students, I must critically look at what I do in my classroom and what impact it has on my students' lives. The intentions I have for the Environmental Topics class are to provide opportunities for students to begin to understand their own points of view and challenge them through the experiences provided to reflect upon their points of view and, by so

doing, contribute to changes in their attitudes, values and perceptions about the world they live in. Beyond that, I want this to translate into new lines of behaviour for them; actions that are *for* the environment. It is important to me that students are able to build their critical thinking skills and make informed decisions in their lives. It is important to me that I investigate my teaching and determine its consequence and adjust accordingly. By conducting a self-study and critically looking at my own planning, and the influences on the enactment of the subject, I hope to identify areas that I can improve and change for the benefit of my future students. I want to be a better Teacher.

1.4 My research questions

How can I best meet the needs of my students as an environmental educator and, similarly, ensure my teaching has consequence on how students act in the world in which they live? The focus of my research is threefold. The first focus is to look at how I balance the interests of my students with my own when planning the course. The second focus is to look at what changes I make (or do not make) in response to how the students engaged with the learning process. Finally, based upon a post teaching reflection grounded in self-study methodology, I look at what I could do in future years to make the course more substantive and consequential to students who are enrolled. I approach this research through a self-study methodology that will critically look at what it is that I do as a teacher in my classes.

The first question I want to address in examining the motivation and underpinning consideration for my teaching practice relates to the environmental topics in science course I have been teaching. In brief, this question gives consideration to the thinking processes associated with the planning and enactment of my teaching. I have my own ideas of what I

want my students to learn, but they may or may not be topics they are interested in or want to learn about. It is important to me that students relate to what they are learning. At the same time, I must realise they do not have the life experience to draw on surrounding environmental issues. In all, I need to closely consider what is informing my initial planning; that is what is informing my practice pre-enactment. For this reason, the first question I seek to answer is: *what informs my approach to planning and implementing a relevant and responsive environmental issues based course?*

This idea leads to the next question I seek to answer through my research. Because I have my own set ideas about what *I* think the students should be learning, this does not always mean it is what *they* want to be learning. I am aware that although I have an intention for curriculum, the actual delivery can be influenced by student response and, possibly, other factors, both personal to me as a teacher and environmental. Because of this, I want to determine if my ideas for curriculum anticipated, actually translates into curriculum enacted. This question is focused on consideration in the act of teaching. This leads to my second research question: *how do I respond to and balance the interests of students with my own intentions when teaching an environmental issues based course?*

In order to complete the cycle of planning and implementing, it is important that I also look at what happens after the course (or topic) is complete. In order to learn from each experience and move forward for next time, it is critical that I, as a teacher, reflect on what I do in order to improve my practice. This query is focused on a post-teaching consideration. Thus, the third research question I will explore is: *based upon reflection of prior teaching, what could be done differently to provide more transformative opportunities for students?*

1.5 Significance of the research

This study is significant in terms of my own teaching practice and the lives of my students. First and foremost, it engages me in a systematic analysis of my own teaching with the intention of providing evidence for prompting change in my teaching actions.

Further, the study is beneficial for other teachers. As teachers, we are often our own worst critics when it comes to our successes and failures. I recognise that there are certain aspects of what I practice that are effective and some that are not. It is my hope, that by critically looking at my practice, by telling my story and sharing my experiences, others will take the time to critically look at how they plan their courses, how they respond to their students and how they look back at what they experienced to look more deeply at how they can improve on what they have accomplished. More importantly, I anticipate the study will give indication of the tensions associated with what we seek to do as teachers and whether this is realised in our teaching. For this reason, I see the study being significant in regards to illuminating to others how a teacher's practice in critiquing her work allows a deeper consideration of her intended and enacted practice.

The study is also significant because it pursues a methodological approach not evidenced in the environmental education literature. Although there is a growing body of research in self-study methodology, as will be shown, there is no evidence of such an approach taken in the area of investigating the tension between curriculum intended and curriculum enacted in the context of environmental education.

1.6 Thesis outline

In the next chapter, the Literature Review is presented. Because the study focuses on (1) underlying foundations of environmental education, (2) foundations of curriculum,

(3) influences on curriculum enactment and (3) teacher's learning through self-consideration, the review covers a range of ideas.

I begin by defining the construct of environmental education, with special emphasis on its history and intentions. I also distinguish it from environmental science. Further, I provide an overview of the common research themes in environmental education, especially in exposing the limited research that has been conducted on curriculum enactment and the tensions associated with curriculum enactment from a teacher's perspective. I present two theoretical frameworks that can be used as typologies for examining a teacher's orientation to curriculum enactment, these being Derek Hodson's levels of sophistication and Elliot Eisner's orientations. I will also introduce Bronfenbrenner's theory of ecological development which provides a critical lens for understanding the personal and/or environmental influences on curriculum enactment; that is the influences on the congruence, and possible mismatch, between curriculum intended and enacted. I will also briefly describe Mezirow's theory of transformational learning which assists in understanding how teacher's learn as a result of data-informed consideration of practice. The literature review concludes by examining Fullan's views on educational change and the influences on change.

From there, in Chapter 3 I will describe the methodology of the inquiry. In this chapter, I will explain why I have chosen self-study methodology for my research and why it is important to me to have taken this approach. In this segment, I will discuss my research process, what data I collected and how it was analyzed. In Chapter 4 I present the data collected, followed by analysis in Chapter 5. I conclude the inquiry in Chapter 6.

Chapter 2 - Literature review

2.1 Introduction

Chapter 1 provided insight into my story of becoming a teacher and emphasizes my developmental goal to become a Teacher. This next chapter will explore the literature that has helped me develop my research questions. I begin by defining environmental education in section 2.2. This is followed in section 2.3 with an overview of common research themes in the environmental education literature, drawing attention to the lack of literature focusing on self-study methodology that focuses on the space between curriculum intended and enacted and the tensions that are experienced within this space. In section 2.4, I introduce existing theories in education focusing on Elliot Eisner's orientations to curriculum. Further, I look at influences on curriculum enactment using Bronfenbrenner's theory of ecological development as a typology for such consideration. I also give consideration to curriculum change, especially at the enactment level, with primary consideration of change at the personal level. In forming the construct of change are Jack Mezirow's phases of transformative learning. The chapter concludes with Michael Fullan's theory of educational change which will be used to provide understanding of possible influences upon a teacher's enactment of aspired curriculum. Overall, the chapter covers a variety of constructs central to the thesis topic and research questions – that is, understanding the foundations of a teacher's practice, the influences upon her practice, and the resulting contributors for potential change in a teacher's practice as a result of considering reflection on her practice. The chapter ends in section 2.5 with a summary of the chapter and introduces Chapter 3, Methodology.

2.2 Environmental education

As environmental education becomes more prevalent in curricula across the globe, there comes the necessity to define what exactly it is and what its goals should be. There has been considerable debate about these semantics. Educators often interchangeably use the terms environmental education (EE), education for the environment (EfE), and, more recently, education for sustainable development (ESD). A theme that seems to reappear in the literature is the idea that there are three main aspects to EE. These include (1) education *about* the environment, (2) education *from* (or "in") the environment and (3) education *for* the environment, a typology that appears to be first coined by Palmer (1998) in his assessment of the 1974 UK Schools' Council Project Environment criteria. Education *about* the environment implies a cognitive, knowledge based education. education *from* the environment suggests that the environment be used as a resource or setting for learning. Finally, education *for* the environment emphasizes the need for pro-environmental action or a change in behaviour. Jickling and Spork (1998) critique the use of the phrase "education for…" as a means to "promulgate, indoctrinate propagandize or in any other way coerce students into adhering to predetermined attitudes, assumptions or values" (p. 315). They state several problems with education for the environment, one of which is the anthropocentric nature of EfE. They argue that the word "for" implies that humans are able to decide what is "good" or "bad" for the environment (Jickling & Spork, 1998).

This reference to the "for" of environmental education is evident within what are referred to as *the basic principles* of environmental education. While the wording is different from author to author, the common goals, purpose or components of EE include,

in some form: knowledge, awareness, involvement, relevance, human relationships, decision-making, problem solving and critical thinking. David Orr (1991, 1996) suggests that "*all education must be environmental education"* (para. 20) and concludes with the statement that the "*way learning occurs is just as important as the content"* (para. 25). Orr's assertions draw attention to the practice of environmental education, highlighting that it is the practice of the teacher that contributes to change. This assertion parallels Jickling and Spork (1998) who provide a list of characteristics of what they believe to be the basis of education for the environment. Their suggestions include fostering political literacy, developing critical thinking, enabling problem solving, opening students' minds to alternative worldviews and to engage students in cultural criticism and reconstruction. In all, both Orr and Jickling and Spork focus on the process of environmental education, emphasizing that the context and content of study are providing the vehicle for the educating that might occur in environmental education.

Within the literature attention is drawn to the relationship and difference between environmental education and environmental science. For example, Edelson (2007) writes at length about the importance of including environmental science as a core course within high schools in the United States. He proposes that "environmental science provides an opportunity for students to gain a more rounded understanding of contemporary science because it has two features that are absent from current high school curriculum" (p. 44). He states that the interdisciplinary nature of environmental science and the importance of illustrating science and scientific theory as a tenuous but durable area of study are the defining qualities for it to be a core course in a student's life curriculum. The appeal, in his opinion, of environmental science as a discipline, is the unresolved nature of the issues and topics being studied. He emphasizes that environmental science is largely dominated with

developing students' understanding *about* the natural world and promoting their critical understanding of issues central to the environment. Edelson does not, however, discuss the opportunities for an environmental *science* course to additionally be an environmental *education* course; that is extending the learning into a more action-oriented manner.

This extension is evident in the literature. For example, in his article *Time for Action: Science education for an alternative future* (2003), Derek Hodson presents challenges with regards to defining scientific literacy as there is no agreed upon definition in terms of curriculum development. He indicates for some an individual's scientific literacy is the "capacity to read newspaper and magazine articles about scientific and technological matters with a reasonable level of understanding, others see it as being in possession of the knowledge, skills and attitudes essential to a career as a professional scientist, engineer or technician" (p. 646). Though he is writing from a science specific focus, it is applicable to the context of environmental education, especially as he often used environmental issues as examples.

Just as there is no agreement on what scientific literacy means, there is also discrepancy on what environmental education means, as I have previously shown. In discussing the different science education slogans and movements, such as Scientific Literacy, Science for All, and Science Technology and Society, Hodson recognises that there have been improvements in the way that science curricula are planned and delivered through the education, however "there is still considerable cause for concern" (p. 647).

As a solution Hodson presents following four levels of sophistication in issues-based curriculum development and course planning.

- Level 1: Appreciating the societal impact of scientific and technological change, and recognizing that science and technology are, to some extent, culturally determined.
- Level 2: Recognizing that decisions about scientific and technological development are taken in pursuit of particular interest, and that benefits accruing to some may be at the expense of others. Recognizing that scientific and technological development are inextricably linked with the distribution of wealth and power.
- Level 3: Developing one's own views and establishing one's own underlying value positions.
- Level 4: Preparing for and taking action. (p. 655)

In its basic form, level one is about *awareness* of how science and technology have impacted society historically and are dependent on culture. The second level draws in a critical perspective and seeks to support students in recognising that in science and technology, *decisions are often driven by specific interests*, and often do not have any regard to other cultures or beings. Level three addresses the need for students to begin *developing their own views and values* beyond the official information being presented to them. Finally, the fourth level is aimed at helping students "*prepare for and take responsible action*" (p. 656). He argues that if students are to become "active citizens" they need to be encouraged to "take action *now* (in school)" and that opportunities for them to take action are provided (p. 657).

Hodson proposes that these levels are taught at specific stages within schooling where level one is taught early, with the subsequent levels building on the previous ones. He does, however, state:

> In advocating for a 4-level model, my intention is not to suggest that all action is delayed until the final years of schooling. Rather, that students proceed to whatever level is appropriate to the topic at hand, the learning opportunities it presents and

> the stage of intellectual and emotional development of the students, bearing in mind that simple class management principle of investing each topic with a degree of variety. In some areas of concern it is relatively easy for students to be organized for action; in other areas it is more difficult. It is also the case that, for some topics, level 3 is more demanding than Level 4. (Hodson, 2003, p. 658)

Hodson emphasizes that curriculum developed while taking these four levels into consideration is critical in furthering education change, but is not without barriers. Planning an intended curriculum with the four levels in mind requires a teacher to evaluate and possibly change her personal and professional values, lifestyle as well as approaches to science pedagogy. Shifting to this type of curriculum planning raises concerns about how students' learning is to be evaluated and assessed, it requires an element of flexibility in content and decision-making. In addition to the pragmatic challenges of this type of curriculum, he also comments on the socio-political challenge. He cautions that successful implementation of these levels my lead to more opposition from society, parents and even some of the students themselves as there are preconceived perceptions about how learning science should look. He states "(t)here may be teachers, educational administrators and members of the wider community who perceive the capacity for effecting social change that is located in a body of students who are critically literate in science and technology, and sufficiently politically literate to ensure that their voices are heard, as a threat rather than a triumph of the science curriculum" (p. 665).

Overall, Hodson's framework is a valuable means to evaluate environmental education program's intentions and, at the individual level, an environmental educator's intended and enacted curriculum. What are the emphases in the intended curriculum? What

does a teacher aspire for? As well, what is enacted? And, are these consistent? Although there is no evidence in the literature that Hodson's framework has been used for such, it is likely it can be used as a typology in investigating such questions.

2.3 Overview of environmental education research

Evident within the literature is research on the subject of why people become environmental educators (Agne & Nash, 1976; Pooley & O'Connor, 2000) with attention to motivations for teachers' commitment to environmental education (Sosu, McWilliam, & Gray, 2008). For example, Sosu, McWilliam and Gray found that "perception of control and autonomy" (p. 185) were the significant factors in leading teachers to be committed to environmental education. In their study they found teachers' commitment to environmental education was influenced by "their belief in the importance of teaching environmental education to pupils and some environmentally related life experiences" (p. 185). As might be expected, studies indicate that teachers are commonly motivated to any of or all of the *about, in* and *for* dimensions of environmental education explicated by Palmer, with most teachers oriented, at least in their intentions, to the *for* the environment (Pooley & O'Connor, 2000).

Further, considerable research has been conducted on the impact or influence of environmental education interventions on student participants. In looking at the consequence of environmental education programs (Nelson & Guerra, 2014; Newhouse Berns & Simpson, 2009; Alagona & Simon, 2010), the studies showed that most research focused on action based research. Newhouse Berns & Simpson (2009) provided a summary of the research connecting outdoor education and environmental concern. They

highlighted that there has been mixed, even conflicting, results in studies about outdoor education's impact on environmental concern.

Alagona and Simon (2010) focused their research on the field study aspect of environmental education in college level environmental science disciplines. They found that students who took a field course indicated that they had a "desire to learn about the natural sciences and acquire technical environmental science research skills" (p. 192). Once the course was completed, the students identified non science specific aspects as favourite components to the course. Alagona and Simon observed "these students did not lose interest in the natural sciences, but their interest and engagement in the humanities increased dramatically" (p. 192). These two components lead to their advocating for an interdisciplinary approach to environmental education at the college level.

Although there is considerable attention to teachers' underlying motives for being an environmental educator and influences on environmental program interventions, what is apparently absent from the literature in environmental education is examination of teacher's reflective consideration of practice in enacting curriculum, especially in regards to what they intend to enact and what they actually enact. As mentioned, although there is a significant body of research on what informs teacher's practice and the influence of teacher interventions, there appears little written on the space between curriculum intended and enacted.

Outside of environmental education, the literature includes many studies on reflective considerations of teacher practice, (Jordan, 2010; Sletto, 2010; Loughran, 2002, 2004), primarily conducted by teacher educators on their own practice in terms of teaching teachers and certainly not on reflective practice in environmental education within high

school contexts. The literature on reflective practice emphasizes reflection-in-action (Jordan, 2010), embracing the unexpected (Sletto, 2010) and a meaningful way to teach about teaching (Loughran, 2002). Loughran discusses the spectrum of what reflective practice means to different people. He indicates that "for some, it simply means thinking about something, whereas for others, it is a well-defined and crafted practice that carries very specific meaning and associated action" (2002, p. 33).

Despite the studies on what draws people to become environmental educators, to study the effectiveness of their programs, and the importance of reflective practice, there is no evidence in the literature of teachers following a systematic analysis of their own practice as an environmental educator, especially in systematically investigating the space between curriculum intended and enacted.

2.4 **Existing Theories: curriculum, human development, transformational learning & educational change**

Although Derek Hodson's typology provides insight into what might undergird a teacher's practice, an understanding of what informs curriculum, that is the broad learning experiences provided for students, is necessary. This section focuses on giving foundational understanding of what commonly is evidenced as orientations to curriculum; that is what is this curriculum trying to achieve and what is important?

2.4.1 Curriculum theory

Elliot Eisner's five orientations to curriculum, as described in the 1979 publication *The Educational Imagination,* provides a practical means to introduce the nature of different curriculum perspectives, especially in how curriculum unfolds in the classroom.

As Eisner suggests, understanding our own ontologies of curriculum brings about awareness of our values and perceptions of educational order (Eisner, 1979). In brief, Eisner suggests that these orientations to curriculum tend to form the planning of curriculum and the enactment of curriculum, both at the macrosystem level, as in a national curriculum, and at the individual teacher level. He asserts that these orientations give insight into what might inform the content of a formalised curriculum and ultimately assists in understanding what a "balanced" curriculum might look like and what might be dominant or privileged in an unbalanced curriculum, especially in terms of anticipated outcomes. The first orientation, Development of Cognitive Processes, is the belief that the curriculum, again at either the macrosystem or individual teacher level and the strategies used for teaching, should foster the development of the student's cognitive process. From this perspective, the school's or teacher's major role is to help students to learn *how* to learn and to provide them with the opportunities to use and strengthen the intellectual tools they already have. Curriculum with this orientation is largely problem-centered. Students would identify problems to investigate, individually, in groups or as a class. Eisner notes that teaching in this orientation requires teachers to generate problems for students to work through and to raise the kinds of questions that prompt cognitive development (Eisner, 1985). It is likely that this orientation would be evidenced in many teachers' enacted curriculum, especially where the development of critical thinking and inquiry skills might be privileged. In Environmental Education, a program underpinned by such an orientation might emphasize the importance of data collection, processing and analysing of such data and critical thinking.

The second orientation, academic rationalism, states the major role of the school is to foster the intellectual growth of the student in the subjects most worthy of study. The

school's role is to provide students with intellectual knowledge and techniques to study the academic disciplines. Curriculum with this orientation tends to be the most common, as it provides concrete, testable outcomes for teachers and curriculum planners. It is likely that in an environmental education curriculum grounded in this orientation, the emphasis on learning *about* the environment might be emphasized.

Personal Relevance, the third orientation, emphasizes the importance of personal meaning and the school's responsibility to develop meaningful programs for the students. Sometimes referred to as a humanistic approach to curriculum, it is inferred that students will be more successful in learning, in theory, if they are active participants in developing the curriculum. Such an orientation is underpinned by a view that students will be intrinsically interested in the subject matter and be actively engaged if they see the learning of personal significance. The teacher's role is to develop programs, in this study's case, environmental education programs, in collaboration with students rather than the mandated content. This is a negotiable curriculum where students have input in deciding the curriculum they are to learn. Curriculum negotiated in this manner could be successful, though challenging in terms of evaluation, since the goals and objectives can vary greatly from student to student. Evaluation criteria would need to be process based rather than content based.

Social Adaptation and Reconstruction, the fourth orientation, describes aims and content that are derived from the analysis of the society's needs the school is designed to service. The school's role is to locate social needs and to provide the kinds of programs that are relevant to meet those identified needs. This orientation provides planning for society's needs like parenting classes, drug and sex education and cultural studies. The

idea is not to help students adapt to a society that is in need of change, but to provide the students with the ability to recognize the real problems and the tools to do something about them. It would be anticipated that environmental education programs grounded in the development of critical agency and action would characterise such an orientation.

The fifth orientation, Curriculum as Technology, focuses mostly on curriculum planning and less on delivery. It describes curriculum planning as a technical undertaking in a "means-end" model once the ends have been determined (Eisner, 1985). The central problem is not to question the goals, but to provide a structured planning method for purposes and objectives. It gives educators a way to devise purposes and ways to use them as criteria for effective evaluation. Eisner indicates that this model of planning has been advocated for by a number of educational theorists including Tyler, Dewey and Bloom. The technical orientation to curriculum would be evident in classrooms as measurable goals for each subject area. Such an orientation could potentially be evidenced in an environmental education curriculum where the attainment of clearly defined learning outcomes is the imperative.

Again, although this typology is likely not able to cover all motivations and intentions for curriculum, it does provide, for this study, a practical lens for understanding what an environmental education teacher might see as important or prioritised in her planning as important and what is actually enacted. In brief, understanding the congruence between the orientation of a curriculum intended and one enacted is likely able to be investigated through this five orientation schema.

2.4.2 Ecological theory of human development and transformative learning

At the heart of this study is investigating the space between curriculum intended and curriculum enacted. What does a teacher aspire to do, and what is actualised? And, what are the reasons for any mismatch between intention and enactment? Understanding the influences on a teacher's efforts to enact curriculum can likely be understood by examining socio-cultural views of human development. Bronfenbrenner describes development as an individual exhibiting evidence of taking on more complex behaviour, a view underpinning his Ecological Theory of Human Development developed in 1979.

With respect to teaching and learning of environmental issues, his theory, which examines how the factors surrounding an individual in enacting curriculum affect development, is applicable. The fundamentals of his theory are based on three main factors that influence, namely: the developing person; their environment; and the reciprocal interaction between the two. In essence, what happens developmentally in an individual's life, such as in the enactment of an environmental education subject, can be influenced by person and/or environmental attributes and the dynamic between these. His theory is best represented through the use of concentric circles, as shown in Figure 2.1, with the individual, in this study's case, the teacher, as the center focus.

Bronfenbrenner (1979) would suggest that personal attributes of the individual, such as beliefs, motivations, confidence and knowledge will influence curriculum enactment. It is well documented in the curriculum enactment literature (for example, Fullan, 1992) that teacher interest and ability to deal with the task at hand is a major influence on curriculum reform. Similarly, as evidenced in the environmental education literature, choosing to teach environmental education with a focus on change *for* the

environment is largely influenced by a teacher's beliefs about the purpose of education, and environmental education specifically (Newhouse Berns, & Simpson, 2009).

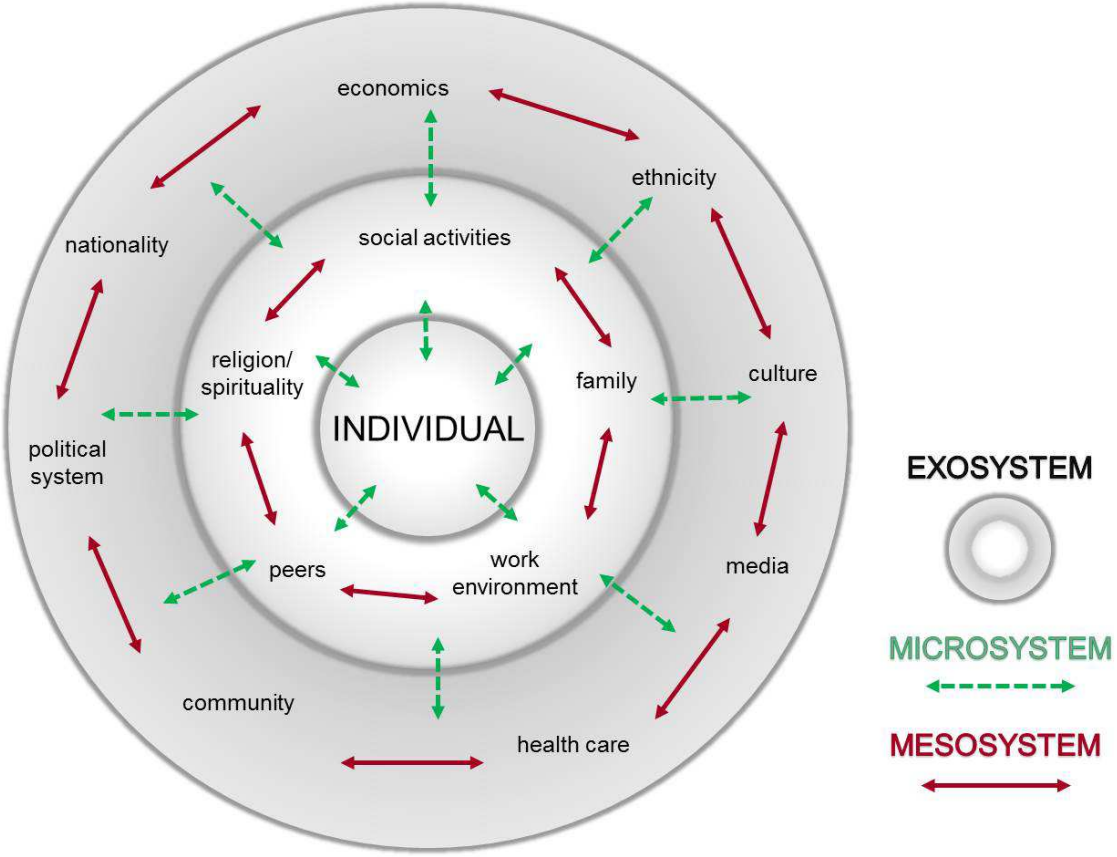


Figure 2.1. Ecological Theory of Human Development. This figure is a visual representation of Bronfenbrenner's ecological theory of human development.

In Bronfenbrenner's model, influences upon the individual are also associated with environmental factors. As shown in figure 2.1, the interactions between the individual, activities, roles and interpersonal relations are referred to as the *microsystem*. The factors in the microsystem can be direct or indirect, positive or negative and support or hinder development. Some of the factors in the microsystem are located closer to the individual's

circle, while others are placed on circles further away from the center depending on how much influence they have on the individual. The connections within the settings (factors within a circle) are labeled as the *mesosystem*. These interactions between two or more settings involve the individual directly and can have the most impact on immediate development. On the other hand, the connections between settings but not the individual are referred to as the *exosystem*. These factors and events may not have a direct impact on development, but rather an indirect one.

The basis of Bronfenbrenner's theory is to put context to how experiences can effect an individual's development and places emphasis on how the factors will influence each individual in different ways. The dynamic between factors, both personal and environmental, or, indeed, just personal, are central to understanding one's development. Being aware of these dynamics, especially when they oppose each other, becomes important to the development process. If they can be identified and responded to, the developmental process is likely enhanced.

The awareness of these forces is foundational to critical reflection. As suggested by Jack Mezirow's theory of transformative learning, critical reflection and understanding the meaning of experiences are opportunities for changes in an individual's frame of reference (1997). He defines frames of reference as 'structures of assumptions through which we understand our experiences' (p. 5). According to Mezirow, there phases in the process of transformational learning, and all learning experiences move through these phases to some degree. Erickson (2007) summarizes the phases as: "a disorienting dilemma, self-examination, critical assessment of assumptions, awareness that others share this experience, exploration of options, planning a course of action, acquisition of knowledge and skills to implement plans, provisionally trying new roles, building self-confidence and

competence, and a reintegration into one's life on new terms" (p. 67). In brief, the focus of this study is on analysing my practice and identifying tensions in my practice. Drawing upon both Bronfenbrenner's work, especially in identifying the influences on my practice, will assist me in identifying sources of tensions and, in turn, assist in my learning. Although Bronfenbrenner's model may assist in identifying whether tensions experienced are a result of individual or environmental influences, his model gives little attention to specific elements that might impact on curriculum enactment. The section that follows provides a brief overview of influences on curriculum enactment and change.

2.4.3 Curriculum enactment and change

In this study the influences on curriculum enactment will be investigated, and, thus, an examination of the literature understanding such processes is important. Michael Fullan describes in detail the barriers to educational change in his book *The New Meaning of Educational Change* (2007). The process of proposing, developing, implementing and sustaining a quality environmental education course requires a shift or complete change in thinking, emphasizing the significance of the teacher in fostering change. By so doing, he emphasizes the individual level of Bronfenbrenner's bio-ecological model as a critical influence on developmental change, especially curriculum enactment. Fullan provides an overview of the change process (Figure 2.2). The process involves, initially, a change being initiated or promoted. The direction of such change may be more or less defined. Once planned, even minimally, the change is not automatically implemented or attempted. Factors, resident within the individual teacher or multisystem environmental factors can impede of support the change process. Ultimately, the continuation of the change beyond the first or second year/phase is dependent on the institutionalization of the change. He

notes that the process is non-linear, leading back to previous stages to allow for alterations. In the process of implementing new courses, new activities, and new topics, it is important to constantly assess, revise and adapt the initial goals set for the course.

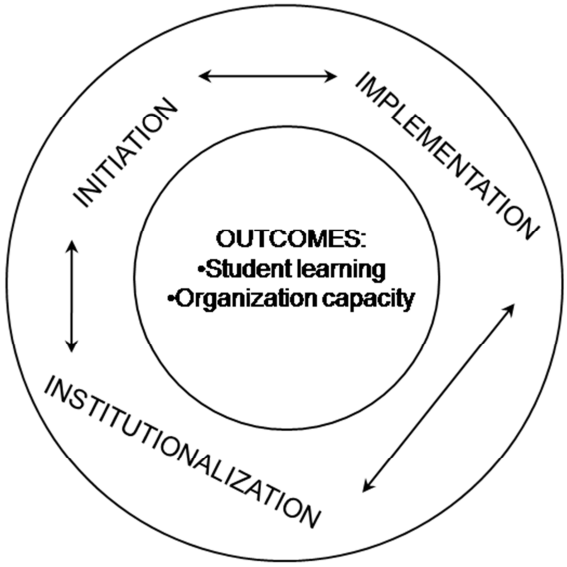


Figure 2.2. The Change Process. This figure is a simplified overview of Fullan's change process.

When it comes to planning and implementing change, Fullan states "educational change depends on what teachers do and think – it's as simple and as complex as that" (2007, p. 129). In essence, Fullan identifies teacher attributes more than environmental attributes as the key determinants of change. Teacher confidence, knowledge and skill are all contributors or impediments to change. Important to Fullan is the complexity of the change required. He suggests that the complexity involved in planning and implementing new programs can be a barrier to the success of that program. Fullan believes there are three main reasons why planning for change fails. The first is that planning does not consider local content and culture. This is especially important when it comes to studying environmental issues. When students cannot connect at Bronfenbrenner's microsystem

level, there is less meaning for them. In essence, planning that fails to link with student interest can ultimately be an impediment for change. He further identifies "dangerously seductive and incomplete" (2007, p. 107) planning as an impediment to change. Teachers often get too caught up in their own beliefs and goals, and by so doing, planning for students' interests are often overlooked. The third barrier is the fact that there is often too much emphasis placed on the planning portion and less on the actual implementation aspect. That is, the mental picture of the change is present, but the mechanism for its enactment is compromised, often by lack of follow-through, effort and resourcing.

Fullan (2007) maintains that one of the voices in curriculum enactment often overlooked is that of the student. The people who are affected the most by the change are often the last ones to have a say in the changes being made. He discusses how engagement of students and student voice are the key factors for successful change. In all, although the literature commonly identifies personal and environmental elements supporting or impeding enactment and change, Fullan's commentary provides insight into the importance of a teacher's thought processes, in areas such as motivation and interest, as critical elements supporting change. Although Bronfenbrenner and Fullan both identify contextual and environmental influences on development change, they also both draw attention to the importance of the individual as a critical agent in enabling or thwarting change.

2.5 Summary

This chapter has presented the foundational literature associated with the topic. I have explored conceptions of environmental education and areas of research. I have defined the approaches to curriculum that might be evidenced in curriculum intended and enacted. I

have discussed Hodson's levels of sophistication for science curriculum, Eisner's orientations to curriculum and Fullan's ideas on educational change. I have also discussed the common research themes in environmental education, reflective practice and identified a gap in the area of self-study research within the context of environmental education. The next chapter will discuss the methodology for how I plan to conduct my research, the context of the study, data collection and my research instruments.

Chapter 3 - Methodology

3.1 Introduction

The previous chapter discussed the literature with regards to environmental education, curriculum orientations, and influences on curriculum enactment and change. In this chapter, I will address the methodology of my research and the processes I will be using to analyze the data I have collected.

3.2 Practical inquiry through self-study

I wanted to conduct my study in a way that would be practical to me in the end. I wanted to investigate my practice, but in a systematic manner. My three research questions (1) *What informs a teacher's approach to planning and implementing a relevant and responsive environmental issues based course; (2) How does a teacher respond to and balance the interests of students with her own intentions when teaching an environmental issues based course;* and *(3) What could be done differently to provide more transformative opportunities for students,* are personal and reflective in nature.

Virginia Richardson (1994) discusses two forms of research that are conducted on practice; the first being "practical inquiry undertaken by practitioners in improving their practice" (p. 5) and the second as "formal research undertaken by researchers or practitioners designed to contribute to an established and general knowledge base" (p. 5). She indicates that research with an interpretive or exploratory purpose is becoming more common in education, as many teachers conduct informal research on their practice daily, essentially conducting an informal self-study as described by Samaras (2010).

Samaras and Freese (2006, in Samaras, 2010) describe two types of self-studies; formal and informal. A formal self-study is "a systemic research approach to explore one's practice" (p. 89). Whereas informal self-studies "include activities that provide practice in exploring one's teaching and learning using reflection as critical dimension" (p. 89) and do not necessarily include formal data gathering. Hamilton, Smith and Worthington (2008) describe self-study as a way to study someone's beliefs, actions and ideas in an autobiographical, political and historical manner. Dinkleman (2003) discusses how a self-study is an "intentional and systematic inquiry into one's own practice" (p. 8). Dinkleman draws this argument for self-study from John Dewey's theory of reflective teaching. Ultimately, self-studies are meant to be a critical and transformative form of research which challenge current practices (Samaras, 2010).

When setting up a methodology for a self-study, the literature does not prescribe a specific set of requirements. Instead, Pinnegar (1998, in Loughran, 2007) emphasises that "there is no one way, or correct way, of doing self-study" (p.15). Loughran (2007) suggests that how a self-study is conducted depends primarily on the question to be understood. When developing a self-study methodology, he notes that it is important to be conscious of the "continual interplay between research and practice within the practice setting" (p. 15). He suggests that since the practitioner and the researcher are the same person, it is inevitable that the practice will change as a result of feedback within the research process. This emphasis draws attention to the importance of seeing self-study connected to Mezirow's transformative learning theory. Systematic analysis of data collected that relates to the self has potential for being a foundation for critical investigation. Such investigation can lead to reconsideration and ultimately new resolutions and courses of action.

Amanda Berry (2004, in Loughran, 2007) suggests four main reasons researchers chose to conduct a self-study, including (1) articulating a philosophy of practice and checking consistency between practice and beliefs, (2) investigating a particular aspect of practice, (3) developing a model of critical reflection and (4) generating more meaningful alternative to institutional evaluation (p.14). She notes that while these are general themes to motivation behind self-studies, they are what lend themselves to criticism of the value of self-study as a method of research for those who are not familiar with it.

To assist in developing a self-study methodology, Samaras describes five methodological components as (1) personal situated inquiry, (2) critical collaborative inquiry, (3) improved learning, (4) transparent and systemic research process and (5) knowledge generation and presentation (2010, p. 86). She notes that while they are listed numerically, there is an element of dependence and fluidity between these aspects.

Self-studies, while being personal in nature cannot effectively be done alone. Having someone, who Samaras refers to as a "critical friend", to collaborate with allows for probing questions which lead to a deeper understanding within the self-study research and provide support through the research process. This critical friend "is a trusted colleague who acts for clarification of your research and offers and alternative point of view in a constructive manner" (Samaras, 2010, p. 117).

As the literature suggests, self-studies are more than a personal reflection, which according to Loughran (2002) is thinking about a particular problem or notion; rather, they are a way to align teaching intentions with teaching actions (Loughran, 2007). The self-study methodology allows me as a researcher to critically evaluate the "status quo" of my teaching and to make informed changes to improve my practice.

3.2.1 Context of the study: The school setting

This study was conducted during a single section of Current Environmental Topics in Science at the grade 11 level during the first semester of the 2010/2011 school year. This course was chosen because of the environmental issues focus and because there is no prescribed curriculum content, allowing for more freedom regarding the specific learning outcomes, course structure and student assessment. The school where the course was taught is a technical vocational school which draws students for different reasons; central location, range of family incomes, ethnic backgrounds, support at home, English as additional language among others.

While the primary participant of the study is myself who also engages a critical friend in the data analysis, it is important to note that student demographics in the school/class is one of the influences/barriers in my intended and enacted practice. According to the school census data, there is an ethnically diverse population of students including First Nations, Métis, landed immigrants, refugees, first generation, or multi-generational Canadians. These factors can, but not always, present a challenge for the students that manifest as poor attendance and learning gaps. However they are also positive driving forces for some who want to improve their situation and seek opportunities that education will give them.

3.2.2 Context of the study: Putting the Self in self-study

As this is a self-study, it is also important to place myself in the context of the study. I discussed in section 1.2, Being a Teacher, that I have always had a deep personal connection to the environment and the natural world. It is this connection that led me to become an environmental educator. As such, early in my career as a teacher, I proposed

offering an environment-focused course as I felt there was a gap in the school's programming. My own experience as a teenager going to high school in a small, relatively isolated town surrounded by the boreal forest is vastly different than the experience the urban students who are enrolled in the course have had. This tension between my personal connection to nature and my professional situation is the source of influence, both supportive and inhibiting, for my teaching to have consequence on my students.

3.3 Research instruments

In my research I will be focusing on three phases of teaching a specific course. The first phase, which is addressed by Research Question 1, focuses on my preliminary planning and pre-delivery of the subject. Research Question 2 focuses on the actual delivery phase of the subject and Research Question 3 focuses on the post-delivery phase. These three phases align with Fullan's model for educational change discussed in section 2.4.3 and shown in figure 2.2. Table 3.1 presents a snapshot of my research questions and how they are aligned to the research design. The table includes a breakdown of how each research question will be answered taking into consideration both data sources and data analysis.

Table 3.1

Summary of research design based on research question, phase of teaching, data sources, data analysis and limitations/ethical issues.

Research Question	Phase of Teaching Sequence	Data Sources	Procedure for Data Analysis	Limitations & Ethical Issues
What informs a teacher's approach to planning and implementing a relevant and responsive environmental issues based course?	Pre-teaching considerations	Topic/Issue Task Rationale	Coding for Eisner's curricular orientations and Hodson's levels of sophistication	Ethical issues: conducting study on my own practice.
How does a teacher respond to and balance the interests of students with her own intentions when teaching an environmental issues based course?	In situ teaching considerations	Teacher and student journal responses Critical friend	Coding for responsive actions, change in plan, tensions etc.	Limitation: limited student journal responses
What could be done differently to provide more transformative opportunities students?	Post-teaching considerations	Teacher and student journal responses Critical friend	Critical reflection on results from previous questions Critical friend probing questions	Limitation: limited student journal responses

As a way to apply Hodson's (2003) levels of sophistication to answering the first question pertaining to what informs my teaching of the Environmental Topics course and for the purpose of this study, I have interpreted the levels into categories that are more applicable to the course content and the student demographics. His stance is that the levels of sophistication in curriculum are developed over time; however he states "students proceed to whatever level is appropriate to the topic at hand, the learning opportunities it presents and the stage of intellectual and emotional development of the students" (2003, p. 658). Since my students come from varying backgrounds and with previous knowledge, I cannot assume that they have all experienced the spiral nature of the Manitoba science curriculum and, therefore, must provide them with opportunities to work at the level of sophistication that is most appropriate for them within that topic and that context.

In terms of this study and the analysis of my data, Hodson's Level 1 addresses the impact humans have on the environment through their actions, science and technology. Activities and content directed towards society's impact on the environment would fall into this category and will be given the label "Impact".

I interpret Hodson's Level 2 as looking at society's decisions towards the environment that have vested interests without regard to other cultures or species within the global environment. Activities and content that address this idea will be given the label "Interests".

Level 3 suggests personal values and beliefs towards the environment. The original intention of the Environmental Topics course was to develop student understanding and values of current environmental issues. For an activity or content to

fall into this "Values" statement category, they would need to incite an "I feel", "I believe" and other verb responses that indicate what students may think or sense about the issue being discussed.

Finally, the last category based on level 4 is the one of taking "Action". For activities and content to fit into this category, I believe they must incite a genuine intention to take action.

With respect to the first research question: "What informs a teacher's approach to planning and implementing a relevant and responsive environmental issues based course?" I examined the activities, labs, assignments and other coursework I planned and implemented through the lens of Eisner's orientations of curriculum as described in the literature review in chapter 2 and Hodson's levels of sophistication as described above to see if I was able to provide all four levels to the students for each of the big ideas presented in class.

In order to address my second research question: "How does a teacher respond to and balance the interests of students with her own intentions when teaching an environmental issues based course?", I have looked through the rationale behind the lessons, and the teacher journal entries for trends in the data, signs of changes in planning, and if they were in response to tensions or disconnect experienced between teacher and student interest in the topic and what was done to address the tension.

To complete the cycle, my goal to look forward, through looking backwards in my third question; "What could be done differently to provide more transformative opportunities for students?" I have looked through the results of the first two questions. I have employed my critical friend to ask probing questions about my practice and to

critically evaluate the decisions I made during the teaching of the course with respect to my intended versus enacted curriculum. The role of critical friend was fulfilled by my thesis supervisor. His knowledge of self-study methodology, my research focus and personal experience with being a critical friend made him the most suitable candidate for the role.

3.4 Ethical considerations

The research for this self-study was cleared through the Education/Nursing Research Ethics Board at the University of Manitoba. Due to the nature of my own practice being the focus of the self-study, I did not have to solicit participants to conduct my research. I did, however, have to remain cognizant of what I have used as the data.

As per my practice of keeping students' assignments for at least one full study year, I still had these in my possession and have used the entries as part of my data collection and analysis. The three students whose journals were selected as samples in the data for this study were all over the age of majority, no longer students at the school and signed a free and informed consent letter allowing me to use their work as examples within my data. Their names have been changed to allow anonymity and all traces of their names have been removed from the sample work included in the data and analysis chapters. The students did not receive any compensation, either financially or in terms of marks or grades in the course.

3.5 Limitations of the study

One of the critiques of self-study, as a research methodology, is the inherent personal nature of the study and its limited value to other researchers or teachers.

Loughran (2007) notes that "(w)hen the researcher and the practitioner are one and the same, careful scrutiny of what is being done, how and why, become all the more important if the outcomes are to genuinely affect understandings of practice beyond the individual self" (p. 12). The research I have conducted is very specific and personal so it is not generalizable, nor is it reproducible. Action research studies, narratives, and self-study, in particular, are very difficult to transfer to another situation – what works for one researcher-practitioner, may not work for another, the fifth foci of self-study methodology (Samaras, 2010). However, knowledge generation and presentation mandates sharing the experiences and learning from other researcher-practitioners, and this process, in itself, draws attention to the potential for the applicability of the research beyond the self (Loughran, 2007).

There is the element of subjectivity to self-study, because the researcher and the participant are the same person. Since I am looking at what I have done in the past, I have addressed the concern about the "interplay between research and practice within the practice setting" (Loughran, 2007) by the fact that I did not conduct the research on my practice while I was in the process of teaching the course, so I was less likely to adapt and change what I was doing to meet the needs of my research questions.

Another critique of self-study outlined by Loughran (2007) is that the data collection process is critical in ensuring that the researcher-practitioner remains objective in their analysis. Since I am using my course planning documents, timelines, my own teaching journal, and student journals as my data collection, analysis and evidence, there is a certain element of bias that may come in to play. I have addressed this limitation by using course content from previous years, as I would not be able to adjust and shift my

plan to meet the research questions. Additionally, the critical friend provides an outside perspective to the research as he was not directly involved in the planning, teaching and implementation phases of the course.

3.6 Summary

In this chapter, I have outlined the intent of the study and the methodology by which the questions will be answered. I introduced the research design and discussed the tools that I used to analyze the data I collected during the implementation of the course I have taught. I have also talked about the ethical considerations and limitations of conducting research on one's own practice. The following chapter presents the data I collected during and after the implementation of one Current Environmental Topics in Science class.

Chapter 4 - Data

4.1 Introduction

In Chapter 3, I presented the methodology for the research, which described the research that occurred in Current Environmental Topics in Science (CTSE3S) over the first semester of the 2010/2011 academic school year. I also detailed the research questions and how the questions would be answered using a self-study approach. In this chapter I provide a description of the research in detail. Specifically, I provide a description of the lesson sequence over the course focusing on the major foci or "big ideas" of the lesson sequence; a justification for my lesson approach; samples of student work as a result of the teaching; and commentary from my personal teaching journal that arose in response to the teaching. This timeline of big idea, lesson synopsis, teacher and student journal entries will be used as the data for answering the research questions regarding my planning a relevant and responsive course for students.

Rather than presenting the course lesson by lesson, as there were 88 teaching days in the semester, I have combined them into the big ideas (themes and chunks) to make them easier for the reader to follow and to assist in reducing the complexity of the analysis. I have chosen to present the data in a chronological format to provide the reader with a sense of how the course was taught so as to see the progression of ideas and messages presented, and, subsequently the responses to what I was doing (both from the teacher and the students).

It is noteworthy that the manner in which the lesson sequence and ensuing data in terms of student and teacher response are presented is rather unorthodox. The focus of the self-study is a systematic inquiry involving an analysis of my teaching, the results of my

teaching and reflection of the teaching. The lesson descriptions, the teacher response and student responses have been combined because of the nature of a self-study methodology where all three of these components - the (1) teaching, (2) results from teaching and (3) reflection on the teaching, are all data or results and need to be presented as action units rather than separate acts. For this reason, this chapter presents these three components across the subject. It is also important to note, that these components are from that time; that is they are *in situ* accounts of my teaching. They cannot and were not modified for this thesis, which, as will be shown, causes me considerable concern and, ultimately, provides the impetus for change. As stated earlier, the self-study methodology allows me to critically evaluate the "status quo" of my teaching and to make informed changes to improve my practice (Loughran, 2007). This chapter, in its rawest form as data, is my status quo.

4.2 Data organization

As mentioned, the subject sequence for the Current Environmental Topics in Science (CTSE3S) is presented as a chronology starting from the beginning of the subject until its completion. The data are organized into (1) big idea, (2) synopsis of lessons, (3) teacher journal entry and (4) student journal entry. As it would suggest, the "big idea" is the message or the topic that was identified either by the students or myself as topic or issue to be taught during the course. When teaching CTSE3S, before and after that academic year, I did not plan too far ahead in terms of content and activities. I set out to have a big idea to teach every week that would build on the previous topic, that would start with a discrepant event or cause an element of cognitive disequilibrium, then have a series of activities for students to learn about that idea and synthesize their own thoughts

on the topic into a personal journal entry. I tried to plan activities that students would enjoy and that would hopefully make them think beyond the basic understanding of an environmental issue. Each lesson synopsis is organized into "big idea" (topic/message), "what I did" (lesson/activity), "why I did what I did" (rationale). After each lesson synopsis, I have included the "teacher journal entry" as a reflection of the lessons' delivery. These responses were written either immediately after the class or as a summary of the week's lessons when the students were writing their own journal responses. The final piece of data for each lesson is the students' work identified with the heading "Student activity/journal response". As mentioned in the methodology, I have selected three specific student journals to use in my data. These students' journals were selected for a variety of reasons including their academic performance in other courses, their vocational interests, and their willingness to give consent to use their work as samples in this study. Claire was a strong student academically, and was enrolled in other science courses but no vocational courses. She was an immigrant to Canada, moving here when she was 8 years old from Eastern Europe. Roger was a student who was enrolled in an alternative program for his academic courses, was in a vocation, and was often suspended from school for non-compliance. Jamie was a student who was weaker academically; he often required additional support in his writing, and tasks sometimes needed to be broken into smaller instructional components. He was enrolled in a vocational program and based on the course marks, he was demonstrating success within that program.

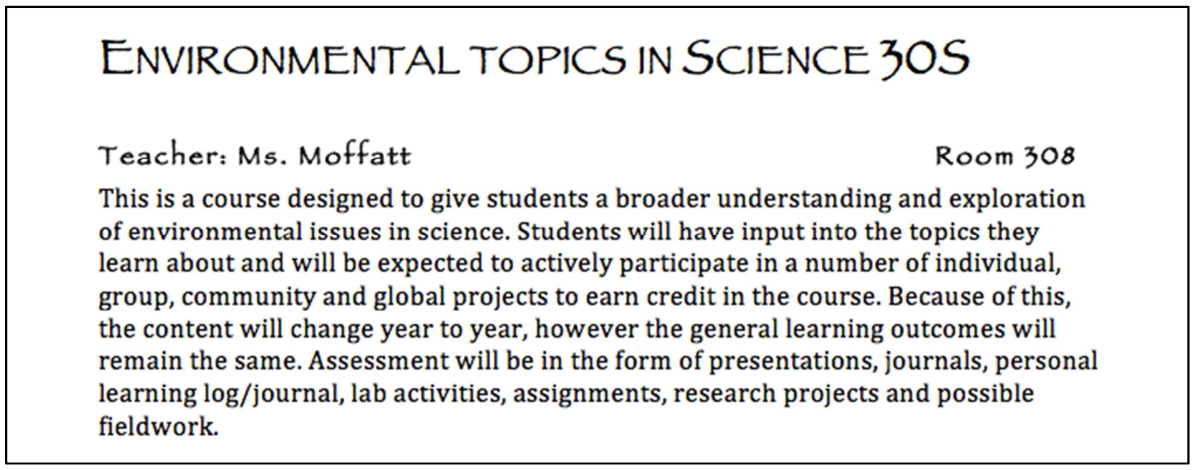
In the data sequence, I have included samples of student responses for journal entries relating to the big idea or topic that will be used for the analysis in the next chapter. In order to keep this data chapter at a reasonable length, in the cases where I

have only included one sample, the other students' responses have been included in Appendix C. Additionally, a complete list of the journal entry questions provided to the students is listed in Appendix D.

4.3 Data and results

I start this data section by presenting a portion of my course outline from 2010/2101, drawing attention to what, at that time, I was articulating in text, to students as the curriculum intended. As well, I provide a statement of reflection on my rationale for creating a statement with such a learning intent.

At the beginning of the 2010/2011 school year, my intention for the CTSE3S course was to provide students the opportunity to explore the environmental issues they were interested in. I envisioned a course where students were learning about topics and relating to them on an individual, school/community and global scale with the altruistic goal of the students becoming advocates for an issue they had a passion for. When planning the lessons, I aimed to begin each of the big ideas with a question or situation that would cause a disequilibrium for the students, provide the students with the learning opportunities to make their own sense of the idea/issue and record their new thoughts in their learning journal.


ENVIRONMENTAL TOPICS IN SCIENCE 30S

Teacher: Ms. Moffatt Room 308

This is a course designed to give students a broader understanding and exploration of environmental issues in science. Students will have input into the topics they learn about and will be expected to actively participate in a number of individual, group, community and global projects to earn credit in the course. Because of this, the content will change year to year, however the general learning outcomes will remain the same. Assessment will be in the form of presentations, journals, personal learning log/journal, lab activities, assignments, research projects and possible fieldwork.

Figure 4.1. 2010/11 CTSE3S Course Description. This figure shows the brief overview of the course content provided to students on the first day of classes.

Figure 4.1 is the brief course description presented to the students on the first day of the course (the complete course outline is located in Appendix A).

On a personal level, my primary goal for the course was to provide students with opportunities and guidance to take action on issues they had a passion for while meeting the learning outcomes set by Manitoba Citizenship and Youth (complete list of specific learning outcomes is located in Appendix B) and preparing them for future courses.

4.3.1 BIG IDEA #1: Intro activities

Lesson 1: Message/Topic: Course outline/outcomes/expectations
Lesson 2: Message/Topic: What do students think?
Lesson 3: Message/Topic: Student values towards nature, environment and sustainability

WHAT I DID:

I spent the first three lessons of the course getting to know the students, acquainting them with the format of the course, and what they can expect. I provided tasks that allowed me to find out their attitudes towards science (Fraser, 1981), their beliefs about the environment and their knowledge of current environmental issues.

WHY I DID WHAT I DID:

The primary goal for these lessons was to get an idea of where the students were in terms of their thinking about, feelings towards and general knowledge of environmental issues.

I wanted to have an idea of where students were in terms of their attitudes towards science and sustainability. The intention of doing this survey was to collect a baseline of where students were in terms of science related attitudes.

The introduction questions were intended to get students thinking about their values and what they think of the three terms. Activities like this one show me which of the students were more likely to participate in class discussions and who were the withdrawn and reserved students. I hoped that having a discussion about these words would open up the expectations of being involved in the class discussions and that no idea is a bad idea, that everyone has an opinion, even if it is not the same as yours. I wanted to foster an environment of acceptance and non-judgement when it comes to expressing thoughts to the class.

Teacher journal entry:

The goal of this week was to get students oriented to the course. It looks like this will be a pretty good group of students. There are currently 17 registered, though I suspect that one or two may not stay with the course based on what they wrote in their journals (one specifically stated that he is going to drop it). I also suspect that there will be some students who join the course late. I have spoken with one who wants to have her timetable changed to join the course.

The students seem pretty receptive to the ideas of the course. There are 3 who will be the dominant chatterers and discussers in the class and another 4 that will be hard to get them to discuss in the larger group setting. I am looking forward to teaching this group.

Once the students had answered the questions in their journals, I had them write one to three words on a sticky for each of the main ideas and then place them on a large poster paper. It is interesting to see how few know what the term sustainable means.

Sample journal responses:

1. What does "nature" mean to me?

Claire: To me, nature is our planet itself. Nature is all of living and non-living things on Earth. Nature is the beauty of our world.
Roger: Nature to me is anything that's not man-made.
Jamie: To me nature mean [sic] all living things in the wilderness.

2. What does "environment" mean to me?

Claire: Environment is the place we live. Environment is the nature around us.
Roger: To me its anywhere in the world that can support life of any sort.
Jamie: To me environments means the world and everything in it.

3. What does "sustainable" mean to me?

Claire: [left blank]
Roger: To me sustainable means maintaining the balance in the circle of life.
Jamie: To me sustainable is something that has been around for a long time and continue to last for a long time.

4.3.2 BIG IDEA #2: Identifying environmental issues.

Lesson 4: Message/Topic: Sustainability: Ecospherotron
Lessons 5 & 6: Message/Topic: Introduction to global scale environmental issues
Lesson 7: Message/Topic: Topics/Issues to focus on
Lesson 8: Message/Topic: Journal Entry.

WHAT I DID:

I asked students to divide into groups and each got a copy of the "miracle" image from the "ecosphereotron" (E-Tron) activity (Sea to Sky Outdoor School, 2000). We explored the idea of sustainability through the images.

Before watching *The 11th Hour* (Conners & Peterson 2008), I gave students a sheet of points to think about and note while watching the documentary. We had a class discussion about the issues presented. I guided the discussion to include local, national and global issues - that touched on more than just destruction of the environment. I asked students to identify their top three issues and put them up on the SMARTboard in a mind-map. I posted the journal question "*In your opinion, what is the most pressing issue facing the planet?"* on the SMARTboard for students to answer.

WHY I DID WHAT I DID:

I was first exposed to the Ecospherotron images at a conference in the spring of 2010. The intention behind this activity is to get students to think about the impact humans have on the planet and the connections we have with other species. I wanted to draw out some of their previous knowledge about environmental issues and concerns. The last stage of the activity asking them to put the images in order was to see if they were generally pessimists or optimists for the future. Since this was the first "group" activity, it gave me a chance to see who were the leaders, who were the loners, who were the dominant voices and who were the silent ones.

I wanted students to have an idea of the different concerns/issues the planet is facing. *The 11th hour* is a decent video to use as an introduction. I chose a video rather than a lecture, discussion or brainstorming activity as there is still a lot of shuffling around of student timetables, and this is an easy thing for those who were late joining the class to get caught up on.

I wanted to draw some themes/issues out of the students for what they may be interested in learning about. While I could have predicted what they would come up with as the top three, I wanted them to come up with them as a class. The intention was that they would take ownership of what they were learning if they were the ones to choose the topics. The goal of the journal question was to pull out what the students have taken out of the last couple of classes - either from the discussions or the video or both.

Teacher journal entry:

The E-Tron activity went well. The students were pretty observant of the differences between all the images. The group with the more vocal and opinionated students dominated the discussion at the end, the non-joiner group mostly copied down what I put up on the board. When I was

walking around checking on them, they had a few things written for the images, but not a lot. I encouraged them to look and write down anything they saw, and reminded them that this course isn't just about what they can memorize and regurgitate from what I tell them, but how they can apply what they know and what they think about the topics. They can expect to get out of the course what they put into it. Time will tell.

Watching *The 11th Hour* is both a blessing and a curse. The video has some really good ideas of what is happening to the planet, however students seem to tune out partway through. I am not sure if it is because it seems so doom and gloom or if they get bored watching it, even though they have guiding questions to answer while they watch it. I hope that we can get some good discussion about what topics they want to study from it.

The discussion about 3 topics they want to know more about was interesting. Again, the students who are more involved are dominating the topics. I made a point of asking all the students in class about what they want to study - even looking at their paper when I knew that they are shy and didn't want to share publicly. I will have to be mindful of not putting them on the spot all the time, but also try to draw them out of their shell - little by little.

This week was a bit of a challenge. As I suspected, two students have dropped the course, no hard feelings. And there have been another three added. Two of them have joined the class because they *want* to take the course; the other was told by his guidance counsellor that it would be a good course for him. I don't think he will stick it out. What seems like a revolving door is difficult to deal with, as I want new students to complete the TOSRA and the 3 intro journal questions, but I also don't want them to miss what we are currently doing.

Student activity/ journal response:

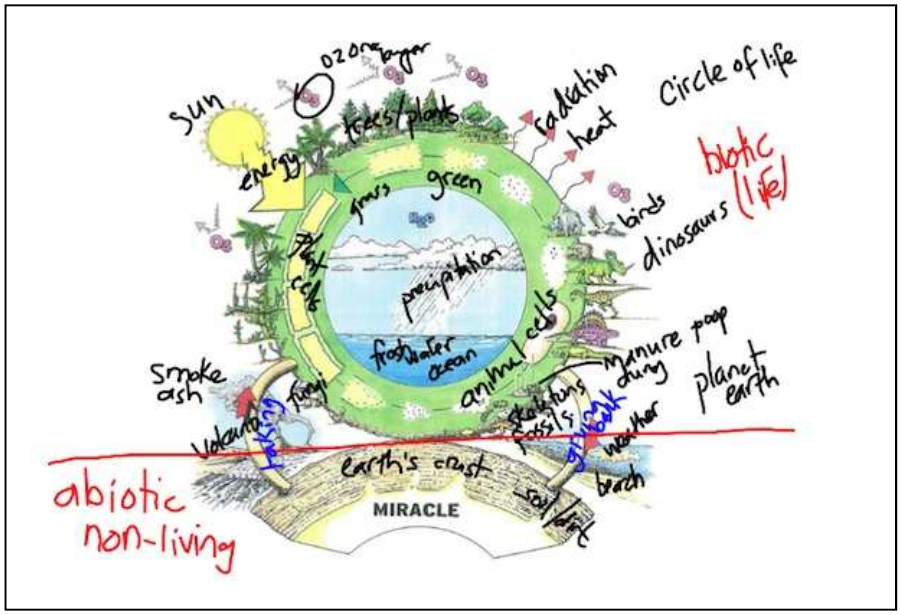
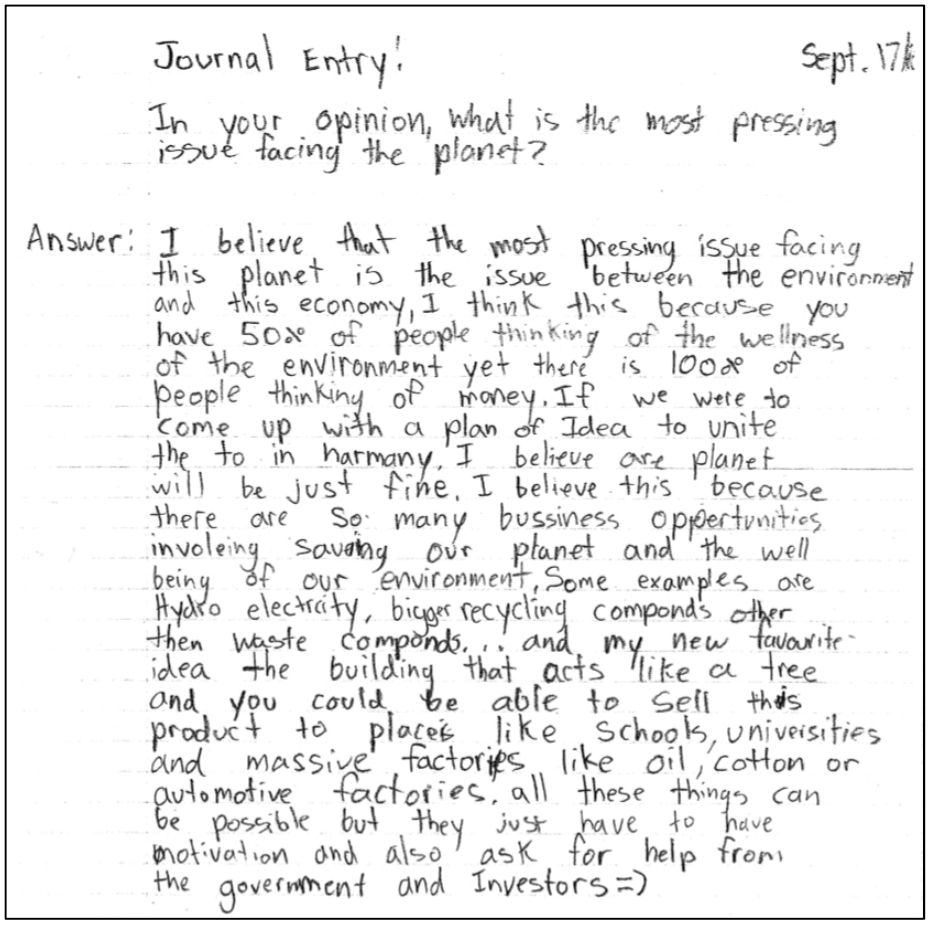


Figure 4.2. Ecospherotron: Miracle. This figure is an example of collective student reponses to the E-tron image "miracle"


Journal Entry! Sept. 17th

In your opinion, what is the most pressing issue facing the planet?

Answer: I believe that the most pressing issue facing this planet is the issue between the environment and this economy, I think this because you have 50% of people thinking of the wellness of the environment yet there is 100% of people thinking of money. If we were to come up with a plan or Idea to unite the to in harmany, I believe are planet will be just fine. I believe this because there are so many bussiness opperturnities involeing saving our planet and the well being of our environment, Some examples are Hydro electricity, bigger recycling componds other then waste componds, .. and my new favourite idea the building that acts like a tree and you could be able to sell this product to places like schools, univerisities and massive factories like oil, cotton or automotive factories, all these things can be possible but they just have to have motivation and also ask for help from the government and Investors =)

*Figure 4.*3. Student Journal Response. This figure shows Jamie's response to the pressing issues entry.

4.3.3 BIG IDEA #3: Personal choices have an impact

Lesson 9: Message/Topic: Right or wrong, choices
Lesson 10 & 11: Message/Topic: Yes, but - computer lab
Lesson 12: Message/Topic: Present to group
Lesson 13: Message/Topic: Journal entry.

WHAT I DID:

I placed a series of items on the tables in the classroom (mugs; "to go", ceramic, "compostable" and a Tim Horton's cup; grocery bags; plastic, compostable, homemade cloth and purchased reusable). I lead a discussion with students about which ones were the environmentally friendly choice and why. When students would identify an item as

being the environmentally friendly choice, I would counter it with possible background to why it may not be that environmentally friendly after all. We discussed the idea of "green washing" and the importance of evaluating the idea of "Reduce. Reuse. Recycle." By adding "Rethink."

I introduced the idea of there always being two sides to an issue, and showed them some examples from the book *Green's not always black and white* (Murren, 2009). I ran through the list of items in the book and had students select one that they were interested in knowing more about. I made a copy of their chosen product or activity from the book for the "Yes…but…" assignment.

I provided guidance and conversation about the items they selected to research. I chatted with them about *why* it may be hard to find the "other side" to the choices. In many cases I helped them re-frame their search questions to maybe find more information.

I rearranged the tables in my room from rows to a "boardroom" style for this class to provide a better set up for discussing their products.

Students responded to the journal entry question "*Are you likely to make informed choices regarding environmentally friendly products? Why or Why not?"*.

WHY I DID WHAT I DID:

I wanted the students to think about how what we often see as being the "right" choice, may not actually be the "best" choice. The intention was for them to think beyond the "I put my bottle in the recycling bin, so I am recycling" and look at if they were completing the cycle part of recycle. It is was also important for me that they understand that there were 3 other "R"s they could consider before "Recycle" and that putting something into the blue bin is not the only thing they can do. When I would present the counter argument for their choices between the objects I had on display, they were getting frustrated with me, I wanted to take advantage of that disconnect they were experiencing as a launching point for the rest of the course. I told them that if there was only one thing they learned from this course, it was: to question everything that they were being told and think about the choices they make.

I knew that the students would likely have a hard time finding information for both sides of their product/activity, which was partly the intention of this assignment. I wanted the students to experience the frustration of not finding answers to what they were looking for so that they could think about what kinds of questions they need to ask that will get the information they may need. But also to be able to discuss with them the validity of the information they were finding on the internet, and what might be some of the reasons they were finding more information for one side than the other.

The purpose of arranging the tables into a boardroom set up was to take some of the pressure off having to "present" to the class. Many students have a fear of presenting, so setting up this way made it more of a seminar format. I wanted them to feel less pressure

if it was set up this way, but also hold each other accountable when they were not the ones speaking.

The intention of the journal question was to see if students felt they would put more thought into their purchases. Since many students finished quickly, and others were still writing, I felt the need to prompt the students to put more effort into their responses. It was still early in the course; I wanted to foster the understanding that "good enough" was not actually good enough.

Teacher journal entry:

The informal presentations went OK. We pushed the tables together to make it more like a boardroom, and less like a classroom, so they didn't have to stand up to present. Again, the students who are more outspoken had no problem talking about their topic to the class. None of the students brought in visuals (either photos, print outs or the real thing). Attendance wasn't very good today, which may have to do with the presentations, or not. I will have to take a look at the daily to see if students were sick only for this class.

The journal entry today took anywhere from 5 to 20 min for students to answer. I asked those who finished quickly to show me their answers. I asked them a few more questions about their answer to get them to go a little deeper. A few did. Others were happy with what they had and did not add anything. The last part of the class was spent mapping out the next part of the course. Students seem ok - or indifferent - to the plan that I came up with.

4.3.4 BIG IDEA #4: Healthy water

Lesson 14: Message/Topic: Poison Pump - from ProjectWET
Lesson 15: Message/Topic: Poison Pump journal entry
Lesson 16: Message/Topic: Waterborne diseases, jigsaw, poster gallery
Lesson 17: Message/Topic: Collect info on three other waterborne diseases

WHAT I DID:
The students picked water quality as one of the issues they wanted to learn about. I had students divide up into 6 groups, no one was allowed to work independently for this activity, so I had to force encourage some very students to join with others. I reminded them that this is a welcoming class and that group work is an expectation. I introduced the activity "Poison Pump" (Watercourse, 1995), without using the title, by setting the "scene" as being in London in 1948.

I asked the students if they were familiar with any waterborne diseases. I presented some information about the causes of different types of waterborne diseases to the class by defining parasite, bacteria and protist. I provided the class with a series of fact sheets on common waterborne diseases to choose from and create a larger poster with specific information. I gave each student a summary table to record information about at least two other diseases from the other students.

WHY I DID WHAT I DID:

The intention of the "Poison Pump" activity was to introduce the students to looking for patterns and commonalities in data/information they were presented with. I also wanted them to use some problem solving skills and logic to reason a conclusion based on what information they have. The activity is geared to slightly younger students, so I had to modify it a little for their age group. I presented the clues to them as though they were health officials being presented with "new cases" coming across their desks. I gave them the information selectively, and intentionally gave the cards out in different order to the groups so they wouldn't all figure it out at the same time.

I wanted the students to write out the process they took to logically solve the cholera outbreak mystery from the day before. The class was shortened because of early dismissal, so all the start and end times of classes were off the normal schedule. Many students were late for class because it did not start at a normal time. The journal entry was a practical way for students who arrived late to still be able to participate in class.

Instead of lecturing the class with information about different waterborne diseases, I wanted the students to become "experts" in one disease and collectively teach each other about the others in a jig-saw format. I pre-selected diseases for them to study as I did not want them to spend too much time lost in the Internet trying to find a disease to research. I specifically chose ones that have either been prevalent in Canada or have super interesting or gross symptoms. I wanted the students to see the commonalities and differences between the different diseases they were looking at. Initially I was going to have the students present their findings to the class as though they were a panel of experts presenting to each other, however not everyone had completed their poster and it was a shortened class. I decided to do the gallery walk style instead as it allowed those who were finished to get more information, and those who were not yet finished had more time to complete theirs. I informed them that I would leave the posters up for at least a week and that they would be responsible for filling in the information from other students' posters on their own time.

Teacher journal entry:

The first main topic that we will be looking at is water quality. The Poison Pump activity from ProjectWET went over ok. It is a pretty easy activity for grade 11 students, I am wondering if there is a way that I can make it more advanced for older students. Something to think about for next time. I was more interested in what the group dynamics were like, it was interesting to see who took over the leadership in some of the groups. There are some leaders within the smaller setting that I wasn't expecting.

The waterborne diseases jigsaw is going to work well for those who are taking it seriously and are here. Today's attendance (the 29th) is not all that great. There are 6 students missing (of 17) who are normally here, so when it comes to the poster gallery tomorrow, there won't be many to choose from for getting the other information filled in. I may have to adapt the plan for those who aren't here today.

The students who missed yesterday (29th) have been assigned the disease info and poster as homework. I am not optimistic that they will all get it done. I will be leaving the posters up around the room for next week so those who missed the class, or were a class behind, will be able

to get the other information. Interestingly, some of the students in my other classes have been looking at the disease information and have been asking questions about them.

4.3.5 BIG IDEA #5: How safe is our drinking water?

Lesson 18: Message/Topic: Toxic Water: The Kashechewan Story.
Lesson 19: Message/Topic: Deadly Water: The Lessons of Walkerton
Lesson 20: Message/Topic : Local pollution, global confusion part 1
Lesson 21: Message/Topic : Local pollution, global confusion part 2
Lesson 22: Message/Topic: Local pollution, global confusion - Filter the water
Lesson 23: Message/Topic: SDWF water quality test
Lesson 24: Message/Topic: SDWF water quality test - follow up questions
Lesson 25 & 26: Message/Topic: Drinking water treatment - article questions

WHAT I DID:
I placed several bottles filled with water from different sources, including the tap, the Assiniboine River, well water from outside the city, the classroom's fish tank and the water fountain, on the front table to open a discussion about which they would drink from and what does it mean to have safe drinking water and does everyone on the planet have access? How about Canada? We discussed where Winnipeg's drinking water comes from. I gave students a handout to complete with watching the CBC News in Review episode called *Toxic Water: The Kashechewan Story* (CBC News, 2005).

I had to leave a plan for a sub; they were to hand out the guiding questions for the next video, without presenting any information about the *Deadly Water: The Lessons of Walkerton* video prior to starting the video.

I read a story from a Green Teacher article: "Water: Local Pollution, Global Confusion!" (Tetrault, 2009) that mentions the different types of pollution that go into the Red River. I led the students through a discussion about the international nature of waterways, and that what goes into water in one location may travel downstream and impact other systems. I had students pick a country from a beaker resulting in random pairings. Each country received a fact sheet to collect information for the next part of the activity where they would build a water filter.

I acted as the UN to provide supplies to the students as they worked through the activity. I was available to provide them with help - either by me as the UN or indirectly by recommending another country that may be able to help them.

I projected a series of questions on the SMARTboard for the students to answer with their partners and put together with the country fact sheet and their left over world cash in the envelopes with their filters when they had finished assembling them.

To test their filters, the students used a set amount of water that I collected from the Assiniboine River. Once students had finished pouring their water into the filters, a

teacher candidate in my classes showed them two videos about the Ganges River and led a discussion about different cultural uses, views and relationships to waterways - *On the Ganges River* (Kaaola, 2009) and *Ganges River-Pollution* (Sadler, 2007).

I had the students divide into groups of their choosing. Each group received a "lab book" that included all the instructions for the different parts of the lab, and a lab kit from the Safe Drinking Water Foundation (SDWF, 2009). In preparation for the tests I collected water from the Assiniboine River, a sink in my classroom, a small town north of the city, a friend's treated rural well water and his untreated well water to go with the provided "pure" water. I explained to the class that this was the first time that I have used these kits, so we would have to go through them all step by step and see what happens and that I *may* be able to trouble shoot if they did not work out as we expected.

I provided students with different articles about Winnipeg's water treatment processes. I distributed them to students based on the length and complexity of information. The articles were from the City of Winnipeg water treatment plant, and the CBC website.

WHY I DID WHAT I DID:

I started the big idea of safe drinking water by presenting the different bottles of water as a visual and with the hope that the students would think a little more about how fortunate Winnipeg is to have clean water.

In the discussion about Kashechewan, one student said that water quality would never be an issue in a city because we have water treatment plants. I wanted to discuss Walkerton, but did not have good background knowledge myself, so I decided to use the CBC news clip as a way to present the information. Since I was going to be away, this video seemed like a good follow up to the previous class's discussion.

The intention of sharing the story from Green Teacher about who polluted the water was to reinforce the idea that everything we do may not have visible impacts locally or immediately, but can have an impact we may not be able to see. Getting the students to work in pairs for the second part of the activity was because the activity is limited to only 8 countries. The activity is designed such that some students had a difficult time deciphering the minimal instructions provided for their country.

The intention of this activity is to tie the economy, environment and society together into a global sustainable development activity. I wanted the students to filter water that could realistically be used as drinking water rather than the artificially polluted water from the story. When discussing the activity with my teacher candidate, she mentioned the videos on the Ganges River, so we incorporated them as follow-up.

The SDWF kits have been sitting a room between my classroom and the next one for a few years. I figured this would be as good a time as any to use them. I intentionally did not try out the labs before doing them with the students, as I wanted them to experience the problem solving that goes into a lab that does not work out the way one might expect it to. In science classes we often have students complete labs that we know will give the

results we want to reinforce or introduce a concept. In this case, because some of the kits were older and some of the materials needed were past their best (or use) before dates, I really did not know if they will get the results one would expect. I wanted the students to test their water that was filtered through the water filters, however we did not have enough of the test materials left over from the kits.

I wanted the students to have individual responses to the questions in their journals to ensure that all of the students were able demonstrate what they may have learned from the activity. As I made my rounds through the groups, the same students would answer my questions and it seemed that there were some that did not really seem to be participating.

It was important for me to bring all of the drinking water concepts (waterborne diseases, drinking water treatment, and safe drinking water for everyone) back to a local perspective for the students by learning about the process for treating drinking water in the City of Winnipeg (and other major centres with water treatment facilities). I also wanted students to practice getting information from written text, making sense of it and synthesizing it into responses to questions.

Teacher journal entry:

The intention of this week's topic is to look at drinking water safety within Canada. There is often a sense of security when it comes to our water because Winnipeg has been fortunate enough to have good quality water. The CBC in the News clips are short, so the students are able to focus on them. It is interesting to see the physical responses of the students to some of the parts of the stories. We had a quick discussion about boil water advisories in Manitoba and how they are determined. When I asked the class if any of them have been under a BWA, one of the students had to boil water in his home community. When he shared the story, it brought the issue a little closer to home for the other students.

In preparation for the drinking water analysis next week, I wanted the students to have an idea of water quality and access to safe, clean drinking water. I went through the "who polluted the Red River" story from an article in Green Teacher that I used with the grade 10 classes, including going through the process of "polluting" the water again. Students were paired up randomly by selecting a country from a beaker. They spent some time in the computer lab collecting some basic information about their new country - demographics, official language, socio-economic status etc. in preparation for making a filter for the polluted water (also an activity in the same Green Teacher issue).

Today class was spent building the filters. Each country received some money, a set of instructions and some other basic information. The amount of money they got was relative to their global economic status, the instructions had varying levels of English depending on their literacy rates etc. They were allowed to interact with the other countries to form partnerships etc., but they needed to be realistic (Afghanistan was not likely going to be helped by the US, but maybe Canada would help). I acted as the "UN" or the "World Bank" and they had to come to me for supplies, better instructions etc.

It was interesting to see how some of the students really took on the roles of their countries while others didn't really get into it at all. One student opted to sit out and not participate. I have given him a textbook assignment to do instead. I have seen him sneaking peaks at what the rest of the

students are doing, but has not completed any of the work I have assigned him. The students who pulled the US were very pushy and demanding money in exchange for help. The students who were representing Canada built their own very quickly then went to help Ghana, then Sudan. It was also interesting to see some of the students going on espionage expeditions and trying to sneak a peek at what other countries were doing.

The original activity has students filter the water that was "polluted" in the "who polluted the red river" activity. I have given them actual water from the Assiniboine River instead - taken from the same place that we will be using for the testing next week. I must remember to have them test the water they have filtered as well next week to see if there was any improvement in its "quality" after going through their filters.

I am glad I decided to show the YouTube videos of the Ganges. It is interesting to see how the students respond to the different images in the videos of the dead animals floating in the water then cutting to someone taking a drink out of it. One of the videos also talked about the waterborne diseases in the water, which was a bonus tie in to what we did previously.

This is the first time I have used the Safe Drinking Water Foundation kits. They have been sitting in the back of my room for a few years. Some of the test materials they supply are past their "best before" or "use by" dates, so we discussed how accurate and reliable the results may be (interestingly, some of the strips in the kit that was sent this year are past due, so I'm not sure what that says about them either). We discussed the importance of keeping tools clean to prevent cross contamination and false positive results. Again, I am surprised at how a couple of the students are really taking charge of their group to keep them on task and following the procedure. I have been upfront about them being guinea pigs for this activity and mostly hands off as the instructions are very clear and easy to follow. Since I haven't used this kit before, I am learning it with them, so I want them to go through it and ask questions when they get stuck. I told them that this is for me to figure out where the tricky spots are for students who haven't done sampling and testing before. So far so good. I am surprised at how many of them are not familiar with how to properly record data into a table - or how to set one up.

The students who attend regularly were pretty engaged in the activity. I think I would do it again. There are a couple of things I would change in the format of the instructions/follow up questions to be a little more insightful for the students, and to get them thinking about their own water. It would be nice to be able to get some water from a more remote community for them to test.

I wasn't sure where to go with this information now that they have done the SDWF testing. It would have been nice to go on a field trip to our water treatment plant, but I didn't have enough forethought to plan it. Instead, I have given students a series of different articles on how drinking water is treated. They have an article analysis to complete and a series of questions including writing a story or comic of a water molecule being treated. Some of the students who aren't very creative are having a really hard time with the story.

4.3.6 BIG IDEA #6: Aquatic ecology

Lesson 27: Message/Topic: Definitions - 3 point approach
Lesson 28: Message/Topic: Definitions - concept overview
Lesson 29: Message/Topic: Reading on Eutrophication
Lesson 30: Message/Topic: Aquatic ecology - pond water study/ Terraqua column

WHAT I DID:

I provided students with a list of terms that I would be using. Once the students had some time to collect the definitions from the glossary of the environmental science text books in the classroom, I placed pieces of paper with each of the terms written on them and put them in a large beaker for the students to select from. I handed out premade copies of a concept overview sheet for the students to fill in on their own once they had selected a term from the beaker.

I gave a section of a textbook chapter on eutrophication to the students who were done filling in their concept overview to read with some questions to answer.

I instructed students to partner up with someone they had not worked with. I provided students with instructions for creating a "terraqua" column from *Bottle Biology* (Ingram, 1993). I asked each partner what type of nutrient treatment they wanted to use, from a list of suggestions or an idea of their own, as a treatment for their column.

WHY I DID WHAT I DID:

I decided to give the students a list of terms to get definitions for to be familiar with before I started using them. The idea was for them to have some pre-teaching exposure to the terminology they would be encountering when learning about aquatic systems. I wanted the students to take one of the terms listed to create the overview, but I did not want them all to choose the same term, so I had them randomly draw their terms from the beaker. The idea was to post the overviews around the room for future reference as a gallery walk.

The section of the chapter I gave was about eutrophication. It had a short inset story about the Experimental Lakes area. I wanted the students to have some pre-exposure beyond the definitions. The intention of this work was for them to read the given text with a purpose. The questions were to guide them in the reading.

To connect with the topic of eutrophication, and to move to some "doing" science by building the terraqua columns and decide on what they would use as a nutrient treatment in the aquatic part to create eutrophic environment to see what differences (if any) there was in the growth of either the aquatic or terrestrial plants. I had the students work with a partner for two reasons - the main one was that I did not have enough materials for everyone to make their own. The second reason was because they had been working on their own for most of the week, so I wanted them to have the chance to socialize and work together.

Teacher journal entry:

The plan for this week was to introduce the students to aquatic ecology. I would like to get them thinking about the impacts our choices and actions have on our water systems. I have a few ideas for where to go with this, but I will let the students decide what path they want to take. Ideally, I would like them to head to Omand's Creek to take some water samples, but I don't think we will be able to get it in before the snow falls. I have given the students a "definitions" assignment for them to get some exposure to the vocabulary they are going to encounter. I am not entirely certain

how effective these assignments actually are, other than to give me some time to figure out what we are going to do next.

The creek water/terraqua column activity was a good thing to do on the day before a long weekend. It's too bad that we weren't able to go collect the water as a class. In the future, it would be nice to have the students collect the water and then look at what they caught to use in the columns.

For SAG I attended a session on interdisciplinary topics in science 40S regarding Lake Winnipeg. It was good, but not entirely what I was expecting. Oh, who am I kidding, I didn't really know what to expect from the session. There is some really good stuff that other teachers are doing re Lake Winnipeg. I would like to do more on this topic, however the challenge I am finding is that students don't seem invested in it. I wonder if heading out there for the day would be a worthwhile trip - would it be best to go within the first couple of weeks of the course as "inspiration" or towards the end as a wrap up. I guess it would depend on which semester the course is being held. If it's first semester, then we would have to go towards the beginning - second would have to be more towards the end. Something to think about.

Student activity/journal response:

Figure 4.4. Terraqua Columns. This figure is a photograph of the student columns at the end of the course.

4.3.7 BIG IDEA #7: Water systems

Lesson 31: Message/Topic: Notes on taking notes; Bill Nye Wetlands
Lesson 32: Message/Topic: Bill Nye Rivers and Streams; Bill Nye Oceans
Lesson 33: Message/Topic: Bill Nye Lakes and Ponds
Lesson 34: Message/Topic: Planet Earth: Fresh water
Lesson 35: Message/Topic: Journal Entry.

WHAT I DID:

I gave a lecture style lesson on tips for taking notes from audio and video sources. After the lesson, I played a *Bill Nye the Science Guy* episode for the students to take notes from, while I also took notes on the overhead while the video was playing. After the video, we compared the notes I took with theirs and talked about what they missed, what information was important and how to figure out what is critical to get down onto paper.

I gave the students the option of reading up on different wetland types or watching the Bill Nye episodes on them and taking notes about them as they went. The majority of the class voted the Bill Nye option. We watched a Bill Nye marathon of all the water systems related episodes.

I showed them the BBC's *Planet Earth* episode about freshwater (Fothergill, 2007). I handed out guiding points for them to focus their note taking.

WHY I DID WHAT I DID:

I had two goals for this week. The first one was that I wanted to start weaning the students off of only copying down everything that a teacher puts up on the overhead/SMARTboard and start to develop the skill of taking their own notes. I chose Bill Nye as the "practice" because it is pretty simple to follow and easy to take notes on.

The second goal was that I wanted the students to develop an understanding that water systems were not just oceans and lakes while working on their note taking skills.

Partway through the week, I had taken a look at the notes the students were taking while watching the *Bill Nye* videos. Since the show is very formulaic, most students were able to get the main points about all the systems. I wanted them to take notes on less "educational" structure. Giving them guiding points for the Planet Earth series was meant to give them an outline of what they might want to pay closer attention to.

The journal questions were designed to help the students pull together all the information they were exposed to during the week into something that makes sense for them, and for me to see what they had learned from watching the videos.

Teacher journal entry:

One of my goals for students in my grade 11 and 12 classes is to help them become better note takers - so Monday was a session on taking notes, followed by a *Bill Nye* video. Students were to take notes while watching the episode, and then compare what they had with what I had. Some students did better than the others. I gave them the option of picking one type of water system to research, become an expert on, and present to the class. They could partner up if they wanted as there aren't as many water systems as there are students. Or they could watch all the *Bill Nye* episodes on the different water systems, take notes and answer some questions at the end. The majority of the class voted for the *Bill Nye* option. I think they will regret their decision after the third one. We finished the water systems with the *Planet Earth* episode of Freshwater. The video footage really is spectacular.

I am hoping that the journal entries from today will show some links with all the things we have talked about so far regarding water, water quality and personal choices/impact.

Student activity/ journal response:

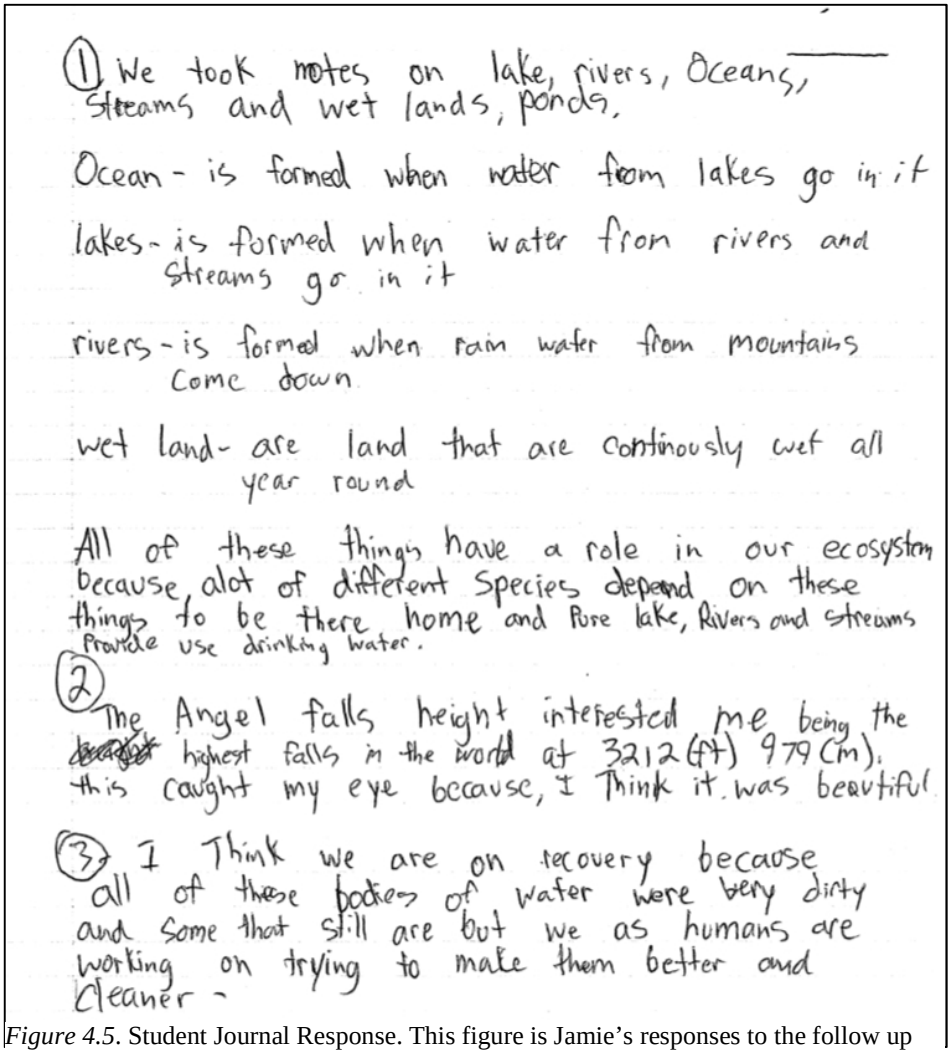


Figure 4.5. Student Journal Response. This figure is Jamie's responses to the follow up questions for the water systems entry.

4.3.8 BIG IDEA #8: Global warming and climate change

Lesson 36: Message/Topic: Global climate change previous knowledge Q and A.
Lesson 37 & 38: Message/Topic: *An Inconvenient Truth*
Lesson 39: Message/Topic: Is there another side to climate change?
Lesson 40: Message/Topic: Journal entry

WHAT I DID:
I provided students with 5 opening questions about global warming/climate change for them to answer on their own then guided a class discussion answering the questions as a group. I gave the students a set of guiding questions/points for watching *An Inconvenient*

Truth (Guggenheim, 2007) and encouraged them to take notes while watching. I stopped it before the end of class to have a quick discussion about what they had seen up to that point. Following the second part, I lead the students through a discussion about climate change, what may be causing it, is it a natural phenomenon that is being augmented by human activities etc. We discussed the importance of getting both sides of the story to build informed opinions about issues. I talked with them about data collection and interpretation depending on the researchers focus and interests. I did not provide any specific information about the next video they would watch, nor my own opinion on the topic, before pressing play. I projected this week's journal entry question on the SMARTboard for students to answer.

When the students had completed writing their responses, I lead them through a quick discussion about their thoughts on the topic as a group.

WHY I DID WHAT I DID:

I wanted students to reflect on what they already knew about global warming and climate change for two purposes. The first was that I wanted to draw out their preconceived ideas about the topic so I could better address any misconceptions and perhaps create some discrepancies in what they think they know. Since *An Inconvenient Truth* is the main source of information about climate change that a lot of society is familiar with, I thought it would be a good introduction for the students on the topic and would give us something to refer back to when discussing the topic.

The second point I wanted students to think about was what informs their opinions, and do they truly question everything they were told/taught as being the only truth out there. Agree or disagree with the counter argument presented in *The Great Global Warming Swindle* (Robin, 2008), I wanted the students to really think about asking those hard questions and being critical of the information they are being presented with in the media, by teachers, their friends, parents etc.

The journal question this week was written in the hopes of eliciting responses from students that shows their reflection on what they can take as fact or fiction and that they should be critical of the information that they were being presented with, regardless of the source.

Teacher journal entry:

The next main topic identified from the first few classes was climate change and global warming. My goal with this topic is to have the students question everything they are hearing and seeing so they can make their own decisions. By starting off with the charismatic Al Gore, all the ideas that they have generated so far will be confirmed. I have given them some "points to think about" while they are watching the documentary. Some of the students claim to have seen it before, and they are not necessarily paying attention as it is playing.

Before showing the students the *Great Global Warming Swindle*, we had a quick discussion about data collection, stats and how they can be interpreted in different ways and with different slants depending on what the goal of the research is. We identified some of the truths and also potential problems with the statements that are made about global warming data. It is important to me that

the students start to think critically about things they are being told and taught. Even if this means that they question ME every time I teach them something new. I may come to regret this statement later. It was interesting to see their reactions to the *GGWS* as it was playing. Some students still disengaged and tuned it all out, but most of them were actively watching it. Perhaps because it was new information/perspective they hadn't heard before about the topic.

4.3.9 BIG IDEA #9: Media Influences on public knowledge

Lesson 41: Message/Topic: Global Warming in the Media
Lesson 42 & 43: Message/Topic: The Day After Tomorrow.
Lesson 44: Message/Topic: Journal Entry

WHAT I DID:

I lead a quick discussion about the influence media - news reports, social media etc. – has on our understanding of global issues. I gave the students some points to think about while watching a few news clips about extreme weather events where the reporter mentions an increase in the events due to climate change. We discussed what influences society's understanding of complex scientific topics, how many citizens were not getting both sides of the story and how a large portion of the "developed" nations will base their beliefs on what they were told without looking for more information. We decided to watch an extreme example of a fictional story that had some basis in fact - *The Day After Tomorrow* (Emmerich, 2004).

I provided students with some guiding points to consider while watching the movie. We discussed the importance of separating fact from fiction in the case of this movie and how the distortion or omission of fact can also create fiction that is more believable.

WHY I DID WHAT I DID:

I wanted to introduce the idea of reliable sources of information and questioning the information being provided. I used news reports, as they were generally the source of "fact" that most people were exposed to.

I also wanted the students to see how facts can be twisted to tell a story while still keeping some element of truth. It was important to me that the students see the extreme end of what is out there for people to make sense of in terms of climate change. Also, knowing that I would be away for a class, having the movie carry over two periods made planning for the substitute much easier.

Teacher journal entry:

We started off the class with a short discussion/rant about media and how it has such a big influence on what we perceive as the truth. One student brought up the "controversy" of the landing on the moon - we also went to alien abduction, the Holocaust, assassinations of presidents/celebrities and the Illuminati. It was pretty interesting, and heated, I am glad that none of the administrators chose that class to pop into. I brought it all back to climate change by asking them where most people get their "reliable" information from. We watched some news weather reports about extreme weather events that happened around the world and how the news reporters

were mentioning climate change as the reason. They also identified movies and pop culture as having influence on what people develop as their own truth.

After the discussion about media's influence on what we know, I gave them the choice of watching *Twister* or *The Day After Tomorrow*. They have a series of questions to answer regarding the science, their use of "facts" and what is realistic and what isn't in the movie.

4.3.10 BIG IDEA #10: Consumerism - Stuff

Lesson 45: Message/Topic: What did you spend your money on? Eco Footprint.
Lesson 46: Message/Topic: "*STUFF: the secret lives of everyday things*"
Lesson 47: Message/Topic: Self-assessment for report card/ STUFF cont'd
Lesson 48: Message/Topic: *The Story of Stuff*
Lesson 49: Message/Topic: Earthopoly. Journal Entry

WHAT I DID:
I opened the class with asking the students to write down everything they spent money on over the weekend, while I did the same on the SMARTboard for them to see. I asked them to put everything into the following categories: food/beverage, shelter (clothing etc.), entertainment and transportation. I instructed them to further divide the items into necessity and luxury, and then assign an approximate dollar amount to each category. As students finished their lists and categories, I asked them individually to complete an online eco-footprint calculator (Global Footprint Network, 2008).

I was not at school on Tuesday, I left instructions for the substitute to distribute sections of the book *Stuff, the secret lives of everyday things* for the students to read (Durning, 1997).

As a report card/assessment check in, I projected a set of 5 "rate yourself on" statements as a self-assessment for the students to complete. As they completed the assessment, I had quick discussions with each of them about the rating they gave themselves and why. While they were waiting for me to meet with them, or if we had already met, they were to continue working on the "Stuff" assignment from the previous day.

In order to facilitate discussions about their "Stuff", I set up the classroom to have a round table discussion about the items they were assigned over the last two days. Before we started the discussion, I played the online video *The Story of Stuff* for the students (Free Range Studios, 2007). We had a discussion connecting what the video presented, their section of the book, and the "Yes…But…" item they did at the beginning of the course.

We ended the week off with a round of "Earthopoly" - an eco-themed version of Monopoly and a journal entry.

WHY I DID WHAT I DID:

Before starting the big idea of consumerism, I wanted the students to have a reference point for what they spend their money on before we start looking further into the topic. I felt that it was important for them to start paying attention to the different items they consume, what they spend their money on etc. It was also important for me to do the same for my own spending patterns to show that while I try to be as conscious about my spending as possible, I do still have to make choices. I wanted them to fill in the online Eco-footprint calculator to give them a sense of what their impact is on the planet. The site that I had them use is not ideal as they have the options of Calgary or Toronto where energy sources and costs were very different from Winnipeg, but it gave them a starting point.

I opted for a reading for the students to do while I was away as a way to introduce them to the back story of what goes into manufacturing all the "stuff" we own or use on a daily basis. Originally the intention was to go over the readings from the book they were working on, however only three students had completed this work when it was time to discuss. The others said they did not completely understand what they were supposed to do. I changed the plan to show them the video as it presented the same ideas of what goes into manufacturing the items we use every day.

The intention of the self-assessment was to give students the opportunity to have input into the mark they would be receiving on their report card for the class. The way the course is set up, it is challenging to assess how well they have "learned" the topics and to assign a mark to their understanding. I feel that by allowing the students to have input, they would not be surprised when the report card comes. Also, having a discussion with them at this time is a good check-in opportunity for how the course is going for them. Were they liking it? Were they learning things they were interested in? What else can we cover?

There were a lot of students absent from class on Friday. They had been asking to play a game for a few weeks, so rather than starting a new concept, and with so few in class, I figured it would not hurt to have a lighter day. I gave them a journal question to answer that tied the game Monopoly to the current topic of consumerism.

Teacher journal entry:

This week started with a discussion about what we each spent money on over the weekend. Each student did their own list in their journal; I did mine on the board. They were to divide it up between food, clothing (shelter), entertainment and transportation. Some students insisted they couldn't remember what they spent, which is very frustrating - I asked and prompted them to think about what they *did* over the weekend, and to work it out that way. I am not sure if they are embarrassed that they didn't spend much, or that they spent a lot. We had a discussion about if you are trying to tread lightly on the planet (E-tron) do you WANT to spend more or less? We completed a quick online eco footprint calculator for them to see where they are at, and compare with the rest of the class (myself included). We then talked about choices and limitations on what we *can* do as an individual within a family.

I was away yesterday, so I left a jigsaw style assignment for them. They were to each read a section of a book called *Stuff: the secret lives of everyday things*, make notes about what goes into

making those items (bike, coffee, burger, cola etc.) and prepare a summary to present to the class. When I got back today, it seems that they assignment wasn't as clear as I thought it was, so many of them weren't finished, I gave them time to complete it after they completed their self-assessment for the term.

I decided to have the students rank themselves on a scale of 1-10 for the main learning goals of the course, and to give themselves a term mark for the course. I then had a quick chat with each of them about what they gave themselves as a mark and why they thought that's what they should earn. This will be their term mark on their report card. For the "rankings", they were to set some goals for themselves for the second half of the course.

Today was supposed to be a follow up with the readings about Stuff, that the students (except for three) didn't complete -they said they didn't really "get what they were supposed to do". I figured that showing them the animated *Story of Stuff* may have the same outcome of what I was going for with the readings (that there is more to an items story than what we think). They were receptive to this version of the concept, and we were able to have a better discussion about the life-cycles of Stuff and consumerism in general. The discussion ranged from recycling plastic bottles to always needing the newest, most improved e-gadget to planned obsolescence.

Attendance was terrible today (19th). The students have been bugging me to play a game for a while, so I pulled out "Earthopoly" - monopoly with an eco-theme to it. I gave them a journal question that should be pretty easy for them to answer given everything we have talked about the week of studying consumerism.

4.3.11 BIG IDEA #11: Globalization

Lesson 50: Message/Topic: Global morning
Lesson 51: Message/Topic: List of "rights"
Lesson 52: Message/Topic: Journal Entry

WHAT I DID:

I followed the "Global Morning" activity from *Green Teacher* as it is written (Smith, 1995). I discussed the idea of 80:20 with the students and did a little activity with them which entailed me asking them to put any food and drinks they had in their bags on a small table in the middle of the room.

I instructed students to come up with a list of rights for members of a new civilization on their own, and then share with a partner. We had a quick discussion about the different "types" of rights (education, health, etc.) and asked them to put the ones they listed into categories. I recorded the ideas of the partners on the SMARTboard for the other groups to see. Once they were all up, I compiled the ideas of all the groups into one list of 10 rights that everyone agreed on.

WHY I DID WHAT I DID:

I wanted the students to gain an appreciation of where all the products we use come from and the dependence we have on other countries - the Global Morning activity illustrated the idea very well. It was well laid out and I only had to tweak it a little to be age and

location appropriate. Adding the 80:20 activity helped to re-enforce the idea of inequity within the global community.

When I first decided to do the Global Morning activity, I was not sure where we would go next; I wanted to hear what the students had to say about the topic before planning too much more. The discussion about where our clothing comes from brought up the topic of sweatshops. I decided to have the students come up with a list of rights that they feel everyone should be entitled to. The purpose of the categories was for the students to see where their priorities were in terms of rights.

I wrote the journal questions with the intention of hopefully drawing out a sense of compassion for other people who may not have the same rights as we do in a major city in Canada.

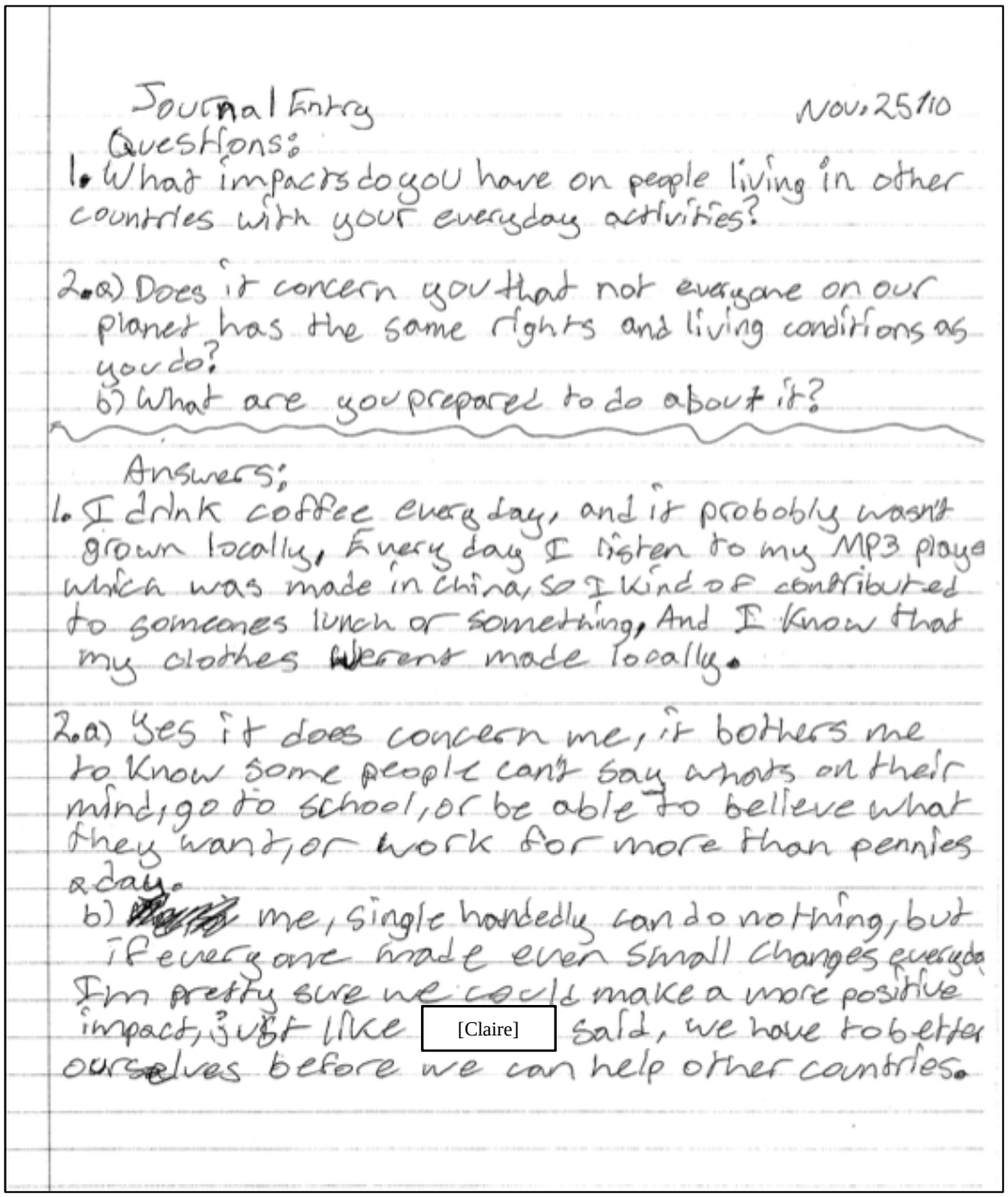
Teacher journal entry:

Building on last week's big idea of consumerism, I wanted this week to look at how our purchases have taken a toll globally. Starting the week off with the Global morning activity from *Green Teacher* brought a little geography into science, which they didn't really appreciate as much as I did, but was a nice cross-curricular for them. I had the students look at the "made in" tags for their shirts - some had to have someone check for them - to see where all their shirts came from. I pulled up a map of the world on the SMARTboard and passed around a globe for them to find the country where each of their shirts were made. They were surprised at how many were made in the Philippines, especially the Filipino students. I intentionally wore a shirt that was made in Canada so we could discuss that while my shirt may have be MADE here, where did the cotton come from? Where was the fabric made? This led to a conversation about buying local but still having a global impact and the giant conglomerate stores may sell something cheaper to us, but what does that mean for the people who made the product. We had a quick discussion re the 80:20 rule in economics. When we went through the Sea-to-Sky activity for the 80:20, they caught on pretty quickly what was going to happen, especially once I started moving the tables around on them. I was pretty candid when I tried to tie in the fact that there is even an 80:20 situation within Tec Voc by using the 80% of the students in the building are spectacular and great, but it seems that the 20% who are the trouble makers seem to dominate the time and resources of the teachers.

As a follow up to the discussion about where our clothes came from, we did a "list of human rights" activity where students, on their own, then in groups, had to come up with a list of rights that all people would have if they were starting their own civilization on a new planet. They were allowed to have some silly ones, but they also had to have serious ones. Once they had a list of 10 rights, they had to put them into categories - Social, Political, Cultural, Economic, and Environmental. Some could fall into more than one. Each group then presented their Bill of Rights to the other new civilizations. We combined all the ones that overlapped and voted on them to create a Bill of Rights for Planet 308.

This week's journal entry is intended to put them on the spot for what they are willing to do about the impact they have on people who live in other parts of the country. I am hoping to get some good, thoughtful answers out of it.

Student activity/ journal response:



Journal Entry Nov. 25/10

Questions:

1. What impacts do you have on people living in other countries with your everyday activities?

2. a) Does it concern you that not everyone on our planet has the same rights and living conditions as you do?
b) What are you prepared to do about it?

Answers:

1. I drink coffee everyday, and it probably wasn't grown locally. Every day I listen to my MP3 player which was made in China, so I kind of contributed to someones lunch or something. And I know that my clothes weren't made locally.

2. a) Yes it does concern me, it bothers me to know some people can't say whats on their mind, go to school, or be able to believe what they want, or work for more than pennies a day.
b) me, single handedly can do nothing, but if everyone made even small changes everyday I'm pretty sure we could make a more positive impact, just like [Claire] said, we have to better ourselves before we can help other countries.

Figure 4.6. Student Journal Response. This figure is Roger's response to the journal entry about human rights.

4.3.12 BIG IDEA #12: Valuing nature

Lesson 54 & 55: Message/Topic: "The Corporation"
Lesson 56: Message/Topic: Journal Entry:
Lesson 57: Message/Topic: Branding/Corporate logos
Lesson 58-60: Message/Topic: Selling of Nature

WHAT I DID:

I gave a quick introduction to the documentary *The Corporation* (Achbar et al., 2004) by reminding students about filmmaker bias from our past discussions about climate change. I played the video for the students, stopping it periodically when there was a point raised, or students seemed to be discussing something that was mentioned or were losing focus.

I recreated an image originally published in an issue of Adbusters of the message "Are you losing the battle of your mind". I gave the instructions to try and identify as many of the logos as they can in 2 minutes. I "quizzed" the students on different logos in the message and gave a small prize to the student who could identify the LEAST number of logos.

I provided students with a handout of the instructions for the "selling of nature" assignment. I left the next part of the assignment for students to work on while I was away for the day. In preparation for the last part of the assignment, I showed some examples of other "spoof" ads.

WHY I DID WHAT I DID:

I chose to show *The Corporation* because of the discussions in the past week about different companies and sweatshops. I do not normally stop videos to discuss points, however, this one can be very easy to tune out and miss interesting parts. I decided to stop the video when there was a point that we had either discussed already or students seemed interested in discussing or they were starting to zone out.

This week's journal questions were intended to elicit thoughtful responses from students that would show if they were thinking beyond themselves and their everyday lives.

I recreated the Adbusters image because the original one uses a lot of logos from American (or older) companies that the students might not be exposed to in Canada. I wanted to reward the students who actively participated, but genuinely did not know many of the logos, so I deliberately did not tell them that is who would get the prize as I figured the added competition would get them to try to get as many as they could right rather than not participate and get none of them, thus "winning" the activity.

After talking about the impact our consumer choices have on other people across the planet, I wanted the students to look at how "nature" is used to sell products. The Selling of Nature assignment is one that I have done before with previous classes, and allows the students to be critical, but also creative. The second step to analyzing their chosen ads was to look at how to recreate the ads in a satirical form.

Teacher journal entry:
Last week has resulted in some bashing of large companies and their lack of consciousness when it comes to human rights, environmental impact and so on. I thought the students might be interested in seeing the documentary *The Corporation* - I wanted them to specifically see the clips with Ray Anderson- the carpet manufacturer who turned his company around, and the bit about selling water in developing countries. I gave the students some points to focus on when watching the video and would interject here and there as things came up that I wanted to draw attention to, or if they started chatting about it themselves.

To continue the idea of consumerism, and media's influence on society, I wanted to do a looking at the use of "nature" to sell products. This was an assignment I did in a university course that I enjoyed quite a bit, and thought that the students in this class would enjoy as well. They had a very straightforward task today of finding 10 magazine ads that had an element of "nature" in them.

I was away yesterday, so I left the assignment for the sub to hand out - which involved going through the magazine ads they selected, and fill in a table listing the magazine the ad came from, what the product was, was nature used in positive, neutral or negative manner. The next step was to be for them to pick one of the ads, pull it apart and put it back together as a spoof - similar to how Adbusters does theirs. I showed them some examples for ideas, but no one in the class seemed interested in doing it. The big picture, that I shared with them, was that this would lead to them creating an ad as part of the next project - researching and advocating for one of Canada's endangered species. They were less than enthused. I took a quick poll by show of hands as to who wanted to continue with this assignment. 2/16 hands went up for yes, let's continue with this. 10/16 went up for no, let's not continue with this, and 4/16 didn't care either way. I recognized that it wasn't worth trying to force them to do the assignment if only 2 of them really wanted to do it, so we moved on despite my being excited about it.

4.3.13 BIG IDEA #13: Biodiversity

Lesson 61 & 63: Message/Topic: Conservation of Biodiversity - text book Qs
Lesson 63: Message/Topic: SARA registry

WHAT I DID:
I posted a textbook reading section and questions to answer on the SMARTboard. While the students working on the textbook assignment, I put the next project together.

To introduce the idea of legislation used to protect species at risk, I read a fictional story, based on facts, I had written. I lectured about the Species At Risk Act in Canada and its role in conserving biodiversity and provided students with the written instructions for their research project.

WHY I DID WHAT I DID:
Because of the change in topic, I did not have the next project ready to go for the students. I gave them the textbook reading as a way to introduce them to the topic on conservation of biodiversity and also to give myself some time to work on putting their project together.

I read the fictional Peter Scott story to the students as it was meant to be an introduction to using legislation as a method of conserving species. It was also an example for the story option on how to present the information they learned from the research project.

Teacher journal entry:
Since I made the call to move on, I didn't quite have the next project all set up and ready to go for them to start right away. I gave them a series of questions to answer from the biology textbook about conserving biodiversity and the different ways/reasons. There was a lot to read, and some of it was tough text for the weaker and less motivated students. I was honest with them that the reason they were doing this was so that I could work out their species at risk project because I didn't have it ready for them. Most of the class was missing on Thursday as they were volunteering for the school's holiday party, so that gave me a little more lead time for get the project together by Friday.

4.3.14 BIG IDEA #14: Conserving biodiversity: Species at risk

Lesson 64: Message/Topic: Computer lab / research - pick a species
Lesson 65: Message/Topic: Computer lab / research - fill in research sheet
Lesson 66: Message/Topic: Computer lab / research / draft of plan
Lesson 67 - 69: Message/Topic: Computer lab / research / writing
Lesson 70: Message/Topic: Last day for computer lab. Project due.
Lesson 71: Message/Topic: Last day of classes - Earthopoly? Jenga?

WHAT I DID:
As students were working on their research projects this week, I offered them support and suggestions as they needed it. I provided them with website suggestions, a research guideline sheet, assistance in coming up with good "search" questions to get the information they were looking for. I provided series of printed fact sheets available for some species for the students to look through and select from. I encouraged the students to not automatically pick a charismatic species but to look for some of the more unique or less commonly known species.

There were a number of students who were having a hard time staying on task, so I reminded them of the importance of using class time effectively and wisely.

I gave the students a quick lesson on citing their sources in their research. I offered to read over their work and provide feedback if they wanted it, not many were ready for me to look at their work at that time. I spoke with the students who had missed several work classes about what their plan was for getting the assignment done.

WHY I DID WHAT I DID:
I have binders of fact sheets for students to look through as I have found that looking through the SARA and COSEWIC websites can be a little overwhelming, even for someone who knows how to navigate them. The binders were intended to provide students with an easier way to sift through many of the species that were on the lists. The problem with them is that they were a little out of date, and some of the species in there

were not on the SARA registry or their status has changes since they were originally printed. In order to eliminate the 10 projects about polar bears, I decided to have the students sign up for the species they were going to research - it was on an "early bird gets the worm" concept, so the sooner they decided on who they wanted to research, the more likely they would be able to do so.

The students were at different stages in being able to find relevant and useful information on the Internet. By working with them individually or in smaller groups, I was better able help them develop the skills of typing in search words that will help them get the best information they can. It also allowed me to intervene if they were using American information and direct them to Canadian sources before they got too far into their research.

Most of the students were working very well on their projects and would ask questions when they were stuck. I did not force the students who were off task to get back on task, as I wanted them to take some independence and ownership of their time.

When I noticed that students were not taking note of the sites they were using for information, images, etc., I felt it was important for them to have instruction on how to properly document where they were getting all their information as they only have two more classes to work on the project.

There were a few students who had been sick or were absent and missed quite a few classes, so I met with them to be sure that they had a plan for finishing the assignment.

Teacher journal entry:

Students spent the week researching their chosen species from the SARA registry. I encouraged them to pick a non "sexy" species - one that not many people know about, or would care about. They had the week to work in the computer lab collecting information then working on the final product. They had to come see me with what they have to discuss it before I would give them the next part of the project. It seemed to work well for the students who were actually using their time wisely. There are a couple that were totally wasting their time in the lab, saying that they'll work on it at home. I am not going to push them any more than I have been to get to work. If they want to look up cars and music and other things, that is their choice - I have been stressing the idea of our choices have consequences and impact that we may not see throughout the course, so here it is in action.

Most students were able to complete their projects by the due date. There are a few - the ones who wasted last week - who have not finished. I have told them they can work on them over the holidays and either email them to me or hand them in on the first day back, but that they would not get more time after the break.

Attendance on the last day was not all that great, which is not surprising. There was a locker clean out before lunch, and many students have not made their way back for the afternoon classes. There were 6 students in class, I gave them the option of playing Earthopoly or Jenga. They decided on Jenga. I have colour coded the blocks and gave them a cube to roll that is also colour coded. They must pull a block of the colour that is rolled. I explained that this is a bit like an ecosystem where species are being taken out (either through habitat destruction, invasive species,

increased predation etc.). They groaned at me and said "it's the last day, can't we just play Jenga with no hidden meaning?" I replied with "nope! It's all about education in here". They groaned at me even more. It's nice to be able to joke around with this group.

4.3.15 BIG IDEA #14: Conserving biodiversity (continued)

Lesson 72: Message/Topic: Citing sources
Lesson 73: Message/Topic: Cleaning up the projects.

WHAT I DID:
I went over the proper way to cite sources, using some of their work as the examples. We went to the computer lab so they could make changes to their projects and I worked with each student to show them specifically what they needed to do to fix their projects.

WHY I DID WHAT I DID:
Over the holidays I had a chance to look over the projects the students had submitted. There was only one student who cited her sources correctly, so I wanted to give the students the opportunity to fix them and learn from where they went wrong so that hopefully the next time, they will get them right.

Teacher journal entry:
After taking a look at the projects that were handed in before the holidays, I see that a lot of them did not properly cite their sources. So I went over how to do that, and asked them to redo their references, add them in to the final project where necessary (mostly the images in the PowerPoint presentations). It's interesting how many students say they know how to do it, because they learn it in their English class, but then when it comes to actually doing it, they miss the mark. In some cases they have the references part done mostly right, but then don't include the information in the body part of the paper/project. Especially for images.

4.3.16 BIG IDEA #15: The power of one/ Environmental ethics

Lesson 74: Message/Topic: Human impact on the planet.
Lesson 75: Message/Topic: Human impact on the planet continued.
Lesson 76: Message/Topic: Factory Farming
Lesson 77: Message/Topic: Genetically modified organisms.
Lesson 78: Message/Topic: Journal entry.

WHAT I DID:
I introduced the idea of environmental ethics through a quick discussion about the E-tron and what would the planet be like if humans were no longer on it. We discussed the idea of "right" and "wrong" from different cultural, economic and ethical perspectives, and how do humans "value" the natural world in general. I showed the students an episode of History Channel's *Life After People* (deVries, 2010).

We continued the discussion about human values and views towards nature and gave the students the option to watch another episode of *Life After People* or the beginning of a documentary called *Taking Root* (Merton & Dater, 2008).

I showed the first part of *Food Inc.* (Kenner, 2008), I also led a quick discussion about genetically modifying organisms to suit human requirements and what were the ethical issues with it then played a portion of the documentary *The World According to Monsanto* (Robin, 2008).

WHY I DID WHAT I DID:

After talking about the E-tron images, I wanted to show the students one possibility of what might happen if humans were no longer on the planet. I had not originally planned on showing them one of these videos, however during the discussion, I had the idea of showing how one "future" could look.

I wanted students to expand their knowledge about how other cultures place value on the environment, and the idea of taking action on something they were passionate about. I wanted them to watch the documentary *Taking Root*, as I had planned to do some activities from a support document for the film. As we were talking about the video from the previous day, the students who were absent wanted to watch an episode instead.

In the previous class's discussion we touched on the topic of factory farming and how our food is raised. I wanted to show the students the *Food Inc.* documentary as follow up to that discussion.

The last of the ethical issues I wanted to expose the students to was GMOs. I wanted the students to start thinking about their choices, and their rights as consumers to know what is in their food, medicine etc.

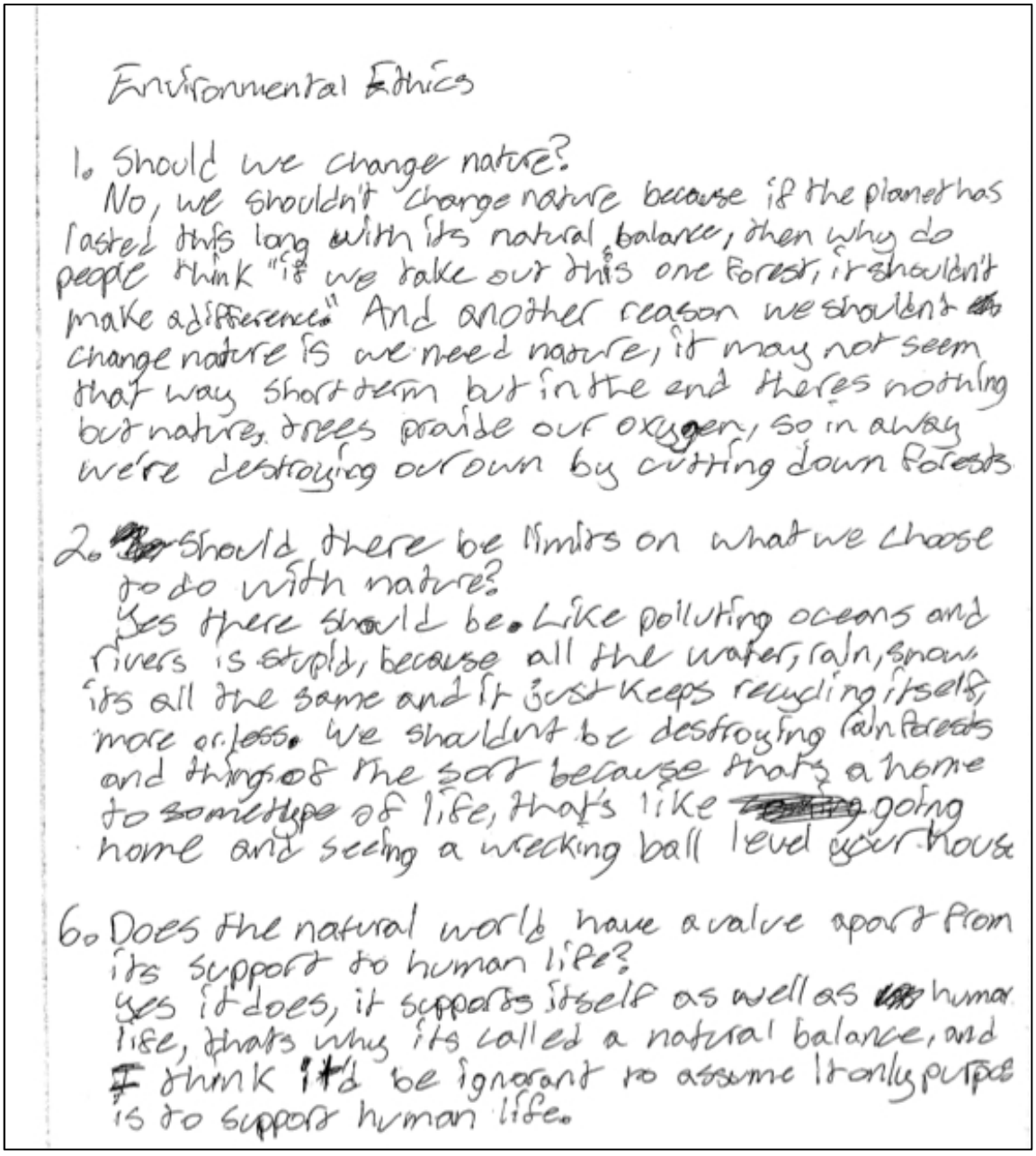
Since the journal questions were a little longer and more complex, I decided to provide a hard copy of them rather than have the students copy them from the board.

Teacher journal entry:

This week's big idea was to look at what humans are doing to the natural world and what would it be like if we weren't around any longer. There were only a few students in class on Monday, and those that were there responded well to the first *Life After People* episode, so they decided to watch another one on Tuesday so that those who weren't there could see some rather than watch a different documentary with new information. I suspect that they just wanted an "easy" day to catch up on work for another course, so this allowed them to do that. Some of them had seen *Food Inc.* previously, so we only watched as much as we could in the timeframe of the period. They were sufficiently grossed out at the chicken factory farming part. We had a quick discussion about never eating certain things again. Unfortunately, the Monsanto video isn't the most captivating for students who are only partly interested in the topic - we watched as much as we could in the period. I contemplated turning it off partway through, but I didn't have anything else planned for the class, and couldn't think of anything off the top of my head. We did have a decent discussion towards the end of the class about companies, what they can and cannot get away with, and how documentaries are always slanted one way depending on the interest of the people making them.

I always feel bad about showing them "movies" all the time. Sometimes I feel that it is the easy way out for me, as it is a way to provide them with information that doesn't require a lot of work on my part. I worry that they aren't getting as much out of the videos as they could be, or if we were to do other activities instead. It really is much easier for me when the attendance is low on a given day.

Student activity/ journal response:



Environmental Ethics

1. Should we change nature?
No, we shouldn't change nature because if the planet has lasted this long with its natural balance, then why do people think "if we take out this one forest, it shouldn't make a difference." And another reason we shouldn't change nature is we need nature, it may not seem that way short term but in the end there's nothing but nature. trees provide our oxygen, so in away we're destroying our own by cutting down forests

2. Should there be limits on what we choose to do with nature?
yes there should be. Like polluting oceans and rivers is stupid, because all the water, rain, snow its all the same and it just keeps recycling itself, more or less. We shouldn't be destroying rainforests and things of the sort because that's a home to some type of life, that's like going home and seeing a wrecking ball level your house

6. Does the natural world have a value apart from its support to human life?
yes it does, it supports itself as well as human life, that's why its called a natural balance, and I think it'd be ignorant to assume it only purpose is to support human life.

Figure 4.7. Student Journal Response. This fgure is Roger's Environmental ethics journal response.

4.3.17 BIG IDEA #16: What are you willing to do?

Lesson 79: Message/Topic: The power of one.
Lesson 80: **Message/Topic:** Where to draw the line
Lesson 81: **Message/Topic:** Environmental thinker/advocate /group
Lesson 82 & 83: Message/Topic: Computer lab research

WHAT I DID:

I started a discussion about what they (we) take for granted as Canadian citizens by posting some questions on the overhead. I showed them an online clip of a video called *Stones Into Schools* (The Banff Centre, 2011) then continued the discussion about what they (we) take for granted.

I led students through an activity that had them place "actions" along a continuum of what they would be willing to do for a cause they were passionate about.

I talked about advocate groups, NGOs and people who have had a major impact on bringing environmental issues to the mainstream conversations. I challenged them to name some advocates they knew, had heard of and what the cause was that they fought for. I handed out, and went over, the instructions for their next assignment.

I discussed the projects with students on an individual or small group basis. I asked them questions about what they were passionate about and then made suggestions as to who or what organization they might find interesting based on what they were interested in themselves.

I offered support and suggestions as needed and reminded them to stay on task, and to properly cite their sources.

WHY I DID WHAT I DID:

Since an underlying theme of the course has been personal action can have a large-scale impact, I wanted to use the video as a starting point for students to make a plan of action on something that they feel passionate about. It could have been something we have talked about in the course so far or something else completely.

In follow up to the *Stones Into Schools* discussion, it was important for me that the students consider what taking action on an issue might look like. I wanted the students to come up with their own "what I would be willing to do" list, then progressively work towards a large group one. They needed to be able to defend or justify why they would or would not be willing to take that particular action.

I wanted to finish the course with exposing the students to some of the organizations and people who have taken action around environmental issues and hopefully inspire them to take action themselves - even if it was only on a small scale.

Teacher journal entry:

Over the weekend I went to the Banff Mountain Film Festival tour of films. There was a great segment of a documentary called *Stones into Schools* based on the book of the same name. I started the class today (the 10th) with, what I thought were, some thought provoking questions. "What are some of the privileges we have as educated Canadians?", "What would your life be like if you couldn't go to school?". I saw that the students weren't really writing down answers to the questions. I got super frustrated that they weren't thinking about it. I kept asking the questions over and over. One of the students then piped up and challenged me by asking "tell us what you want us to answer then". I turned off the overhead, opened up YouTube on the SMARTboard and showed them the same clip I saw over the weekend. It tells the story of a boy who really wanted to go to school, but was blown up by a land mine in Afghanistan. Once it was over, I turned the overhead back on, and asked them the questions again. This time they had some answers for me.

I forget sometimes that these students are teenagers, in an urban center who are often not exposed to events outside their little bubbles. While I was really moved by the video, and I thought it was a perfect fit for the theme of the year - personal choices have impact we don't even know about - I forget that these students don't have that same insight.

I decided to challenge the students with what they would be willing to do for a cause they believe in by doing the Where to draw the line activity with them. They had to draw a line with a + & - at either end, then rank a series of different "actions" they could take for a cause on the +/- scale. They then draw the line between what they would and would not do. They then paired up, and did it again with a partner. They had to agree on what would go where. The pairs joined another pair and did a larger one. Then all the groups came together to do one for the class.

As a way to wrap up the course, I have given them one more research assignment where they will look at an environmental thinker, an advocate, a group or a cause that they find inspiring or motivating and do some further digging into what they are about. They have a few different ways to present the information they find about their topic, including writing a story like the one I read to them about Peter Scott, or the Lorax.

Just like with the SARA project, there are students who are taking the assignment seriously, and those that are wasting their time. I can only ask them to stay on task so many times before I get frustrated. I have said to some of them that it is the last time I will tell them to get back to work, and that if they aren't sure what to do, to come ask me.

Those who are working have chosen topics such as "Books not Bombs", Aldo Leopold, Rachel Carson, Poverty in the Philippines, Brazilian Mudslides.

Student activity/journal response:

See figure 4.8.

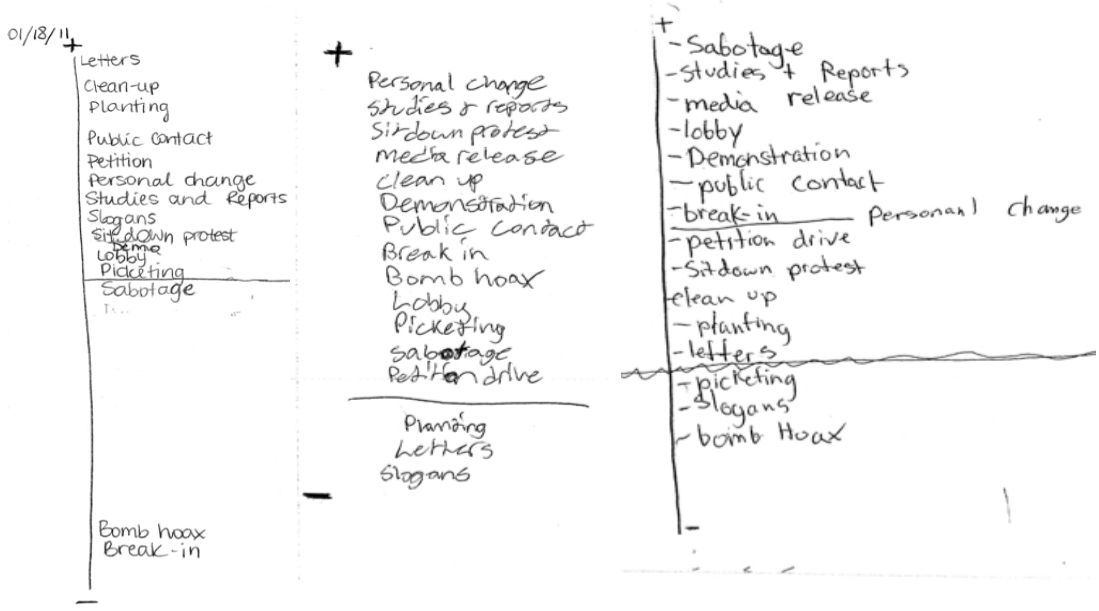


Figure 4.8. Student Journal Response. This fgure is Claire, Roger and Jamie's (respectively) individual reponses to "draw the line".

4.3.18 BIG IDEA #17: Final week – finish projects/summary journal entries

Lesson 84-86: Message/Topic: Computer lab research
Lesson 87: **Message/Topic:** Final Journal Entry #1
Lesson 88: **Message/Topic:** Final Journal Entry #2
Lesson 89: **Message/Topic:** Wrap up and any missed final entries.

WHAT I DID:
I continued to be available for feedback and support as students needed on their research.

I prepared their final journal entries. I was away from school on the first of the two final entry days, so I left printed copies of the final journal entries for the students to answer.

Prior to the second last class starting, I set up the visuals and write-ups for one of the final entry questions. As students entered the class, I gave them the final entry and explained what the display at the back was all about. If anyone missed the previous day, I gave them the sheet they missed. Any of the students who finished quickly, I encouraged to write a little more by asking them some probing questions about their responses.

On the very last day of the course, I gave copies of the missed final entries to the students who missed either (or both) of them. I gave students another copy of the TOSRA test and the opening questions (What does nature mean to me? What does environment mean to me? And what does sustainable mean to me? To answer again now that the course was over.

WHY I DID WHAT I DID:

I split the final entries into two parts in the hopes of being able to draw out what they have learned throughout the course. The first set of questions focused more towards the human activities and the science elements of the course, while the second entries were questions that were geared more towards the social, emotional and action aspect of the course. I wanted to have two different layers to the questions - one more content and the other more attitudes based.

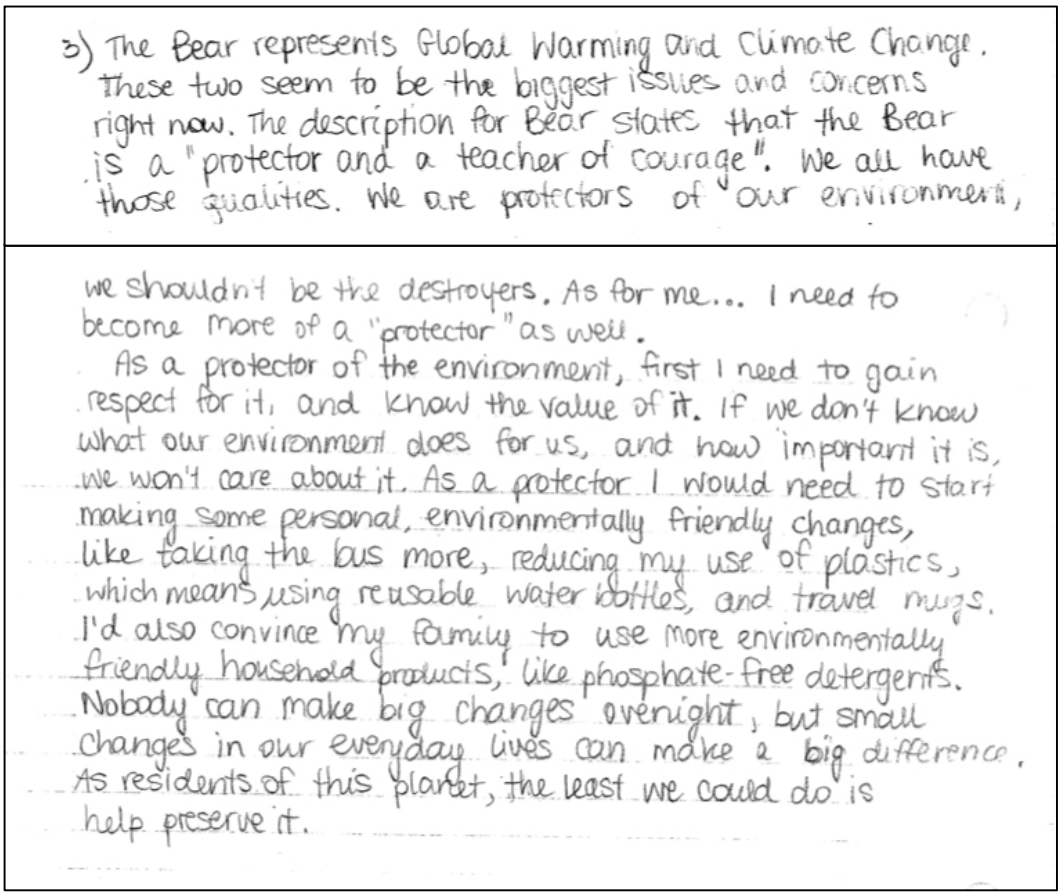
Teacher journal entry:

The final journal entry questions were designed to get students thinking about the entire course and to synthesize the information they have been exposed to throughout the course. This first set of questions is centered around human activities and our treatment of "nature".

The second set of questions are meant to be a little more insightful, with the intention of getting their views, and thoughts about the big ideas and less of the concrete. I am hoping that there will be some deeper level thoughts and answers to the second entry.

The last day of classes is always a little bitter sweet. It is nice for the class to be done and get ready for a new group of students, but it is also sad because I will genuinely miss seeing most of these students on a daily basis in my class.

Student activity/journal response:


3) The Bear represents Global Warming and Climate Change. These two seem to be the biggest issues and concerns right now. The description for Bear states that the Bear is a "protector and a teacher of courage". We all have those qualities. We are protectors of our environment, we shouldn't be the destroyers. As for me... I need to become more of a "protector" as well.

As a protector of the environment, first I need to gain respect for it, and know the value of it. If we don't know what our environment does for us, and how important it is, we won't care about it. As a protector I would need to start making some personal, environmentally friendly changes, like taking the bus more, reducing my use of plastics, which means using reusable water bottles, and travel mugs. I'd also convince my family to use more environmentally friendly household products, like phosphate-free detergents. Nobody can make big changes overnight, but small changes in our everyday lives can make a big difference. As residents of this planet, the least we could do is help preserve it.

Figure 4.9. Student Journal Response. This fgure is Clarie's response to the final journal entry question.

4.4 Summary

This chapter has outlined all the topics, activities, negotiations and responses, both from the students and the teacher, throughout the planning and implementation of the course. The data are presented in a chronological manner to demonstrate the sequence of topics taught, the rationale for their delivery and the responses to them at that time. No content collected during that time has been adjusted for this thesis. In the next chapter, I undertake a systematic analysis of these data and by so doing investigate the status quo of my practice (Loughran, 2007).

Chapter 5 - Discussion

5.1 Introduction

The data presented in the previous chapter captures my planning, implementation and reflection on my implementation of a full semester of the course, Current Environmental Topics in Science (CTSE3S). The first layer of data described the teaching process over this unit of work through the "what I did" and "why I did what I did" sections of each "big idea". In essence it focuses on describing my intention and my justification for my intention. Then, it went on to describe a second layer showing my thinking at that time, a reflection-in-action, and what was informing my considerations of my practice in the "teacher journal entry". Examples of student work were included where appropriate in the "student journal entry" to help demonstrate the planning, student tasks and to support the analysis of the data.

In this chapter I will analyse this data structured in a manner that addresses each of my research questions in relation to the data from the course, primarily with emphasis on the typologies outlined in my literature review.

As per self-study methodology, I analysed data systematically and repeatedly. There were two critical phases to my analysis; my initial independent analysis, followed by a deeper level where I employed the use of my critical colleague. Starting with the independent analysis, I examined the data through three different lenses, corresponding to my three research questions. In the first layer of analysis I was looking specifically at the "what I did" and "why I did what I did" sections of the data for themes and trends that helped answer my first research question: *what informs a teacher's approach to planning and implementing a relevant and responsive environmental issues based course.* I was

looking for the underlying reasons for planning the topics, activities, and lessons we covered. I had four different categories informing my analysis of informants, inspired by Eisner's (1979) five orientations to curriculum, as described in Chapter 2. I will describe each of the categories I identified in more detail later in the chapter when I discuss the first research question.

In the second analysis, still with the focus still on the first research question, I used the lens of Hodson's levels of sophistication (2003). I placed the activities within those levels based on my interpretation of the levels as described in Chapter 3. It is important to note that when I initially taught this course and collected this data, I was not familiar with Hodson's work, and, thus, I did not specifically plan the course with his levels in mind.

The third review of the data was the most critical of my enacted curriculum. This is also where I employed the use of my critical friend, as I was looking at the data for answers to the second and third research questions: *how does a teacher respond to and balance the interests of students with her own intentions when teaching an environmental issues based course* and *based upon reflection of prior teaching, what could be done differently to provide a more transformative outcome for students?* I examined the big picture my goals for the course, the students' goals and also from the perspective of environmental education as discussed in Chapter 2.

The final level of analysis was when I again employed the use of my critical friend who analyzed the data independently from my own analysis and posted questions that elicited a deeper questioning and response to my enacted versus intended practice.

Figure 5.1 is an example of one of the comments and questions posed by my critical friend within the data.

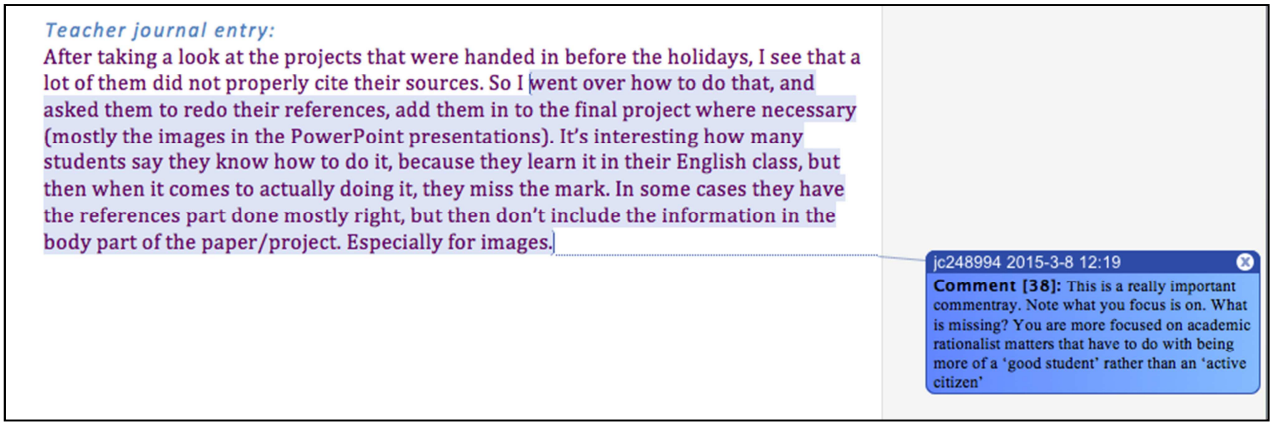


Figure 5.1. Critical Friend Response. This figure is an example of ciritical friend commentary within the data.

We conferenced over Skype and communicated through email to identify how our comments corresponded to the trends within the data and through this conferencing identified three emergent themes in my commentary.

5.2 What is informing my practice?

The first research question I will address in this discussion is: *what informs a teacher's approach to planning and implementing a relevant and responsive environmental issues based course?*. Although my intention for the Current Environmental Topics in Science (CTSE3S) course was to have students move beyond a general understanding of the issues of environmentally related matters towards a role of advocating for the environment, the data showed that I did not meet this intended curriculum to the extent I had envisioned.

In the initial, individual analysis of the data for this question, four different constructs were used to identify the primary influence on what and why I was teaching.

The first category I used was *teacher directed-driven/interest/value*. These were activities I selected and planned without much input from the students. The second category was titled *student-directed-driven/interest/values*, these were activities selected and/or planned by the students. Within these two groups I looked for which of Eisner's orientations was the foundation to that big idea of the lesson series. I sought to determine which orientation underpinned the content of the lesson. For example, was it supported by academic rationalism, social reconstruction or personal relevance? The latter orientation would support the suggestion that the lesson was responsive to student's interests. I deemed it important to keep the teacher and student separate because, in some cases, the students chose the topics giving the element of "personal relevance", however when taught, the activity or lesson was strictly "academic".

The third category influencing what I was teaching and why was whether the activities were proving to be *problematic*. These were primarily activities that occurred because students were not apparently interested in the content or activity, and, as a result, I decided to change the topic or activity. I do not consider this as responding to students; it was more of a personally decided pragmatic decision based upon student disengagement.

Finally, the *administrative/practical/pragmatic category* included decisions again based upon pragmatic considerations because of uncontrollable factors such as shortened classes due to a school wide altered schedule, my own absence from school, or for the need to provide an assessment for the students' report cards.

During the second phase of analysis, I categorized each of the big ideas according to Hodson's levels of sophistication. As mentioned previously in Chapter 3, I considered

level 1 as "impact" (activities that address human impacts on the environment), level 2 as "interest" (decisions made without regard to other living beings or cultures), level 3 as "values" (development of an understanding and value of or towards the environment) and level 4 as "action" (taking action for a cause). In some cases, because there were several different lessons within each big idea, it was possible that more than one level was addressed, but that students may not all have been operating within the same level for the same lesson.

Table 5.1 combines the results from this analysis by presenting Eisner's orientations to curriculum and Hodson's levels of sophistication for each big idea. The first two columns indicate which curricular orientation the activities and lessons were categorized. The middle section of the table makes note of any instances where I either planned for or responded to activities that were problematic in their delivery and any administrative or practical concerns were also noted. The last set of columns indicates which of Hodson's four levels were addressed by the activities within each big idea.

Looking first at the Eisner columns, what is evident from the data is that, from the teacher planning perspective, the majority of the orientations pertain to the Personal Relevance and Academic Rational orientations. There was equal representation of the Personal Relevance and Academic Rational orientations (seven big ideas each), while there were three Cognitive Process and three Social Adaptation. It is apparent from this that much of my teaching focused on science conceptual understanding or content acquisition, emphasizing that my teaching is largely focused on learning "about" the environment and learning "science". I also noted that this knowledge acquisition is seen to be necessary to engage in any appreciation of environmental issues. I placed heavy

emphasis on content acquisition as a necessary first experience rather than practicing active engagement in a topic as a means to provide the foundation for conceptual understanding.

Table 5.1

Summary of data indicating what informs a teacher's planning and implementation of course content.

	EISNER				HODSON			
Big idea	**Teacher role**	**Student role**	**Tensions/ Response**	**Admin/ Practical**	**1 impact**	**2 interest**	**3 values**	**4 action**
#1	PR	PR				√	√	
#2	PR	PR			√	√	√	
#3	A	PR	X		√	√		√
#4	A	A		X	√	√		
#5	A	A/PR	X	X		√	√	
#6	A/CP	A/CP	X		√	√		
#7	A/CP	A		X	√	√		
#8	SA	PR	X		√	√	√	
#9	SA	PR			√		√	
#10	SA	PR			√	√	√	
#11	PR	PR				√	√	√
#12	PR	PR		X		√	√	
#13	A/CP	A	X		√	√		
#14	A	A		X	√	√	√	
#15	PR	PR				√	√	
#16	PR	PR				√	√	√
#17	PR	PR		X		√	√	

PR = Personal relevance
A = Academic rational
CP = Cognitive process
SA = Social adaptation

In terms of Hodson's levels of sophistication, activities and lessons operated primarily on levels 1: impact, 2: interest and level 3: values. Ten big ideas were identified as including level 1, while sixteen included level 2 and twelve at level 3. There were only three big ideas that included level 4: action. The dominance of the first three levels is not surprising based on how I defined them in chapter 3. The "impact" level was predominantly a foundation of information that I perceived as an important step for the students, as they did not all have previous knowledge about the topics. In order to effectively move towards higher levels of sophistication, it was my belief at the time, that there must be a fundamental amount of knowledge on the topic. I defined "interest" as topics that were culturally and society based activities, ones that examined how we interact with other cultures and other species. The third level of sophistication "values" was well represented in the activity selections, mostly in the journal entries. The data in chapter 4 shows that the lessons/activities within the big ideas had elements of knowledge (impact) and culture/society (interest) that moved towards the students writing a values-based response in their journals at the conclusion of the big idea. Although my intention for the course was to provide students with the information they needed to inspire them to move to the fourth level and take action, the data show that I did not provide them with authentic opportunities to do so within the context of the course.

When I started the analytical process, I was expecting to see mostly teacher driven/interest activities in the early portion of the course moving towards more student driven activities towards the end of the course. However, when looking at the data presented in chapter 4 and then summarized in Table 5.1, the data show clearly that, while the intention was to move towards a student directed course, I, the teacher, had

primarily determined what transpired. While the students may have had input to the topics they were studying, they had little control of how and what they learned about those topics. There is a high frequency of the phrase "I wanted the students to" within the "why we did what we did" sections of the data, making it evident that I planned and enacted a content based, teacher driven curriculum. While I have identified that the topics were guided by student input, I chose to focus on delivering that information *to* them rather than allowing them to determine the content they needed to learn themselves. The students were not given the freedom to choose, plan, implement and take action of the course content.

On deeper consideration through the critical friend process, despite the intentions of delivering a curriculum inspiring students to respond to a call to action, the data show that a primarily academic rationalist, content driven curriculum was enacted. The curriculum was additionally based on conventions such as learning to take notes (lesson 31), creating data tables (lessons 23 and 24), properly citing sources (lesson 72) and pragmatic concerns such as attendance and a need for assessment.

One example of a topic within the data that, on the surface, spanned the academic and personal relevance orientations were the lessons on water issues. Starting with *big idea #4: Healthy Water* then moving through *big idea #5: Safe Drinking Water*, the students were required to learn specific information about waterborne diseases, how they are transmitted, and their treatment. Following this highly academic form of learning, the students worked through a series of other activities that lead them on a path towards personal relevance culminating in analyzing our drinking water. They also considered water quality from a global perspective in the filter activity to emphasize and discuss the

importance of being socially aware of water issues. Additionally, the three layers of exploring water quality issues met the course intentions of investigating issues on a personal, community and global scale as described in the course outline (Appendix A).

This series of activities in the Healthy Water activities, addressed three of Hodson's levels of sophistication as students were given the opportunity to learn about waterborne diseases and water chemistry (level 1: impact). They were then exposed to water conditions of different communities and countries with different economies and demographics (level 2: interests). The topic concluded with a journal entry question asking them to reflect on their beliefs around access to safe drinking water (level 3: values). An opportunity to operate at level 4: action was not included in the series of activities.

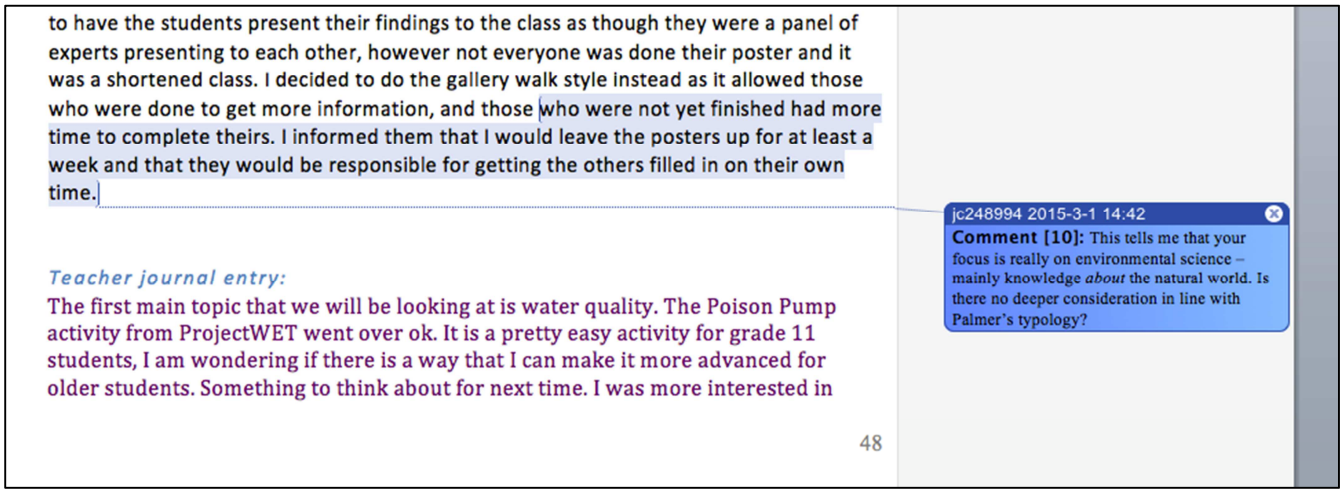


Figure 5.2. Critical Friend Comment. This figure is an example of a critical friend comment to big idea # 4: "why I did what I did".

Although the intention was for students to learn fundamental concepts for their understanding to move towards education *for* the environment, it is evident that the foundation of this series of lessons was based within the context of *environmental*

science, and not *environmental education*. As shown in Figure 5.2, my critical friend draws attention to the tension between responding to Hodson's call to action and the conventions of academic rationalism.

In addition to the academic nature of the activities, the rationale provided for the extended time in the lesson was evidence of the paralyzing influence of pragmatic issues associated with the planning and implementation of the curriculum. On five instances in the teacher journal entries, I make reference to student attendance either as a comment or as a rationale for choosing the activity/lesson for that class. For example, big idea #3 "Attendance wasn't very good today, which may have to do with the presentations, or not", big idea #4 "Today's attendance (the 29th) is not all that great" and big idea #15 "It really is much easier for me when the attendance is low on a given day". In each of these instances, the low attendance was the given reason for what may have transpired in class that day. As noted by my critical friend in Figure 5.3, the focus of my teacher responses at the time was directed towards knowledge acquisition, pragmatic concerns and not deeper questions or considerations of my teaching or the students' interests.

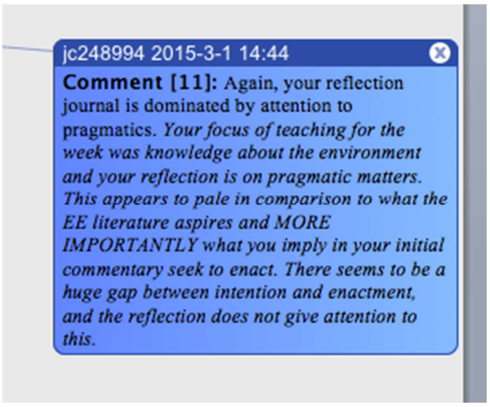


Figure 5.3. Critical Friend Comment. This figure is an example of a critical friend comment directed at what is informing my practice.

Another major trend that appears in the data upon deeper consideration of what informs my teaching is what I perceived as disengagement from the students. There were two main instances in the data where I allowed the apparent disengagement of the students to dissuade me from delving deeper into the topics. As it will be shown further in the analysis for the second research question, I could have responded differently.

The first research question seeks to determine what informs my planning and implementation of an environmental issues based course. The data presented show that there are multiple layers to the planning and implementation of lessons and activities for students, however they are more directed at content acquisition and less at taking action. The content of the course was dominated by academic rationalism. The activities had multiple levels of sophistication with the majority being directed at our impact on and our values towards the environment. There was significant evidence that there was a tension between pragmatic concerns and actively engaging students in environmental education.

In conclusion, my data suggest three themes within my teaching that shows evidence of competing priorities resulting in considerable tension in the enactment of my practice. First, there is an obvious tension between a call to action and the conventions of academic rationalism. In brief, as much as I aspire to support my students in a call for action, I place priority on the conventions of academic rationalism; that is, focusing on these things that I identify as necessary for their future success in academic study. Second, my teaching shows evidence I find it difficult to balance student engagement and the pragmatic nature of teaching. And third, my underlying philosophy and view about how learning occurs versus how to be a Teacher are not congruent. I seek transformation but I seem to focus on knowledge accumulation.

5.3 Responding to and balancing the interests of the teacher and students

My second research question was *how does a teacher respond to and balance the interests of students with her own intentions when teaching an environmental issues based course?* This question asks about what I, the teacher, did in response to the needs and interests of my students and how did I balance those with personal and professional views. The data presented in Chapter 4 provides examples of how I responded (or did not respond) to students on a personal level but also at the class level.

The initial analysis of the data showed that my responses to the students ranged from simple acts that did not relate to the course content (pragmatic concerns) to those that altered the direction of the course. Some examples of the pragmatic responses were rearranging the classroom set up (lesson 12) or allowing students more time to finish their work (lesson 70) and by beginning the course with soliciting responses from the students about what they may be most interested in learning. An example of where I utilized the students' input and interests was in the development of the themes of study for the course. As a class, we looked for themes within the issues they identified as being of interest to them. We then grouped their ideas into themes to provide the image shown as Figure 5.4. These issues, identified by the students, were the inspiration for the big ideas when planning the activities for the students.

In comparing the ideas in Figure 5.1 to the big ideas as outlined in Chapter 4's data, there were many issues the students identified that were not covered (deforestation for example). The data show that I included many of the topics the students were interested in with those that *I* felt were important (for example recycling was a topic within the big idea of consumerism). There were instances in the "why I did what I did" sections of the big ideas where I indicate that I chose the activity in response to student discussions, or a specific student's comment.

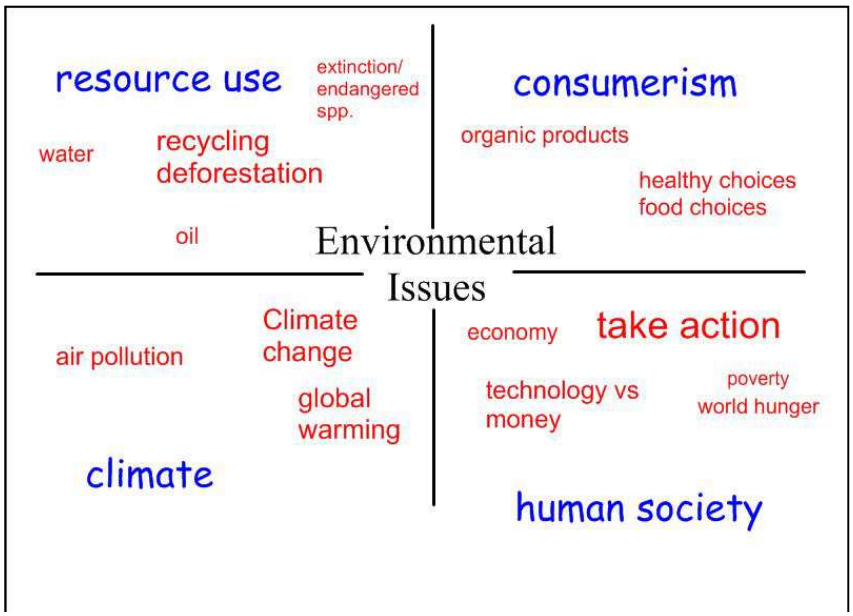


Figure 5.4. Environmental Issues. This figure is a screen capture of the compilation of students' responses to the biggest issues facing the planet earth.

There were also instances where I included ideas based on student discussions, and also where I completely changed the direction of the lessons based on student response/input. There were, however, two instances where I let my own feelings of frustration dictate the course of action and did not step back and look critically at *why* the students might be responding to the activities the way they were.

The nature of the topics in an open ended course in terms of curriculum content allowed for me (the teacher) to change and adapt the content of the course to better fit with what the students wanted to learn about. One intention I had going into the course was the message of every action and decision we make has an impact on the environment - either positively or negatively. Looking through the data, I saw that I was able to maintain that focus through the entire course, even though it was not one of the ideas that the students identified as being important to them to learn about during the "identifying environmental issues" activity, it is one that I personally value.

Upon deeper analysis of the data, in particular the student journal responses, it was evident that there were many missed opportunities where what I perceived as disengagement, may not have been. One trend identified in the data is where I would base the "success" of the lesson/activity on the apparent engagement or disengagement of the students, examples include big ideas #12/13 (Valuing Nature/Conserving Biodiversity) and #16 (What are you willing to do).

When I look at the student data, and undertake a deeper analysis of the students' responses, my failure to respond to the students' journal commentary as I was going through the course prevented me from being more in tune with what the students were writing as their responses. I fell into the "80:20 trap", where the majority of the students were appearing disengaged externally, and I judged their disinterest in the topic as a reason for changing my direction for all students, although some were quite evidently learning. If I had taken the time to understand whether the minority were engaged, I could have responded by ensuring my teaching was responsive to these students at a deeper, more personal level. In particular, big idea #11 (globalization) when discussing

sweatshops, it is noted in the "teacher journal response" section of the data that "I pulled up a map of the world on the SMARTboard and passed around a globe for them to find the country where each of their shirts were made. They were surprised at how many were made in the Philippines, especially the Filipino students. I intentionally wore a shirt that was made in Canada so we could discuss that while my shirt may have be MADE here, where did the cotton come from? Where was the fabric made?". In response to the question "Does it concern you that not everyone on our planet has the same rights and living conditions as you do?", Roger's response was "Yes, it does concern me, it bothers me to know that some people can't say what's on their mind, go to school, or be able to believe what they want. Or work for more than pennies a day." Claire responded: "It really does concern me that alot [sic] of people on our planet don't have the same rights and living conditions as I do. No one ever wishes to be in a life full of abuse and depression…It's not fair that people on the other side of our planet suffer so much, because they don't even have the basic essentials to survive, while we, here in North America, have more than we need". Jamie wrote "yes, I wish we were all at least above the poverty level but the world doesn't work that way". Looking at the journal entry for this big idea now, it is evident that the students were thinking on a deeply personal level. Had I taken the time to look deeper into their personal commentary, I might not have missed the opportunity to provide them with some significant and meaningful learning opportunities. Had I read their responses to the follow up question "what are you prepared to do about it?", I would have seen that Jamie would "maybe support a group that goes against low wage sweatshops", or Roger's response of "me, single handedly [sic] can do nothing, but if everyone made even small changes every day, I'm pretty sure we could make a more positive impact, just like [Claire] said, we have to better ourselves before we can help

other countries". And finally, Claire's response may have had a large influence on where the course content could have gone next. She wrote "(i)n order to try to eliminate the unfair conditions, we have to take it one step at a time. Our country is far from "perfect", and we all need to come together, and patch up our own country, then once we realize that it's not fair to turn our backs on others, we can help those who suffer. For now, I'm done with sweatshops. I'm gonna make smarter decisions because we can save the world…one person at a time". I clearly missed opportunities because I was focused on those that were apparently disengaged, failing to respond to those who were clearly challenged by the learning experiences provided.

In lesson 70 "the power of one" (big idea #16), I showed the students the "Stones into Schools" video. This lesson was another example of where I made a choice to abandon a fruitful learning opportunity for many because I was failed to respond in a manner that would likely have provoked a better response from students, especially in taking action over situations of possibility. From the teacher journal entry: I saw that the students weren't really writing down answers to the questions. I got super frustrated that they weren't thinking about it. I kept asking the questions over and over. One of the students then piped up and challenged me by asking "tell us what you want us to answer then". I was determined to *inspire* the students into taking action on something they were passionate about that I lost sight of the need to balance my intentions with their interests. I responded in haste by giving them the total opposite type of activity to do - rather than spurring them into action, I had them sit at a computer and research what *other* people have done. I did not ask the students more probing questions about what they saw as a valuable activity in terms of taking action. They did not respond to what *I* thought was

going to be an engaging and inspiring call to action, and I did not take the time to ask them for their input.

As with all three of these instances, the data show that I missed potentially significant learning opportunities for the students to work their way towards responding to Hodson's call to action and to having a more meaningful transformative experience. This failure occurred because I did not take the time to genuinely look through the students' journal responses to understand and observe the learning that was being expressed on paper, nor did I take the time to solicit genuine input from the students regarding their views on what "taking action" might entail.

5.4 Reflections for the future

My third research question was "*based upon reflection of prior teaching, what could be done differently to provide a more transformative outcome for students?*". This question, at its very core, is introspective and critical of the effectiveness of my teaching. The following discusses comments and observations I made about missed opportunities or actions/reactions that could have been done differently when examining the data in chapter 4.

The incongruences between intended and enacted curriculum become evident upon deeper analysis in the second phase of analysis when I employed the use of my critical friend. Independently and then collaboratively, we were able to identify nine main trends in the data of what informed my planning and implementation of the course. The trends identified in the data are listed in Table 5.2. The first 6 of these trends pertain primarily to the first research question, while 7 and 8 are evidence for my second

research question and 9 is directly related to the third research question. These nine trends can be grouped in to three main themes as shown in Table 5.2.

Table 5.2

Trends and themes identified in the data in Chapter 4.

	Trend in data	**Emergent theme**
1	Activities were teacher initiated and planned	Call to action vs conventions of academic rational orientation
2	Academic focus of content	
3	Emphasis placed on what students "need" to know/learn to be successful	
4	Operating on Hodson's "lower" levels, no authentic "call to action"	
5	Pragmatic issues associated with assessment, attendance, scheduling	
6	Orthodoxy of science – data collection, research reports	
7	The success of a lesson was based on what appeared to be disengagement	Student engagement vs pragmatic concerns
8	Missed opportunities to see significant learning within students	
9	Apprehension towards change on a personal level	View of how learning occurs vs philosophy of teaching

As previously stated in earlier analysis of the data, I found that I planned and enacted a curriculum oriented in Eisner's academic rationalism and not personal relevance or social adaptation. The course was primarily teacher planned and teacher directed, the students had very little input to what transpired beyond the big idea topics they studied. I placed emphasis on what I felt students "needed" to know to be successful in future academic courses and did not provide them with authentic opportunities to take action as I had intended to do. I was heavily influenced by responding to pragmatic

concerns, such as attendance and incomplete student work. I was also caught up in the orthodoxy of "science". These trends in the data combine into the emergent theme of responding to Hodson's (2003) call to action versus Eisner's (1979) academic rational orientation to curriculum. Additionally, the two trends described in the previous section indicating that I based the success of the lesson on student (dis)engagement and the subsequently missed opportunities combine to a second theme of student engagement versus pragmatic concerns. The final trend in the data shows that there was an apprehension towards conducting change on a personal level. I fell victim to Fullan's warning concerning the trap where teachers spend too much time planning and not enough time evaluating with respect to educational change (2007, p. 107). Fullan also describes five barriers to change created for a business environment that apply to education, one of which is "when fear prevents acting on knowledge". While I was not afraid, in the truest sense of the word, to take chances in the course, I did not allow myself to step outside of my own comfort zone of teaching to provide deeper, more meaningful and potentially transformative opportunities for my students. I allowed the perceived barriers to prevent me from truly becoming a Teacher rather than a teacher.

Upon deeper consideration of the data, following my individual analysis and that of my critical friend, the data show that I focused the teaching and learning in the area of education "about" the environment and "science". I am disappointed that I gave this imperative so much consideration. Because of this I have to question my sense of urgency as an Environmental Educator. I question my commitment to providing students with opportunities that provide the foundational experiences to prompt such consideration.

Earlier in this chapter I discussed that there were only three activities in the course that provided students with the opportunity to work within Hodson's level 4: action. I failed to provide students with authentic opportunities to take action on an issue they were passionate about, however when I look back at the course now, I realize that I was not operating within that level myself. I did not take those opportunities to work at a higher level of engagement despite what my values were. Nor did I take the risks to plan activities that would have the students outside, experiencing their environment. I thought that teaching this course would be action enough, however as I look back now, I realize that it was not. The biggest barrier I had when it came to planning something in the environment was myself. I did not have the courage to take on the extra work of planning something meaningful for them outside in late fall/early winter in Manitoba, even though this is one of the seasons that provides substantial opportunity of "in" environment experiences. I allowed the personal attribute factors within the individual system Bronfenbrenner's model of human development to be constraints and barriers, rather than using them as supports for the course development, and especially in the development of myself as an environmental educator.

My actions, and in particular, the beliefs and thinking, that influences those actions were far from the ideal set by Hodson who calls for action. It is difficult for my students to be action oriented, when the data suggests I was not committed to such action myself.

In my attempt to provide my students with transformative learning opportunities within the context of environmental education, conducting this research has provided me with a "disorienting dilemma" to begin my own transformative learning (Erickson, 2007).

The data shows that I provided students with the opportunities to experience the first five phases within Mezirow's theory. For example, in big idea #11, the lessons on Globalization started with the disorienting dilemma of questioning the where our garments came from. The students worked through the phases of self-examination, critical assessment of their assumptions, became aware that others shared their experiences. They did not, however, have the opportunity to move into the next phases of exploring their options, planning a course of action, and the remaining phases within the context of the course despite their journal entries suggesting that they may have been prepared to move further into the phases.

Moving forward into subsequent years teaching this course, in order to provide a more transformative experience for the students taking CTSE3S, there are three key themes from the data. The first is that I must be more cognizant of which orientation to curriculum is prevalent in my planning and teacher. The second imperative is that I need to be more curious about and less dismissive of students who do not appear to be participating in the lessons –either individually or as a whole class. I may be projecting the disengagement on them, when they are in reality having deep meaningful connections within their personal learning space. The third critical message I must take away from this experience is that if I want the students to be passionate, engaged and taking action, then I must model that in the planning and implementation of the course content, especially in the first-hand experiences I provide for them.

5.5 Summary

The goal of this self-study was to examine three aspects of the teacher's role in an environmental issues based course at the high school level. The first question explored

the constructs of what informs the planning and implementation of the course from Eisner's orientations to curriculum (1979) and Hodson's levels of sophistication (2003). The second research question considered how the teacher responded to student interests and balanced them with her own. The final question looked into the future about what could have been done differently to improve the experiences of the students, and the teacher, in the course and beyond.

Conducting this research on my own practice has provided me with an awareness of the implications of the planning and implementation of course content. In analyzing the course content to respond to the research questions, it has become clear that I need to have the courage to go outside of my own comfort zone if I am expecting the students to. I should not accept my own excuses for not taking action and delivering the best possible course for them. I must be more open and respond differently to *why* students may not be participating in or receptive of the activities that I plan. I must be more flexible and adaptable to changing the plan in a course that is open-ended in nature. It is apparent that the primary impediment for an intended curriculum being enacted has primarily been my own personal limitations; that is they have been primarily teacher specific.

If I wish to move forward and truly have an impact on my students by providing them with experiences and drive for change, I must respond to Scott's directive, Hodson's call to action and Eisner's personal relevance/social adaptation orientations to shift my teaching from knowledge acquisition to transformative experiences for myself and my students. Reflecting back to the story of how I came to be a teacher, my personal connection to nature, the bucket full of soapy water, and the quote from Sir Peter Scott that have all influenced my desire to become a "big T" teacher, conducting this self-study

has shown me that I have taken only a few steps down the path of being an environmental educator *for* the environment. In closing, I must also always remember Scott's words: "The conservationist's most important task, if we are to save the earth, is to educate."

Chapter 6 - Conclusion

6.1 Introduction

This chapter is the conclusion to the thesis; I will summarize the research, discuss the implications of the study, the limitations and then close this chapter with my concluding thoughts on the journey this research has provided me.

6.2 Research summary

The focus of this research has been to critically evaluate aspects of my planning and implementation of an environmental issues based course, in particular the teaching practices and the reason for these practices. Chapter 1 described the meandering yet purposeful path that lead me to be a teacher and specifically an environmental educator. The literature review in Chapter 2 provided the background information for the development of the Current Environmental Topics in Science course, starting with my definition of environmental education. I followed that definition with the curriculum theory behind the course, and the supports/barriers to educational change. Chapter 3 provided the outline of the research methodology for a practical inquiry through self-study as well as the research instruments I used for analyzing the data in Chapter 4. The data were presented in an unorthodox manner, as it was necessary to show the interconnectedness of the different layers of data being collected for the research questions. In chapter five, the three research questions are discussed with the support of the data and my critical friend.

6.3 Significance and implications

As with all self-studies, the significance of this research is personal in nature and of most importance to my own teaching practice. While I can discuss what I learned from this journey and the impact it has had on my own practice, the specific results and implications are not easily transferred to another teacher. As outlined by Samaras (2010), the fifth foci of self-study methodology is to generate knowledge and presentation of the research findings. Going through the process and methodology of a self-study has been a tremendous learning opportunity, and thus, this study, by example, can be of significance for others who are thinking of embarking on a critical study of their own practice. This study will aid in filling the gap identified in the research area of intended versus enacted curriculum from a systematic self-study approach.

The data for this self-study were collected during the implementation of one course that I taught in that school year. In regards to self-reflection and being critical of my own teaching practice it is important for me to ensure that the changes I have suggested for moving forward are changes that I make in all my classes – regardless of the subject content. The other courses, while they may be more rigid in terms of pre-determined curricular outcomes, have students who are disengaged, are struggling learners and/or may benefit from being asked deeper questions rather than being dismissed as not interested.

While other courses may have set curricular outcomes and have an academic orientation to their curriculum, there is still the possibility of balancing the set content with a personally relevant approach. The research I have conducted showed that while I had intentions of creating a course that had student driven content, there was a large

emphasis on academic content. This leads me to believe that it is possible to bring student negotiation of lessons into an academic oriented course.

Moving forward, as a result of this research, and in the interest of moving through Mezirow's phases of transformative learning, I have requested that the course be scheduled in the second semester to remove some of my own personal barriers to planning activities that are conducive to taking action; if the course in the second half of the year, I am hoping that the majority of the foundation learning can happen while the weather is not as conducive to being *in* the environment so the students can plan for and take action once it is more attractive to be outside. I have learned that, if I want my students to be engaged and active citizens willing to take a chance, I must also do the same.

6.4 Limitations

In chapter 3, I discussed the limitations of self-studies as not being reproducible because of their personal nature. Another limitation of this research in particular is that it was conducted on a single section of the course taught in one year. This limits the data collected to a specific time and set of students. If I were to conduct this research next year, 10 years from now or with a group of students in a different school, I may not have observed the same results. However, the constant in the data would be myself, and while the data may be have been different, my actions may have been the same. This is a limitation of a self-study, however, it also highlights the importance of conducting critical reflection of our practice to make us more effective and responsive for our students.

6.5 Closing

In earlier chapters I discussed that I wanted my teaching to have consequence on my students and that this research would be an opportunity for me to set a frame of reference for my own learning and that of my students. This self-study has been a valuable process to developing my teaching practice. As teachers, the best way to grow and be the most effective we can is to critically look at ourselves, what we are doing in our classrooms, and the impact our practice has on our students. I started this journey thinking that I was effectively educating students about current environmental issues and preparing them to be educated citizens on the issues. As a result of this research, I have come to the conclusion that, there is a lot more I can do and must do if I want to live up to Sir Peter Scott's statement: "The conservationist's most important task, if we are to save the earth, is to educate". More importantly, there is much more I need to do before I become the Teacher I aspire to be.

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Appendix A

Course outline for Current Environmental Topics in Science, 2010/2011

ENVIRONMENTAL TOPICS IN SCIENCE 30S

Teacher: Ms. Moffatt **Room 308**

This is a course designed to give students a broader understanding and exploration of environmental issues in science. Students will have input into the topics they learn about and will be expected to actively participate in a number of individual, group, community and global projects to earn credit in the course. Because of this, the content will change year to year, however the general learning outcomes will remain the same. Assessment will be in the form of presentations, journals, personal learning log/journal, lab activities, assignments, research projects and possible fieldwork.

As a student it is important that you are aware of the following guidelines and expectations:

Student behaviour:

It is expected that students will put in a strong, persona effort into their class work, assignments and studies. They are expected to be cooperative and respectful in their dealings with other students and the teacher. Rude, disrespectful behaviour will not be tolerated.

Equipment:

Students are responsible for coming to class prepared to learn, discuss and participate in class. Students will leave their personal journal in class.

Attendance and Assignments:

Students are expected to come to class on time and stay the entire period. If a student misses class, it is their responsibility to check with the teacher or other students to get caught up. If a student misses a test or major assignment, they will receive a zero (0) unless:

1. the absence is a pre-approve school activity.
2. the teacher has been notified in advance.

*note: it is the student's responsibility to make arrangements for missed tests and assignments.

Marks:

The marks for the course will be distributed approximately in the following manner:

Personal journal	50%
Group projects/labs	30%
Individual assignments	20%

Signature:

I have read the above information and I am aware of this course's expectations and guidelines.

Appendix B

Table of General and Specific Learning outcomes for Senior 3 Current Topics in the Sciences.
From Manitoba Education, Citizenship and Youth, 2006, p. 79**.**

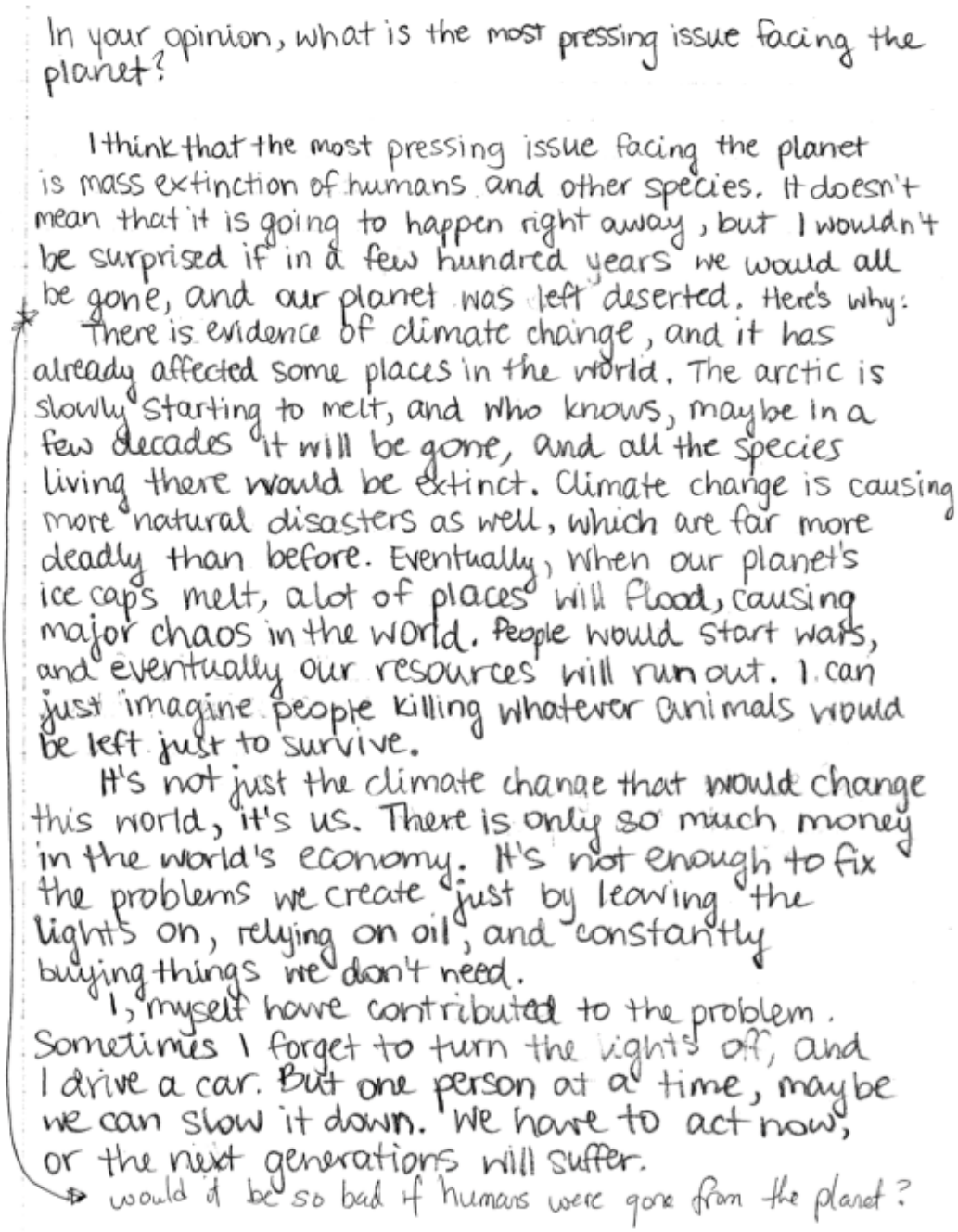
General and Specific Learning Outcomes for Senior 3 Current Topics in the Sciences

GLO A:	**NATURE OF SCIENCE AND TECHNOLOGY** Differentiate between science and technology, recognizing their strengths and limitations in furthering our understanding of the world, and appreciate the relationship between culture and technology.
SLO A1:	Distinguish critically between science and technology in terms of their respective contexts, goals, methods, products, and values.
SLO A2:	Recognize both the power and limitations of science as a way of answering questions about the world and explaining natural phenomena.
SLO A3:	Identify and appreciate the manner in which history and culture shape a society's philosophy of science and its creation or use of technology.
SLO A4:	Recognize that science and technology interact and evolve, often advancing one another.
SLO A5:	Describe and explain disciplinary and interdisciplinary processes used to enable us to investigate and understand natural phenomena and develop technological solutions.
GLO B:	**SCIENCE, TECHNOLOGY, SOCIETY, AND THE ENVIRONMENT** Explore problems and issues that demonstrate interdependence among science, technology, society, and the environment.
SLO B1:	Describe scientific and technological developments, past and present, and appreciate their impact on individuals, societies, and the environment, both locally and globally.
SLO B2:	Recognize that scientific and technological endeavours have been, and continue to be, influenced by human needs and by societal and historical contexts.
SLO B3:	Identify the factors that affect health and explain the relationships of personal habits, lifestyle choices, and human health, both individual and social.
SLO B4:	Demonstrate a knowledge of, and personal consideration for, a range of possible science- and technology-related interests, hobbies, and careers.
SLO B5:	Identify and demonstrate actions that promote a sustainable environment, society, and economy, both locally and globally.
GLO C:	**SCIENTIFIC AND TECHNOLOGICAL SKILLS AND ATTITUDES** Demonstrate appropriate inquiry, problem-solving, and decision-making skills and attitudes for exploring scientific and/or technological issues and problems.
SLO C1:	Demonstrate appropriate scientific inquiry skills, attitudes, and practices when seeking answers to questions.
SLO C2:	Demonstrate appropriate technological problem-solving skills and attitudes when seeking solutions to challenges and problems related to human needs.
SLO C3:	Demonstrate appropriate critical thinking and decision-making skills and attitudes when choosing a course of action based on scientific and technological information.
SLO C4:	Employ effective communication skills and use a variety of resources to gather and share scientific and technological ideas and data.
SLO C5:	Work cooperatively with others and value their ideas and contributions.
GLO D:	**ESSENTIAL CONCEPTS** Explore, understand, and use scientific knowledge in a variety of contexts.
SLO D1:	Use the concepts of similarity and diversity for organizing our experiences with the world.
SLO D2:	Recognize that the universe comprises systems and that complex interactions occur within and among these systems at many scales and intervals of time.
SLO D3:	Understand the processes and conditions in which change, constancy, and equilibrium occur.
SLO D4:	Understand how energy is the driving force in the interaction of materials, processes of life, and the functioning of systems.

Appendix C

Student journal entries not included in Chapter 4 – Data.

4.3.2 BIG IDEA #2: Identifying environmental issues.



In your opinion, what is the most pressing issue facing the planet?

I think that the most pressing issue facing the planet is mass extinction of humans and other species. It doesn't mean that it is going to happen right away, but I wouldn't be surprised if in a few hundred years we would all be gone, and our planet was left deserted. Here's why:

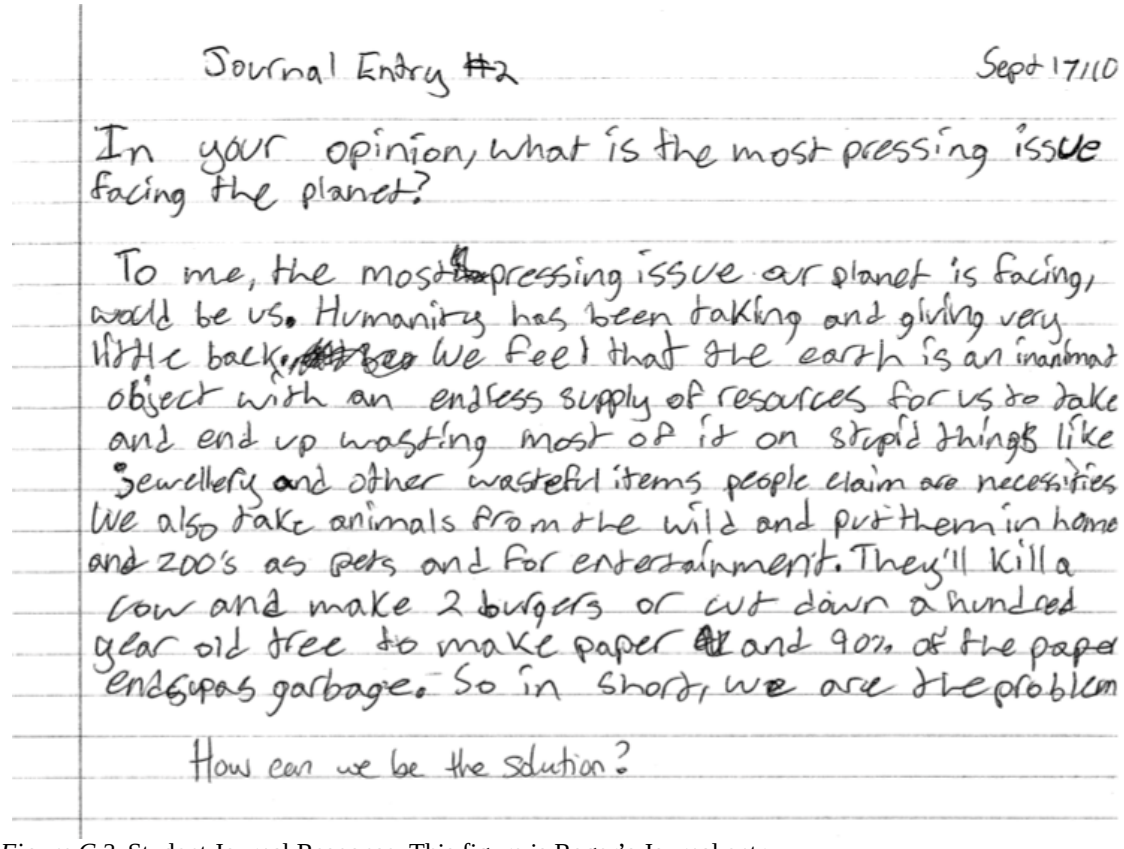
There is evidence of climate change, and it has already affected some places in the world. The arctic is slowly starting to melt, and who knows, maybe in a few decades it will be gone, and all the species living there would be extinct. Climate change is causing more natural disasters as well, which are far more deadly than before. Eventually, when our planet's ice caps melt, a lot of places will flood, causing major chaos in the world. People would start wars, and eventually our resources will run out. I can just imagine people killing whatever animals would be left just to survive.

It's not just the climate change that would change this world, it's us. There is only so much money in the world's economy. It's not enough to fix the problems we create just by leaving the lights on, relying on oil, and constantly buying things we don't need.

I, myself have contributed to the problem. Sometimes I forget to turn the lights off, and I drive a car. But one person at a time, maybe we can slow it down. We have to act now, or the next generations will suffer.

→ would it be so bad if humans were gone from the planet?

Figure C.1. Student Journal Response. This figure is Claire's Journal entry.


Journal Entry #2 Sept 17/10

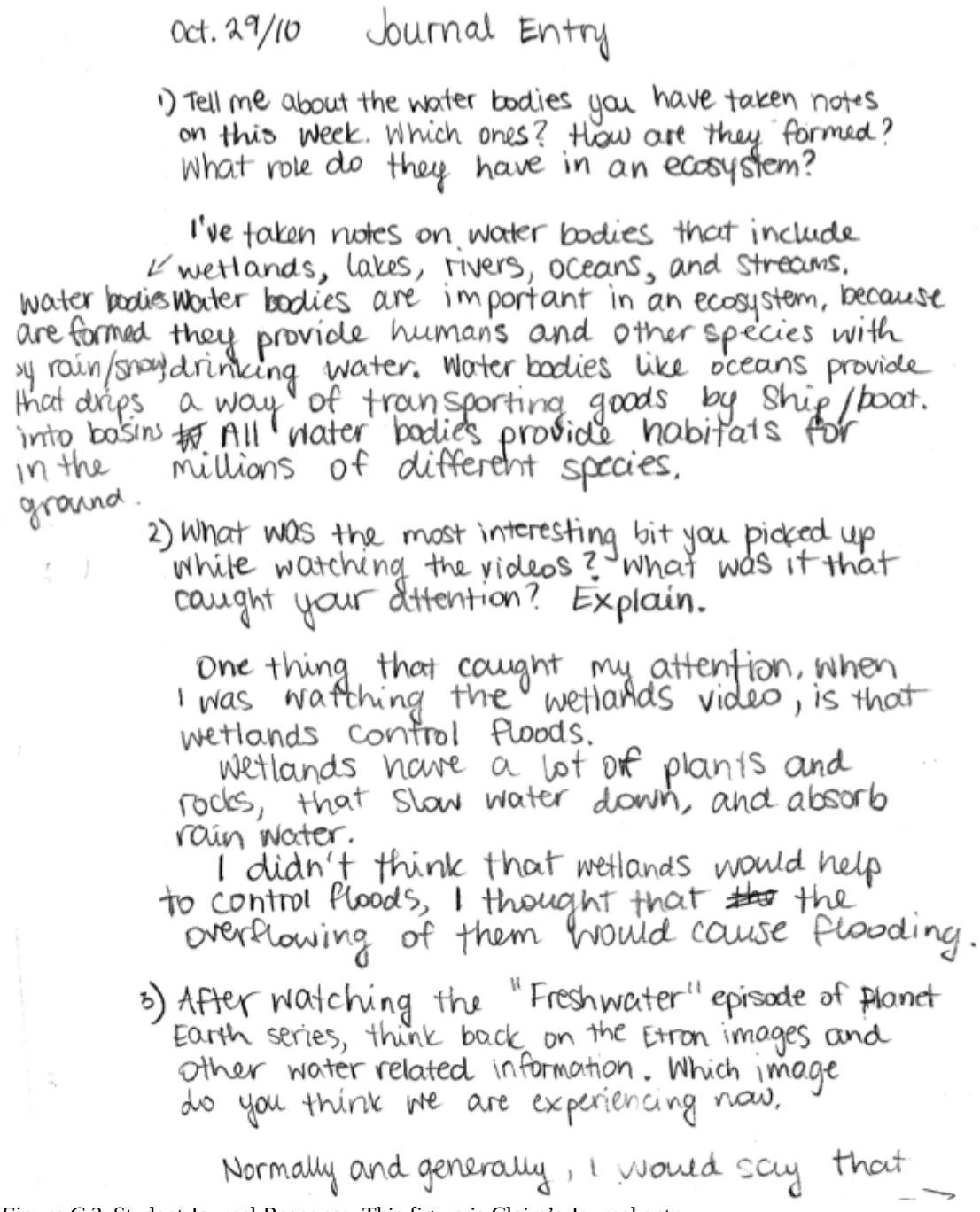
In your opinion, what is the most pressing issue facing the planet?

To me, the most pressing issue our planet is facing, would be us. Humanity has been taking and giving very little back. We feel that the earth is an inanimat object with an endless supply of resources for us to take and end up wasting most of it on stupid things like jewellery and other wasteful items people claim are necessities We also take animals from the wild and put them in home and zoo's as pets and for entertainment. They'll kill a cow and make 2 burgers or cut down a hundred year old tree to make paper and 90% of the paper ends up as garbage. So in short, we are the problem

How can we be the solution?

Figure C.2. Student Journal Response. This figure is Roger's Journal entry.

4.3.7 BIG IDEA! #7: Water systems



Oct. 29/10 Journal Entry

1) Tell me about the water bodies you have taken notes on this week. Which ones? How are they formed? What role do they have in an ecosystem?

I've taken notes on water bodies that include wetlands, lakes, rivers, oceans, and streams. Water bodies are important in an ecosystem, because they provide humans and other species with drinking water. Water bodies like oceans provide a way of transporting goods by ship/boat. All water bodies provide habitats for millions of different species.

water bodies are formed by rain/snow that drips into basins in the ground.

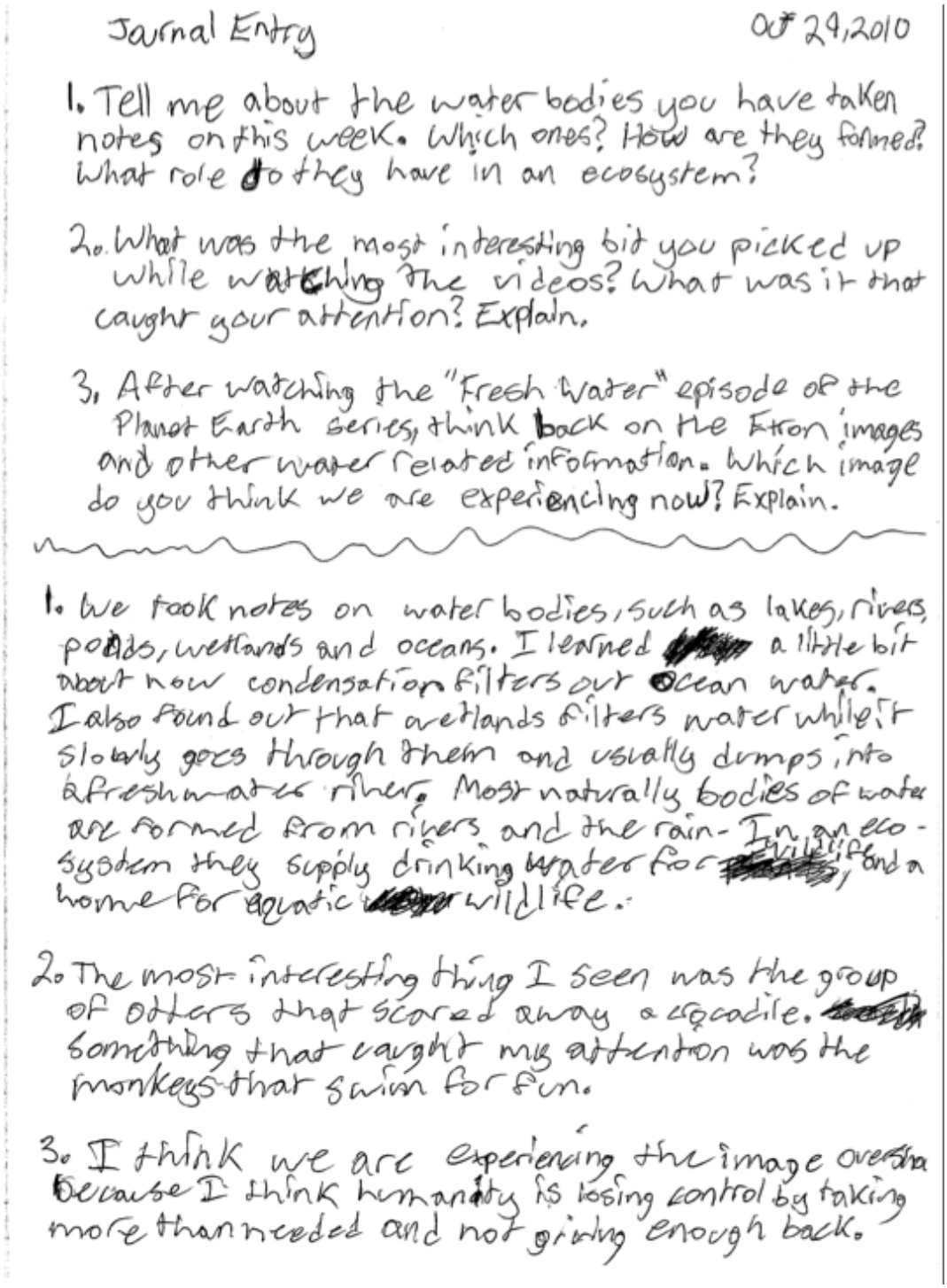
2) What was the most interesting bit you picked up while watching the videos? What was it that caught your attention? Explain.

One thing that caught my attention, when I was watching the wetlands video, is that wetlands control floods.
Wetlands have a lot of plants and rocks, that slow water down, and absorb rain water.
I didn't think that wetlands would help to control floods, I thought that the overflowing of them would cause flooding.

3) After watching the "Freshwater" episode of Planet Earth series, think back on the Etron images and other water related information. Which image do you think we are experiencing now.

Normally and generally, I would say that →

Figure C.3. Student Journal Response. This figure is Claire's Journal entry.



Journal Entry Oct 29, 2010

1. Tell me about the water bodies you have taken notes on this week. Which ones? How are they formed? What role do they have in an ecosystem?

2. What was the most interesting bit you picked up while watching the videos? What was it that caught your attention? Explain.

3. After watching the "Fresh Water" episode of the Planet Earth series, think back on the Etron images and other water related information. Which image do you think we are experiencing now? Explain.

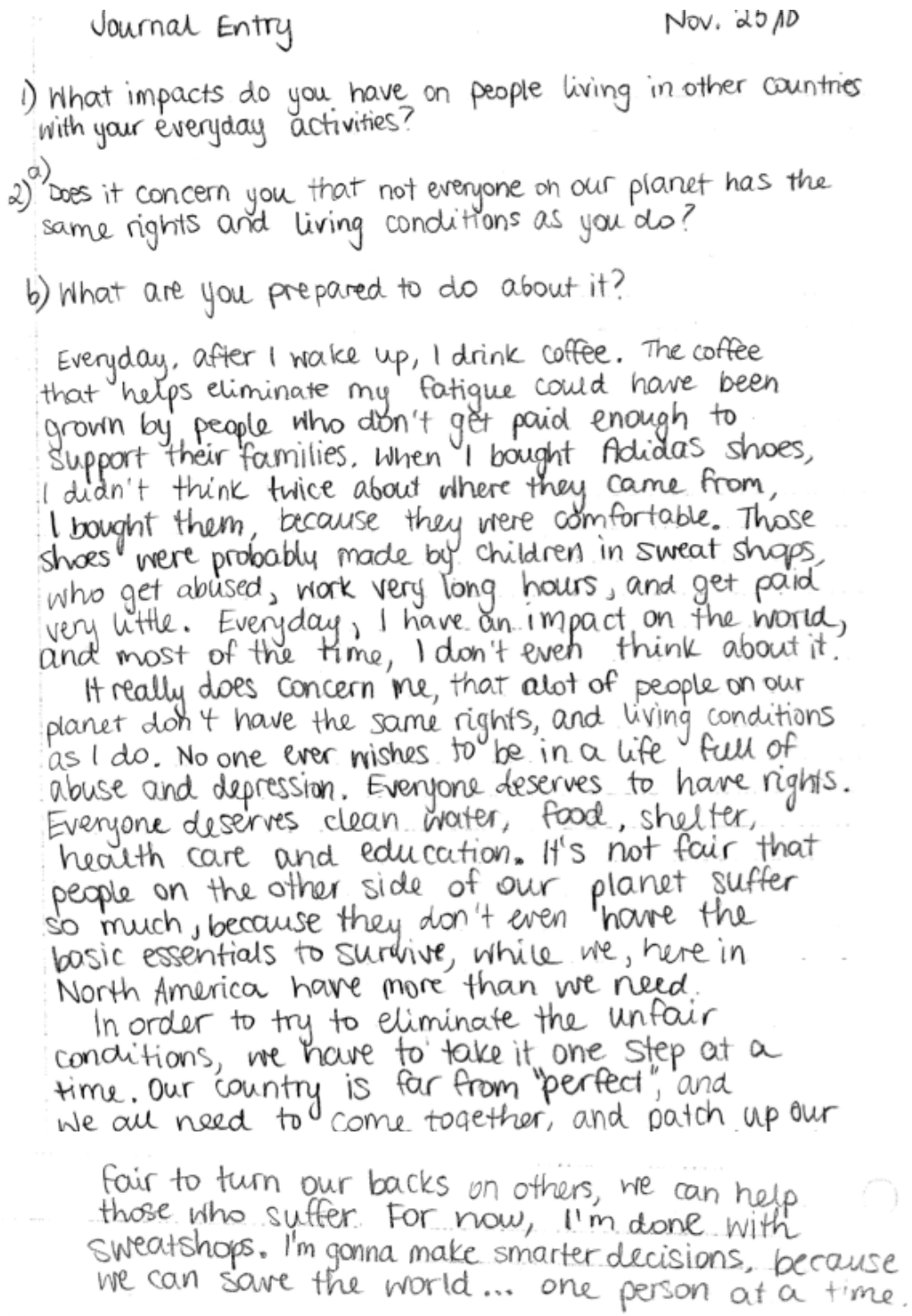
1. We took notes on water bodies, such as lakes, rivers, ponds, wetlands and oceans. I learned a little bit about how condensation filters our ocean water. I also found out that wetlands filters water while it slowly goes through them and usually dumps into a freshwater river. Most naturally bodies of water are formed from rivers and the rain. In an eco-system they supply drinking water for [redacted] and a home for aquatic wildlife.

2. The most interesting thing I seen was the group of otters that scared away a crocodile. Something that caught my attention was the monkeys that swim for fun.

3. I think we are experiencing the image overfra because I think humanity is losing control by taking more than needed and not giving enough back.

Figure C.4. Student Journal Response. This figure is Roger's Journal entry.

4.3.11 BIG IDEA! #11: Globalization



Journal Entry Nov. 25/10

1) What impacts do you have on people living in other countries with your everyday activities?

2) a) Does it concern you that not everyone on our planet has the same rights and living conditions as you do?

b) What are you prepared to do about it?

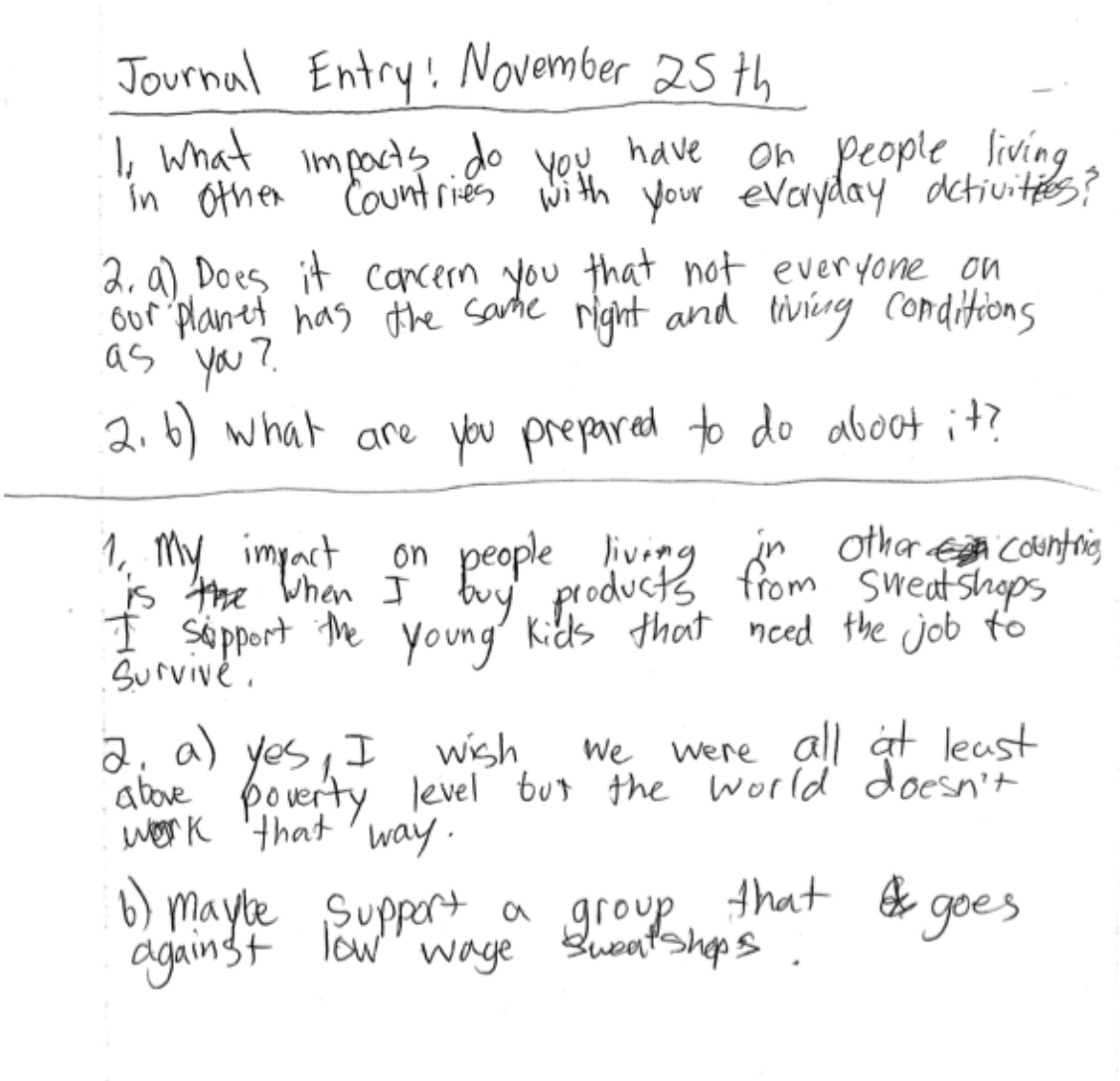
Everyday, after I wake up, I drink coffee. The coffee that helps eliminate my fatigue could have been grown by people who don't get paid enough to support their families. When I bought Adidas shoes, I didn't think twice about where they came from, I bought them, because they were comfortable. Those shoes were probably made by children in sweat shops, who get abused, work very long hours, and get paid very little. Everyday, I have an impact on the world, and most of the time, I don't even think about it.

It really does concern me, that alot of people on our planet don't have the same rights, and living conditions as I do. No one ever wishes to be in a life full of abuse and depression. Everyone deserves to have rights. Everyone deserves clean water, food, shelter, health care and education. It's not fair that people on the other side of our planet suffer so much, because they don't even have the basic essentials to survive, while we, here in North America have more than we need.

In order to try to eliminate the unfair conditions, we have to take it one step at a time. Our country is far from "perfect", and we all need to come together, and patch up our

fair to turn our backs on others, we can help those who suffer. For now, I'm done with sweatshops. I'm gonna make smarter decisions, because we can save the world... one person at a time.

Figure C.5 .Student Journal Response. This figure is Claire's Journal entry.


Journal Entry: November 25th

1. What impacts do you have on people living in other countries with your everyday activities?

2. a) Does it concern you that not everyone on our planet has the same right and living conditions as you?

2. b) what are you prepared to do about it?

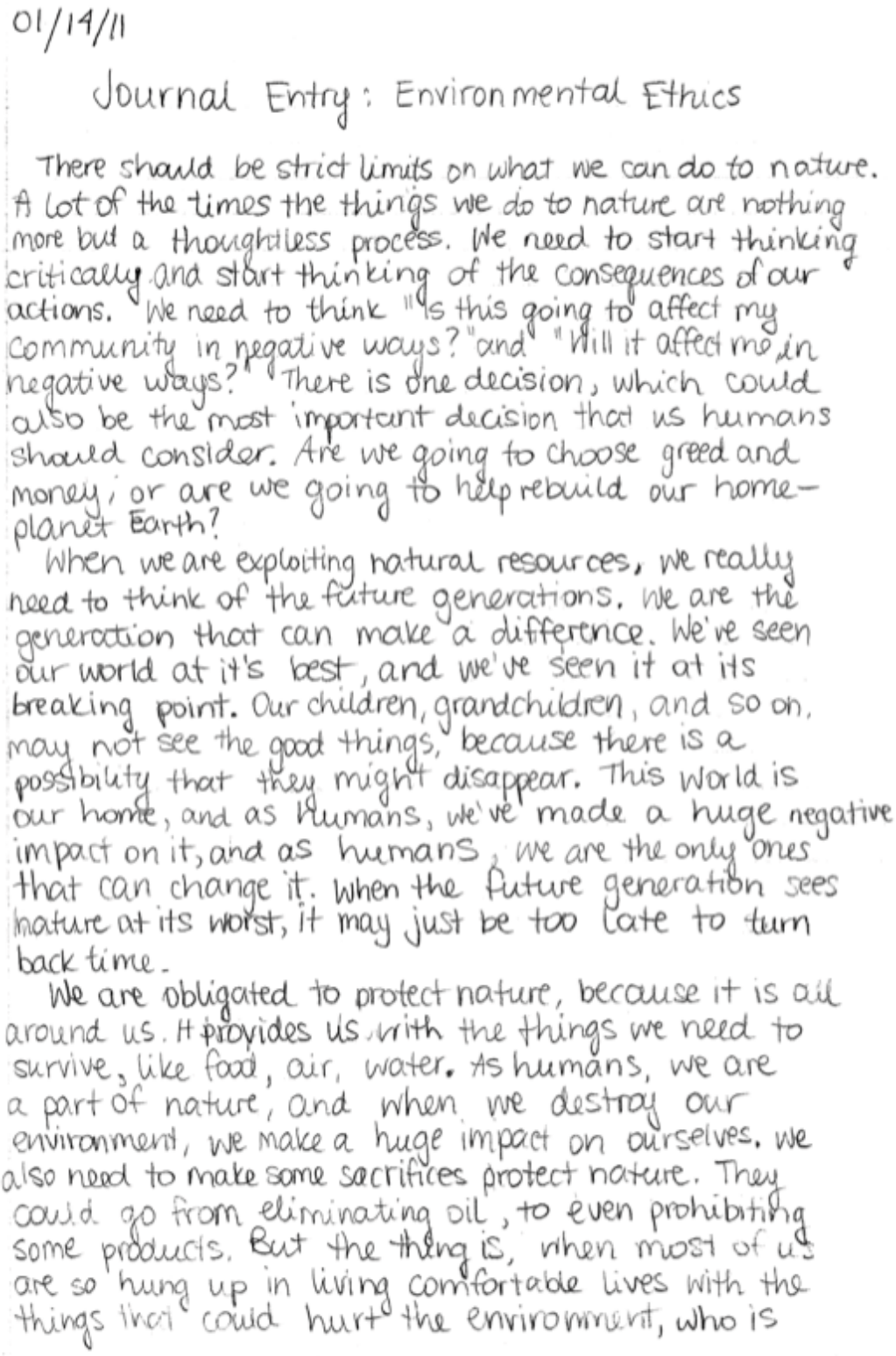
1. My impact on people living in other countries is when I buy products from sweatshops I support the young kids that need the job to survive.

2. a) yes, I wish we were all at least above poverty level but the world doesn't work that way.

b) Maybe support a group that goes against low wage sweatshops.

Figure C.6. Student Journal Response. This figure is Jamie's Journal entry.

4.3.16 BIG IDEA! #15: Environmental Ethics



01/14/11

Journal Entry: Environmental Ethics

There should be strict limits on what we can do to nature. A lot of the times the things we do to nature are nothing more but a thoughtless process. We need to start thinking critically and start thinking of the consequences of our actions. We need to think "Is this going to affect my community in negative ways?" and "Will it affect me in negative ways?" There is one decision, which could also be the most important decision that us humans should consider. Are we going to choose greed and money, or are we going to help rebuild our home-planet Earth?

When we are exploiting natural resources, we really need to think of the future generations. We are the generation that can make a difference. We've seen our world at it's best, and we've seen it at its breaking point. Our children, grandchildren, and so on, may not see the good things, because there is a possibility that they might disappear. This World is our home, and as Humans, we've made a huge negative impact on it, and as humans, we are the only ones that can change it. When the future generation sees nature at its worst, it may just be too late to turn back time.

We are obligated to protect nature, because it is all around us. It provides us with the things we need to survive, like food, air, water. As humans, we are a part of nature, and when we destroy our environment, we make a huge impact on ourselves. We also need to make some sacrifices protect nature. They could go from eliminating oil, to even prohibiting some products. But the thing is, when most of us are so hung up in living comfortable lives with the things that could hurt the environment, who is

Figure C.7.1. Student Journal Response. This figure is Claire's Journal entry.

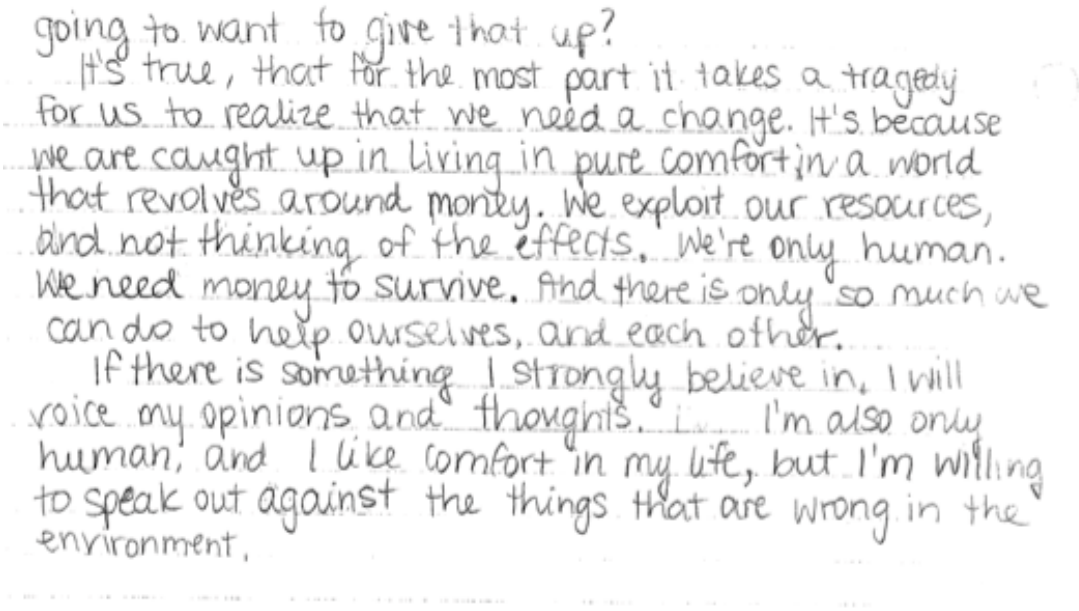
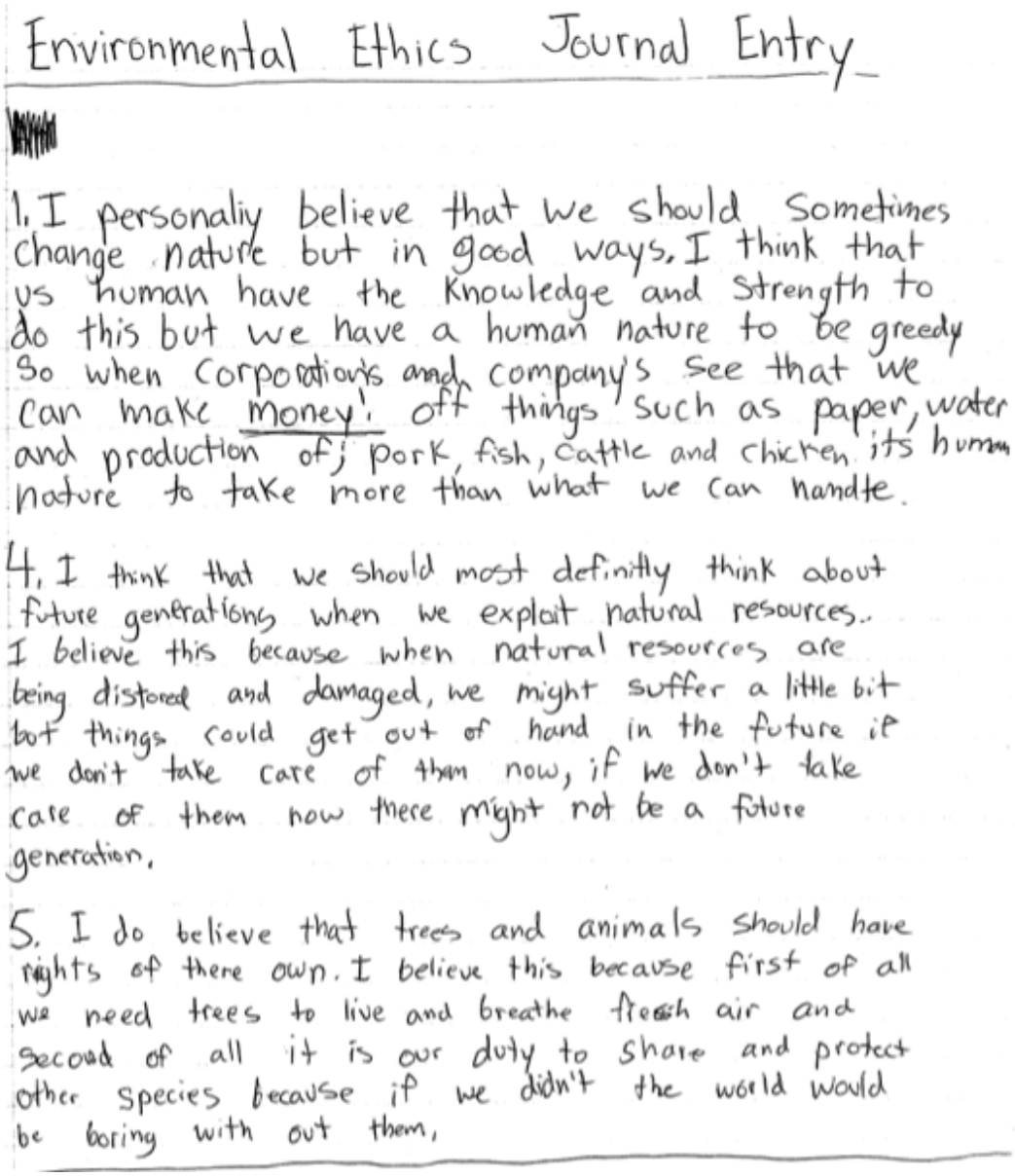

going to want to give that up?
It's true, that for the most part it takes a tragedy for us to realize that we need a change. It's because we are caught up in living in pure comfort in a world that revolves around money. We exploit our resources, and not thinking of the effects. We're only human. We need money to survive. And there is only so much we can do to help ourselves, and each other.
If there is something I strongly believe in, I will voice my opinions and thoughts. I'm also only human, and I like comfort in my life, but I'm willing to speak out against the things that are wrong in the environment.

Figure C.7.2. Student Journal Response. This figure is Claire's Journal entry continued.



Environmental Ethics Journal Entry

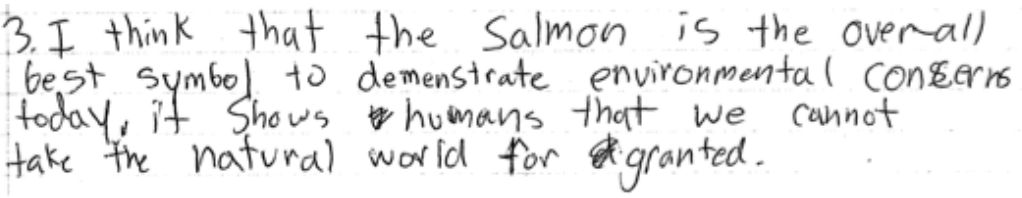
1. I personaliy believe that we should Sometimes change nature but in good ways. I think that us human have the Knowledge and Strength to do this but we have a human nature to be greedy So when Corporations and company's see that we can make money off things such as paper, water and production of pork, fish, cattle and chicken its humm nature to take more than what we can handle.

4. I think that we should most definitly think about future generations when we explait natural resources.. I believe this because when natural resources are being distored and damaged, we might suffer a little bit but things could get out of hand in the future if we don't take care of them now, if we don't take care of them now there might not be a future generation.

5. I do believe that trees and animals should have rights of there own. I believe this because first of all we need trees to live and breathe fresh air and second of all it is our duty to share and protect other species because if we didn't the world would be boring with out them.

Figure C.8. Student Journal Response. This figure is Jamie's Journal entry.

4.3.17 BIG IDEA! #17: Final week - summary journal entries



3. I think that the Salmon is the overall best symbol to demenstrate environmental conserns today, it Shows humans that we cannot take the natural world for granted.

Figure C.9. Student Journal Response. This figure is Jamie's Journal entry.

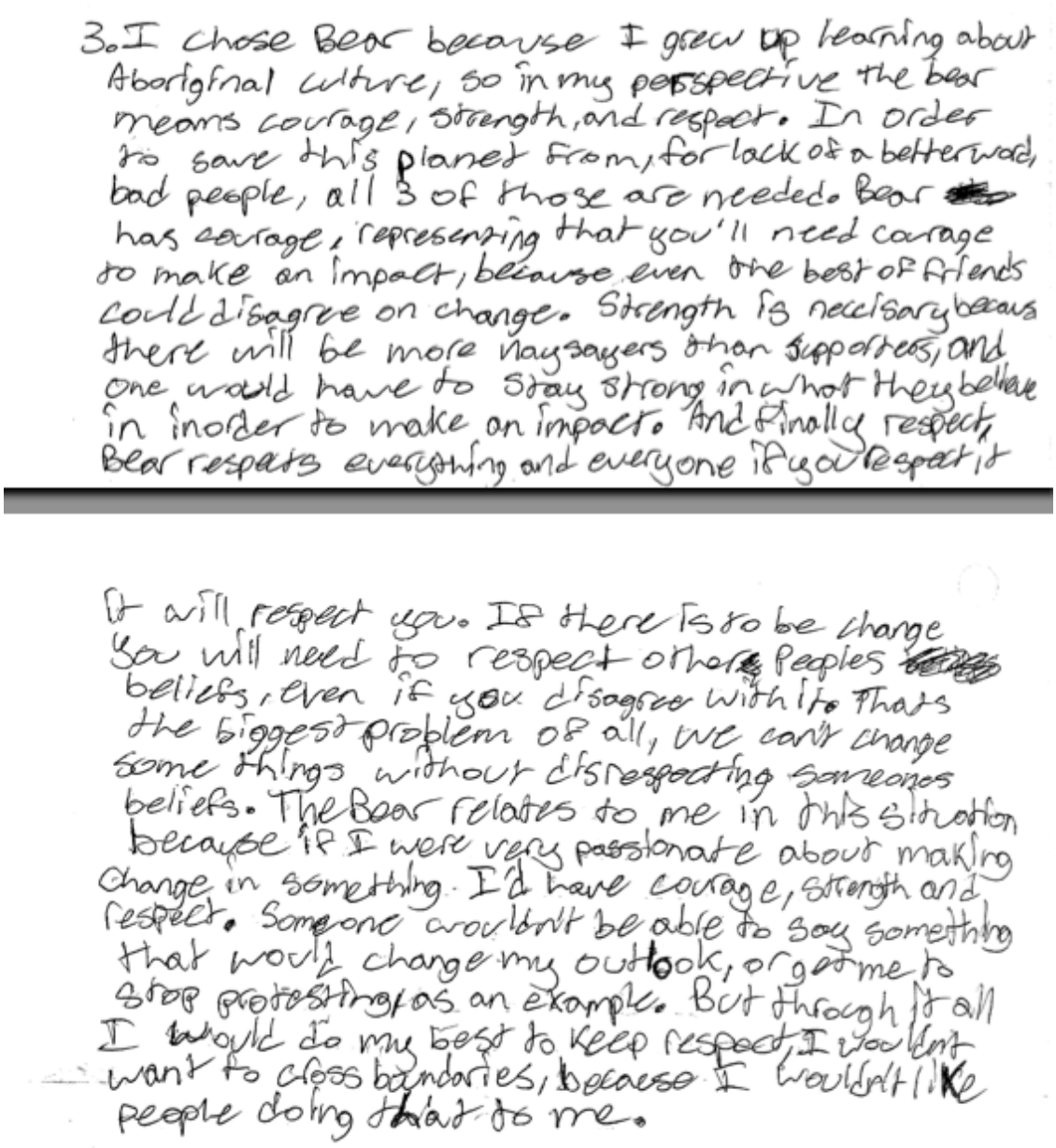


Figure C.10. Student Journal Response. This figure is Roger's Journal entry.

Appendix D:

Complete listing of Student Journal entries.

4.3.1 BIG IDEA #1: Intro activities

- **Journal Entry 16.09.10**

1. What does "nature" mean to me?
2. What does "environment" mean to me?
3. What does "sustainable" mean to me?

4.3.2 BIG IDEA! #2: Identifying Environmental issues

- **Journal Entry 17.09.10**

In your opinion, what is the most pressing issue facing the planet?

4.3.3 BIG IDEA! #3: Personal choices have an impact

- **Journal entry 24.09.10**

Are you likely to make informed choices regarding environmentally friendly products? Why or why not?

4.3.4 BIG IDEA! #4: Healthy Water

- **Journal entry 28.09.10**

Questions about Cholera outbreak in London, 1854.

- **Journal entry 05.10.10**

Deadly water – The lessons of Walkerton

4.3.5 BIG IDEA! #5: How safe is our drinking water?

- **Journal entry 13.10.10**

Drinking Water tests questions

- **Journal entry 14.10.10**

Drinking water treatment questions.

4.3.6 BIG IDEA! #6: Aquatic Ecology

- **No Journal entry**

4.3.7 BIG IDEA! #7: Water systems

- **Journal entry 29.10.10**

Tell me about the water bodies you have taken notes on this week. Which ones? How are they formed? What role do they have in an ecosystem?

4.3.8 BIG IDEA! #8: Global Warming and Climate change

- **Journal entry 01.11.10**

Take 5 minutes to write everything down (at least 5 things) you know, heard/read about climate change.

- **Journal entry 05.11.10**

Some people say that there is no "debate" about global warming and climate change. Now that you have seen *An Inconvenient Truth* and *The Great Global Warming Swindle*, where do you stand on the issue?

4.3.9 BIG IDEA! #9: Media Influences on public knowledge

- **Journal entry 08.11.10**

Global warming in the media

- **Journal entry 12.11.10**

Questions about the "myth" of global warming.

4.3.10 BIG IDEA! #10: Consumerism - Stuff

- **Journal entry 16.11.10**

Daily consumption

- **Journal entry 17.11.10**

Self-assessment

- **Journal entry 19.11.10**

Environmental/sustainability and Monopoly.

4.3.11 BIG IDEA! #11: Globalization

- **Journal entry 23.11.10**

List of basic rights

- **Journal entry 25.11.10**

1. What impacts do you have on people living in other countries with your everyday activities?
2. Does it concern you that not everyone on our planet has the same rights and living conditions as you do?
3. What are you prepared to do about it?

- **Journal entry 29.11.10**
The Corporation notes

- **Journal entry 2.12.10**
Questions about *The Corporation*

4.3.11 BIG IDEA! #11: Globalization

- **Journal entry 3.12.10**
Selling of Nature assignment

4.3.13 BIG IDEA! #13: Biodiversity

- **Journal entry 8.12.10**
Species at Risk questions.

4.3.14 BIG IDEA! #14: Conserving Biodiversity: Species at risk

- **Journal entry 14.12.10**
Conservation of biodiversity.

4.3.16 BIG IDEA! #15: The power of one/ Environmental Ethics

- **Journal entry 11.01.11**
Life After People.

- **Journal entry 12.01.11**
Food Inc. worksheet

- **Journal entry 14.01.11**
Environmental Ethics.

4.3.17 BIG IDEA! #16: What are you willing to do?

- **Journal entry 18.01.11**
Where do you draw the line?

- **Journal entry 26.01.11**
Final entry #1 Genetically modified foods

4.3.17 BIG IDEA! #17: Final week – finish projects/summary journal entries

- **Journal entry 26.01.11**
Final entry #1 handout

- **Journal entry 27.01.11**

Final entry #2

1. How does the above quote from Wangari Maathai demonstrate what has been expected of you in the Current Environmental Topics? Use specific examples of activities, projects, topics and discussions we have had in class to support your answer.
2. As a society, do you think we put enough value on the natural world? Use examples of water quality, climate change, biodiversity and the Ecospherotron to support your answer.
3. Raven, Salmon, Dragon and Bear are all symbols that can be used to represent environmental concerns today. Explain which one you think best represents these issues and concerns and your role in them.

- **Journal entry 27.01.11**

Bonus Final entry

1. What does "nature" mean to me?
2. What does "environment" mean to me?
3. What does "sustainable" mean to me?
4. How do your answers compare to the beginning of this course?