ENHANCING THE DEVELOPMENT OF *SENSE OF PLACE* USING REFLECTIVE FIELD JOURNAL TECHNIQUES DURING A TRAVELING SCHOOL SEMESTER

by

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ABSTRACT

This project evaluated the effects of field journaling techniques in the natural science class at The Traveling School. Students that participate in a Traveling School semester are inclined to make strong connections to the areas they travel in by learning about their surroundings. This study examined the impact of specific techniques that enhanced metacognitive reflection through field journaling techniques and formative assessment. These teaching techniques impacted not only students *sense of place* in southwestern Africa, but also student development of *sense of place* when they returned to their home town/region at the end of the semester. Each student participated in surveys measuring place attachment and place meaning for their home town/region. Additionally, students participated in interviews and questionnaires. Colleagues provided best practices of teaching with science field journals, as well as input on formative assessment techniques. Surveys pre and post treatment showed minimal overall change in student perceptions of *sense of place*. Interviews, observations and colleague feedback showed support that field journaling techniques enhanced student learning and connection to their home town/region.

INTRODUCTION AND BACKGROUND

Project Background

For the past three years, I have worked for a private high school called The Traveling School (TTS) based in Bozeman, Montana. TTS is a study-abroad program for high school females. There are typically 14-16 students per semester. The students are mostly from the United States, representing high schools across the country. Occasionally there is an international student. The students range in age from 15-17 years, and range in grade level from 10th through 12th grade. Academic level varies as this is based upon individual learning styles as well as grade level. Students typically join TTS for one semester of their high school career. Each semester, TTS travels to developing countries, embracing experiential education.

In the fall semester of 2011, I traveled to southwestern Africa as the Academic Program Director and teacher for TTS. We spent three and a half months traveling through and learning about the unique environments of South Africa, Namibia and Botswana. The student to teacher ratio for the semester was four to one. A total of eight subjects were taught, including a natural science course. The natural science course followed Montana State Standards, and was designed to take advantage of the natural environment where we traveled. There were four main units in the natural science course including Introduction to Field Science, Population Ecology, Geology and Conservation Biology & Land Management.

Developing a *sense of place* was a goal of the natural science course. By having students connect with their surroundings in southwestern Africa, they would ideally each

began a process of being more aware, active, and environmentally conscious citizens upon returning home. Past (informal) conversations with students and observations over three semesters, showed that the hands-on experiences and real-life applications of the natural science class helped students connect to their surroundings. This response was predictable as the nature of this program physically places the students in the environments they learn about including the savannah, ocean or sand dune desert. Unlike the connection to the immediate physical locations of the semester, it was less clear how the students' experience and connection to their surroundings while in southwestern Africa would create a drive to connect with their surroundings back at home. For the fall semester of 2011, I saw the potential that the natural science class could provide the students to help make the connection to the environment back home and expand upon their desire to learn more about their surroundings. I examined my current teaching methods and assessment techniques including the use of the science field journal.

In previous semesters with TTS, I had coached the students in using a field journal for observational entries. Typical entries included examinations of plants and animals as well as landscapes representative of a variety of biomes. The journals were seen as a tool to enhance the understanding of the surrounding environment and support the place-based design of the units. As I prepared for the fall 2011 semester with TTS, I wondered if the use of field journals could be modified to also serve the purpose of student reflection and metacognition. I was interested in redeveloping the field journal as a tool for student reflection, formative assessment and ideally a starting point for developing a *sense of place* both in southwestern Africa and in the United States.

Focus Question

An interest in how to best help students develop lifelong passion as active, environmental citizens led me to my primary focus question: Will the incorporation of reflective practices enhance students' learning and development of *sense of place*? Furthermore, I wanted to know how the use of field journals and incorporation of formative assessment could develop and enhance reflective practices.

CONCEPTUAL FRAMEWORK

As our world becomes increasingly globalized and population growth puts pressure on our environment, the importance for youth to grow up as environmentally conscious citizens is imperative. Youth need to develop a connection with their surroundings to be inspired as environmentally active citizens in their communities (Woodhouse & Knapp, 2000). If youth have proper guidance and they are able to expand their worldview to realize their environmental impact, they can become environmentally active citizens (Haas & Nachtigal, 1998). Connection or emotional attachment to a place will lead to the desire to protect that place and lead to awareness of environmental impacts (Ardoin, 2006). Through exploration of their surroundings, students are more likely to take an interest in the well being of their environment.

High School science classes are one avenue through which students have opportunities to explore their environment. Students who make connections with the land and their community have the opportunity to develop a closer relationship with their surroundings. One term for this connection between people and their surroundings is *sense of place*. *Sense of place* is an important piece of creating citizens that are

environmentally responsible (Ardoin, 2006). Connecting with nature helps students develop the idea that they are a key part of their surroundings (Lewicki, 1997). Not only does a development of *sense of place* link students with their immediate environment, but it also enhances their connection to the planet as a whole. As identified by Haas and Nachtigal (1998), if students study what is around them, they will create knowledge of the greater world.

Environmental education creates a link between students' connection to their surroundings and actions that are environmentally responsible (Ardoin, 2006). By helping the students develop a sense of respect for their surroundings, they will become active citizens no matter where they live (Haas & Nachtigal, 1998). The benefits are clear that developing a *sense of place* will enhance the connection to the greater world and immediate physical location.

Sense of place is loosely defined as the connection between people and places. People will develop emotional connections with places that are meaningful to them. *Sense of place* has two main components (Semken & Freeman, 2008). It can be defined as a combination of *place attachment* (knowledge of the place and what you know about your surroundings) and *place meaning* (attitudes, preferences, and feelings about the place). Ardoin further broke down *place attachment* and *place meaning* into four dimensions of *sense of place* (2006). The four dimensions are: "the biophysical environment, the personal/psychological element, the social and cultural context; and the political economic milieu" (p. 114). The biophysical setting provides the basis for all other dimensions. *Sense of place* would not exist without the physical surroundings of the environment.

Educators have the ability to help create the connection between students and their surroundings (Haas & Nachtigal, 1998). Place-based teaching utilizes the students' *sense of place* to develop knowledge and appreciation for sustainability of the environment (Semken & Freeman, 2008). When students connect with the environment, it happens in a specific place. Although developing a *sense of place* can be interdisciplinary, the initial connection to the physical place can easily be created through a natural science curriculum.

Environmental education is a term used for teaching students about the natural environment (Adkins, 2002). Place-based environmental education forms the basis of developing a *sense of place* for students (Semken & Freeman, 2008) and supports students' development of sustainable living within their communities (Woodhouse & Knapp, 2000). A study by Semken and Freeman (2008) researched the question: "Does place-based teaching enhance students' attachment to places and enrich the set of meanings these places hold for them?" (p. 1050). The study confirmed that *sense of place* could be successfully taught through place-based science education with *sense of place* used as a potential assessment measure for place-based science. It addressed students' *sense of place* before and after an undergraduate course in geology. Findings suggest that there could be an increase in *place attachment* and *place meaning* for students who participate in a local, culturally comprehensive, meaningful science course (Semken & Freeman, 2008).

There are several pedagogical practices that have been found to be effective methods to foster students' connection to place. One example is the creation of lesson plans that show interdependence of and connection of issues (Haas & Nachtigal, 1998).

With this practice, students can begin to develop the idea that all life on our planet is interdependent. They will see themselves as part of the system, not separate from the system (Haas & Nachtigal, 1998).

Another pedagogical practice states that teachers must provide students with knowledge about ecology of their surroundings (Lewicki, 1997). This curriculum forms the basis of having students analyze the scientific processes going on around them. Lewicki identified three strands of curriculum: the ecology strand, the thinking strand, and the social strand. The combination of these three strands of curriculum enhances students' understanding of the scientific processes surrounding them. The students observe their surroundings and gain a respect for their environment. This curriculum is utilized to meet the three main goals identified as creating a *sense of place*. The main goals are to develop value of that place, create a relationship with their surroundings and to create active citizens that demonstrate a commitment to creating change in their community and world (Lewicki, 1997).

To teach science curriculum that develops *sense of place*, there needs to be easy access to environments and opportunities to explore the outdoors (Ardoin, 2006). Enough time should be spent outside that allows students to synthesize the meaning of the place they are in (Semken & Freeman, 2008). To effectively develop a *sense of place*, students should actively works towards deepening their understanding of their surroundings. This can be accomplished through outdoor exploration and incorporating student self-evaluation into the curriculum. The ability to self-evaluate creates empowerment and accountability by the students (Lewicki, 1997).

Giving students time to reflect while in their surroundings enhances the development of a *sense of place*. The term *reflection* is not easily defined (Dyment & O'Connell, 2003; Quinton & Smallbone, 2010). In a study completed by Quinton and Smallbone (2010) regarding the use of feedback to promote student reflection and learning, they stated, "reflection is a mental process that incorporates critical thought about an experience and demonstrates learning that can be taken forward" (p. 126). There is no set definition of reflection. There are, however, many models to follow to incorporate student reflection into curriculum. In an attempt to narrow the focus of reflection practices, Grossman (2009) identified four types. They can be placed on a continuum and are based upon depth of the reflection. The four types are "content-based reflection, metacognitive reflection, self-authorship reflection, and transformative or intensive reflection" (p. 15).

Regardless of the definition or types, reflection is an important aspect of student growth. Stefani, Clarke and Littlejohn (2000) state that reflection is important because it provides "opportunities for students to develop a sense of ownership over their individual learning processes, and opportunities for self-assessment and reflection on their achievement such that they as learners can develop a sense of their own personal and professional development" (p. 3). Student reflection is a tool that, upon being well developed, will enhance the students' experience in their education and beyond. Getting students to apply course concepts to their own lives through reflection is "one of the best ways to deepen student learning" (Grossman, 2009, p. 1).

To encourage reflection, natural science educators have routinely looked to the benefits of journaling (Dyment & O'Connell, 2003). Journals can help deepen the

students' observations of their surroundings. According to Dyment and O'Connell (2010) "From an environmental perspective, journals can help students develop intimate connections with the more-than-human world as they learn to observe and record patterns and processes in the natural world" (p. 3). Journals can be utilized to observe and record patterns, but also as reflective tools. Student reflection in journals can enhance their understanding of their own learning process (Dyment & O'Connell, 2010).

There are varying opinions on how to utilize student reflective practices in journals. Grossman (2009) identifies *content-based scaffolding* to assist students in reaching a deeper level of reflection. Content-based scaffolding incorporates steps for the students to practice reflection itself thereby assisting in the creation of a reflective practice. Additionally, to develop a strong reflective practice, guidance from the teacher is needed.

Stefani, Clarke, and Littlejohn (2000) incorporated a reflection journal for students to analyze progress on a group project. They utilized a *free-flow* reflective record and found that there were not enough signs of constructive reflection. It was determined that there was not enough guidance with the journal expectations. With this study, there was no conclusion that the journal enhanced student reflection. Therefore, it is necessary to provide students with clear guidance and expectations for reflective journals (Grossman, 2009; Stefani et al., 2000). As Klentschy (2005) states, "written reflection is essential to promote student's explorations of their own thinking and learning processes, but [reflection] is often omitted if science notebooks are used primarily as logs for procedures and observations of their learning activities" (p. 3). Therefore, student journals need to be more than just logbooks. The process needs to be

heavily guided by the teacher. Dyment and O'Connell (2010) state that generating high levels of student reflection require "guidance, critique, mentoring, and reinforcement that comes from good feedback through the instructor's responses and assessment" (p. 238). Additionally, Mintz and Calhoun (2004) state "teachers can note students' growth over time as well as identify any misconceptions or incomplete learning that needs to addressed" (p. 33). Although significant teacher guidance is needed for successful reflective journaling, overall there are no conclusive studies demonstrating consistent high levels of reflection in student journals (Dyment & O'Connell, 2010). There is a gap in the literature regarding how teachers have successfully created high levels of reflection through use of student journals. However, there are several suggestions for teachers to utilize and techniques to follow when using student journals for reflection.

With the purpose and structure identified, teachers need to guide the students to utilize reflection in their journals well (Dyment & O'Connell, 2010; Gilbert and Kotelman, 2005). It is not easy to have deep and critical reflection. There are several factors that could enable highly reflective journals. These factors include the clarity of expectations, how the journal fits into the overall program of study, the journal audience and the assessment criteria and standards (Dyment & O'Connell, 2010). First and foremost the purpose of the journal needs to be identified. The journal can have several purposes, but these should be specifically laid-out to the students. For example, journals can be used for recording experience, facilitating learning from an experience, supporting understanding, developing critical thinking, encouraging meta-cognition, encouraging ownership or learning or enhancing problem solving skills (Dyment & O'Connell, 2010).

In a natural science classroom, students' reflection journals could also be their science notebooks. These notebooks can be beneficial at serving several purposes (Gilbert and Kotelman, 2005; Klentschy, 2005). Notebooks are tools for students to construct conceptual understanding and they empower them to be active in their learning (Gilbert & Kotelman, 2005). Notebooks can guide teacher instruction (formative assessment). Additionally, notebooks can enhance literacy and communication skills and they can support differentiated learning (Gilbert & Kotelman, 2005). Fulton and Campbell (2004) identify several techniques for student organization of science notebooks including: technical drawings and diagrams, notes and lists, charts, tables/graphs, and written observations. To enhance reflection, the notebook can be designed to have two distinct parts, an *input* and *output* (Chesbro, 2006). The *input* pages include class notes, homework assignments and laboratory notes. The *output* pages include processing the information in a personalized, reflective method. This includes the use of graphic organizers, creative formative assessment tools, summary exercises, and, in general, activities that use higher order thinking. The goal is that students are making a personal connection to the material (Chesbro, 2006).

The benefits of student reflective practices and incorporation of these practices into a science-based journal have been studied. Reflective practices are used to enhance students' depth of understanding and observation (Stefani, Clarke & Littlejohn, 2000). To create a *sense of place*, students need to develop observation skills and connect with their surroundings (Lewicki, 1997). The benefits of enhancing *sense of place* have been examined. The literature suggests that there is a link between student reflections through journaling that can enhance *sense of place*. Teachers have the opportunity to help

influence the youth of today to develop more connections with the world around them. If students gain a stronger environmental connection they are more likely to contribute to society as environmentally conscious citizens. The quality of our future depends upon educating youth to develop their *sense of place* and connection to their surroundings (Haas & Nachtigal, 1998).

METHODOLOGY

Treatment

This project was implemented in the natural science course during the fall 2011 TTS semester. Treatment implementation and data collection spanned the 15-week semester from September to December. Additionally, I collected data in March 2012; three months after the semester had ended. I had 10 students in my natural science course, including one sophomore, six juniors and three seniors. Two of the students were from Montana, while the other eight were from New Hampshire, New York, Connecticut, Indiana, Wyoming, Oregon, Washington and Norway. TTS provided partial needs-based scholarships to select students. The teachers were not aware of who the scholarships were distributed to. The research methodology for this project received an exemption by Montana State University's Institutional Review Board and compliance for working with human subjects was maintained.

I had three treatment areas in this study: unit and lesson plan development, adjusted field journal practices, and increased use of formative assessment practices. The treatment areas were designed to help my teaching methods increase students' learning and development of connection to place. To determine specific adjustments for my

treatment, I gained insight from a review of the literature as well as compiled best practices from former TTS natural science teachers.

Pre-Treatment: Teacher Questionnaire

Prior to beginning treatment in my study, I surveyed six previous TTS natural science teachers. Each of these teachers had taught the natural science class for TTS during the past 10 years. I collected data from the teachers in two ways: through archived lesson plans and through an online questionnaire. I utilized SurveyMonkey and created a nine question Best Practices Questionnaire (Appendix A). I sent the questionnaire via email and private Facebook message online. All six teachers responded. I structured the questionnaire to gain teacher input regarding field journaling techniques, assessment tools, reflective practices and development of *sense of place*. I was particularly interested in how the field journal had been used as an assessment tool. The open response structure of the questionnaire produced a variety of qualitative responses that I was able to analyze for patterns and associations with other data sources. Several themes and findings in analysis of the questionnaire aligned with best practices identified during the literature review. I utilized the findings from the questionnaire to reinforce and shape the field journal techniques and lesson plan development used in the treatment.

Treatment I: Lesson and Unit Plan Development

To enhance students' connection to place, I altered three of the four units to follow the curriculum themes identified by Lewicki (1997). The first unit, Introduction to Field Science, was not modified from previous practices. The remaining three units,

Population Ecology, Geology, and Conservation Biology & Land Management, were altered to include my treatment. I adjusted each unit to follow Lewicki's three curriculum strands: the ecology strand, the thinking strand, and the social strand. The ecology strand focused on students' learning about Earth systems. The thinking strand focused on the opportunity for students to analyze issues from a variety of perspectives. This allowed the students experience in demonstrating both their knowledge and ability to problem solve. The social strand was based upon developing the students' social connection with their surroundings and taking action within their community and world. To apply these concepts to each unit in the natural science class, I created lessons that combined these three strands. For example, in the Geology Unit Plan I developed several lesson plans per strand of curriculum (Appendix B). I matched the curriculum strands of Lewicki with specific lesson plans that enhanced each strand. To enhance study of the interaction between humans and nature, the Lesson Plan: Environmental Perspectives (Appendix C), focused on human interactions with land use and how attitudes and values shape perceptions.

Another example of matching lesson plans with curriculum strands was shown through lessons that emphasized the consequences of individual actions and implications of societal environmental issues. For students to gain knowledge of societal impacts, it was important to design lessons that examined issues from local, regional, national and international points of view. To enhance students' development of *sense of place* in their home region, I attempted to link environmental issues from southwestern Africa, with locations in their home country, through which students might feel a deeper connection. For example, the Lesson Plan: Biodiversity and Wildlife Management Issues in the US

and Namibia (Appendix D) highlighted similar wildlife management challenges that both countries face.

Treatment II: Field Journals

During the second treatment phase, the students used their field journal for two purposes, observations (labs, lectures) and reflection. To enhance reflection and student connection to the science content, I implemented a Field Journal Structure adapted from Chesbro (2006) where the left hand page was the *input* and the corresponding right hand page was the *output* (Appendix E). On the *input* side students included lecture notes, lab assignments and answers to reading questions. Students were guided to use the *output* side to process the information creatively. This was done through formative assessment activities, graphic organizers and reflective journaling through writing and drawing. An example of *input* and *output* pages from a student journal can be seen in Figure 1.

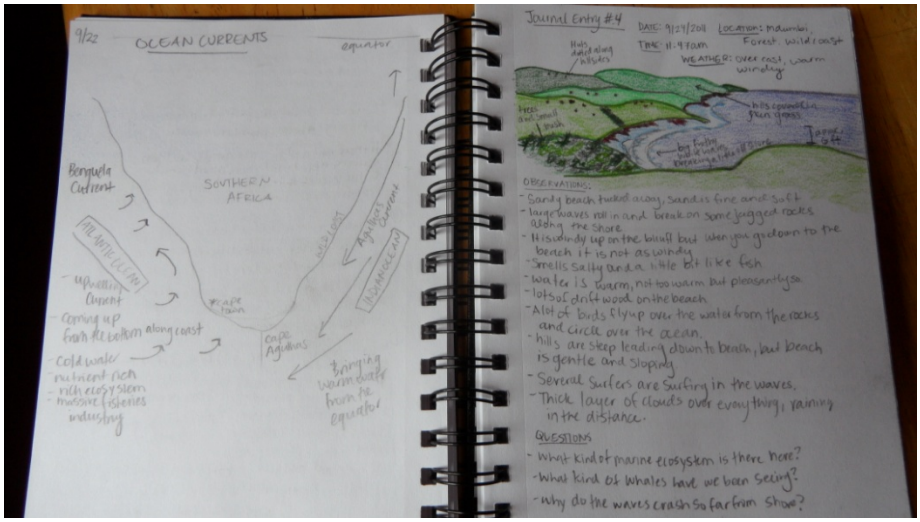


Figure 1. Student journal example of input (left-side) and output (right-side).

To enhance structured use of the field journal, I provided increased guidance through concrete lesson goals and grading rubrics as well as feedback on journal entries. These lesson goals varied depending upon the lesson, however the Grading Rubric for

Field Journals followed a basic outline (Appendix F). To help students reflect on their learning and quality of journal entries, the Grading Rubric for Field Journals was used for student self evaluation. The students completed a self-evaluation of their journals twice during the semester (week eight and week 15). Self-evaluations included grades and areas of improvement. With teacher evaluation of journal entries, I put all my comments on post-it notes and placed it in their journals. I did not write on their journal entries, so as to enhance the ownership of the journal.

Treatment III: Formative Assessment Techniques

During the third treatment phase, I developed and monitored the increased use of formative assessment techniques. With use of field journal entries as a formative assessment tool, I attempted to develop students' own understanding of their learning process and help them develop tools for reflection depending upon the requirements of each entry. The *output* side of the field journal entries was structured to enhance personal connection, reflection and therefore, an excellent tool to gauge learning through formative assessment. To guide students' use of formative assessment techniques, I provided a Field Journal Structure at the beginning of the treatment (Appendix E). Occasionally, I would guide their entry and have them complete a specific type of formative assessment on the *output* side of the journal. For example, I might ask them to all complete a Venn diagram for a specific topic.

Data Collection

The above treatments were developed and applied for the purpose of enhancing students' learning and development of *sense of place*. The following data collection

methods were used to help inform treatment development throughout the semester as well as measure the treatment's overall affect on students' perception of learning and connection to their surroundings. The data collection strategies provided both quantitative and qualitative data, through surveys, questionnaires, interviews, teacher journals, student assessments and colleague feedback.

Surveys

To measure changes in students' *sense of place*, I used the Place Attachment Survey (Appendix G) and Place Meaning Survey (Appendix H). These surveys measured student *place attachment* and *place meaning* pre and post-treatment. Semken and Freeman (2008) used two surveys (the Place Attachment Inventory and the Place Meaning Survey) to assess the two main aspects of *sense of place* (*place attachment* and *place meaning*). For this study, I renamed the Place Attachment Inventory the Place Attachment Survey. This was done for ease of identification of collection tools. The Place Attachment Survey and Place Meaning Survey were administered pre-treatment (week four of the semester) and twice post-treatment (week 15 of the semester and three months after the semester had ended) to all 10 of the students enrolled in the natural science course, however only nine students responded to the post-treatment collection three months after the semester ended. The second post-treatment administered survey was used to evaluate potential change after having returned to their home town/region. In both instruments, students identified the *place* as their home town/region.

Modifications were made to both surveys to best represent outcomes for this study. For the Place Attachment Survey, I modified one of 12 items from Semken and Freeman's Place Attachment Inventory. I changed *Visiting this place says a good deal*

about who I am, to *Being from this place says a good deal about who I am*, in order to better represent the home region instead of a destination. To rate the Place Attachment Survey, a Likert Scale asked students to respond to each statement choosing either *strongly agree, agree, neutral, disagree* or *strongly disagree*. An associated five-point scale was used, with *strongly agree* equal to five and *strongly disagree* equal to one. The design of the Place Attachment Survey included six place-dependence items and six place-identity items. The last place-dependence item, *The things I do at this place I would enjoy doing just as much at a similar site*, is negative and was therefore reverse scored. Using the same final scoring technique from Semken and Freeman, a total Place Attachment Survey score from 36 to 60 indicated *place attachment*, whereas a score below 36 indicated place aversion.

For the Place Meaning Survey, I used all 28 of the items from Semken and Freeman's (2008) survey, making changes to one item and adding in three others. One item was changed from *Important to Native American culture*, to *Important for local culture*. The additional three items included were, *A privilege to live here, Important to learn about*, and *Important to take action to protect*. I added these to more closely define how students feel about where they live, as well as their thoughts of knowledge and importance of environmental action. The items *Overdeveloped, Dangerous, Crowded,* and *Threatened* represented common degradation issues and were reverse scored. Agreement with any of the other 27 items indicated that the home town/region holds that particular affirmative *place meaning* for the student. The students responded to each statement choosing *excellent*, *very good*, *good*, *fair* or *poor* to describe their home town/region. The survey was rated using a five-point scale with *excellent* equal to five

and *poor* equal to one. Using the same final scoring technique from Semken and Freeman, a minimum Place Meaning Survey score of 31 indicated that the home region holds very little meaning for the student, whereas a score approaching the maximum of 155 indicated that their home region holds diverse, rich, positive meanings for the student.

To measure if there were changes in mean *place attachment* and *place meaning* throughout and after the semester I compared the pre-treatment survey responses to the two post–treatment survey responses. Through comparison of the same students' responses, an acceptable measure of relative change was determined.

Student Interviews & Questionnaires

I conducted two interviews and one questionnaire with the students. The Mid-Treatment Interview (Appendix I) was conducted in week eight and was completed by the entire class of 10 students. The Mid-Treatment Interview was comprised of five open-ended questions and focused on students' thoughts on journaling techniques, reflective practices and development of *sense of place*. I conducted these interviews verbally and on an individual, one-on-one basis over the course of three days. Student responses were documented through hand-written notes and were not recorded verbatim.

The second interview was conducted post-treatment during the final week of the semester (week 15). Due to time constraints, I only interviewed three of the 10 students. Interviewees were chosen for this focus group because they volunteered. This limited size and method of selection for participation could potentially bias the data gathered. The Post-Treatment Interview (Appendix J) was comprised of five open-ended questions that focused on students' thoughts on journaling techniques, reflective practices and

development of *sense of place* (Appendix J). I conducted these interviews verbally and on an individual, one-on-one basis over the course of two days. Student responses were documented through hand-written notes and were not recorded verbatim.

The Mid-Treatment and Post-Treatment interviews produced a variety of qualitative responses. I compared responses for patterns and compared patterns with other data sources. Both sets of interviews were analyzed for themes in effectiveness of the treatment.

To address reflection over time, a focus group completed an online questionnaire three months after the semester had ended. The questionnaire was completed between March 5 and March 10, 2012. Challenges arose when seeking to gather information (surveys and questionnaires) from students post-semester. Without consistent access to students, it was difficult to get full participation from all students. For the Post-Treatment Questionnaire (Appendix K), the focus group consisted of three students who responded. This had potential to bias the data as the students who were willing to take the time post-semester to fill out a questionnaire could be biased towards increased investment and motivation towards the study or the topics being asked about. The Post-Treatment Questionnaire was comprised of 10 open-ended questions and was used to determine each student's level of reflection on their experience, as well as their development of *sense of place*. The questionnaire asked students to provide their opinion of the effectiveness of the field journal as both a reflection tool and a tool for development of *sense of place*.

Teacher Field Journal

Throughout the semester I kept a teacher field journal. I observed and documented students during their time working individually and while in small group work. I took notes on student dialogue that indicated a *sense of place* and student reactions to teacher-guided field journals. I wrote about effective teaching strategies and techniques and approaches to lessons that I would change in the future. I analyzed each treatment method and documented this analysis in the Teacher Field Journal (Appendix L). For example, after a unit, I reflected on the effectiveness of the lesson plans and their potential to enhance *sense of place*. I also took notes in the journal regarding informal colleague feedback. The Teacher Field Journal was analyzed for themes that changed over time and effectiveness of the study's treatment.

Colleague Feedback

During the semester, I utilized my colleagues for feedback on teaching techniques. My colleagues acted as passive observers in my class. They provided feedback on the effectiveness of the formative assessment techniques that I used, and overall effectiveness of lesson plan scaffolding. Observations by my three co-teachers were recorded in either a Formal Colleague Feedback Form (Appendix M) or Informal Colleague Feedback documented in my teacher field journal (Appendix N). My three co-teachers each observed one class. There was one observation done for each unit for a total of three formal evaluations of my teaching during the semester. Additional feedback I received was verbal and therefore documented only in personal reflections in the Teacher Field Journal. Informal feedback was sought mostly after academic activities. These classes were taught in locations where the entire semester group was

present, and were typically place-based and hands-on in nature. For example, a mini-lesson on the geology of Table Mountain in Cape Town, South Africa occurred directly prior to hiking the mountain. These classes were shorter, less formal and observed by my co-teachers. This feedback was analyzed for adjustments to the study's treatment during the semester.

Student Journal Collection

Five times during the semester, I collected all 10 of the student's science journals. The journals were used for both summative and formative assessment. However, the main focus of the treatment was to enhance the journals as a formative assessment tool and as a tool for development of *sense of place*. These student-generated artifacts informed my study by providing insight into the level and depth of reflection that was occurring. Each week I analyzed student depth of response and possible change over time for each student in the level of reflection in their work. This analysis was documented in the Teacher Field Journal. Copies of student journals could not be made in the field, however photographs were taken of a few student samples of work. The journals were sent home with the students at the end of the semester. After each collection, I provided individual feedback on techniques and suggestions for improving quality of reflection. Again, copies of this feedback were documented through the Teacher Field Journal because of limitations in the field. The analysis of student field journals bi-weekly throughout the semester provided evidence of the effectiveness of this study's treatment.

This and the other data sources described above were used to create reliability and validity in this project. They provide triangulated data for my focus and sub questions regarding techniques that enhance students' *sense of place* (Table 1).

Table 1
Triangulation Matrix

Focus Questions	Data Source 1	Data Source 2	Data Source 3	Data Source 4
Primary Question: 1. Will the incorporation of reflective practices enhance students' learning and development of *sense of place*?	Student Interviews (Mid and Post Treatment) and Post Treatment Questionnaire	Place Attachment Survey and Place Meaning Survey	Teacher Field Journal	
Secondary Questions: 2. How will incorporation of formative assessment tools develop reflective practices and enhance *sense of place*?	Student Field Journals	Teacher Field Journal	Informal & Formal Colleague Feedback	
3. How are field journals best used as a reflective tool in an outdoor science setting?	Student Interviews (Mid and Post Treatment) and Student Post Treatment Questionnaire	Student Field Journals	Teacher Field Journal	Best Practices Questionnaire

DATA AND ANALYSIS

Several themes emerged from the analysis of the data collection through surveys, questionnaires, interviews, teacher journals, student assessments and colleague feedback.

The first theme highlighted TTS natural science teacher best practices found through the Best Practices Questionnaire, the next theme showed the affects of the treatment areas on student engagement, and lastly, changes in student perceptions of *sense of place* based upon the treatment were analyzed.

Analysis of Pre-Treatment Data: Teacher Questionnaire and Best Practices

The first part of my data analysis focused on best practices found through completion of a questionnaire by six previous TTS natural science teachers. The data was gathered during the first few weeks of the semester. I implemented new approaches based upon information gathered. Themes presented include field journaling techniques, thoughts on reflective practices and implementation of formative assessment strategies.

Several best practices for field journals were identified. Best practices aligned with research completed by Dyment and O'Connell (2010) and Mintz and Calhoun (2004) on limiting and enabling factors of quality of reflection in student journals. Some of these practices included creating a set structure in the beginning of the semester. This structure should be implemented and demonstrated by the teacher. This structure should also include coaching students in journaling techniques. Of the previous natural science teachers ($N = 6$), five responded that the field journals were used daily in class. Three of the teachers stated that regular use of the journal through a structured routine assisted students with traveling and transitioning into a new environment. The journals were used for a variety of purposes including, note taking, observation, hypotheses, diagrams and sketches, reflections and as a study guide. It was suggested that timely feedback from the teacher should be given to guide students' work.

Suggestions for improvements in field journal techniques included “make all assessments compatible with being done in the field journal so that it is truly a thread throughout the semester that tells a story.” This highlighted the idea that all work for the natural science class should be completed in the field journal – instead of having a field journal and an additional notebook. Also, to keep students engaged, a variety of journal entries are important including some student choice in what they complete observation entries on. All teachers stated that they combined both sketches and writing in journal entries.

Five out of six teachers stated that they intentionally used both observation and reflection based journal entries. However, four teachers leaned more towards observation-based entries than reflection-based entries. Two teachers stated that in the future, they would incorporate more reflection-based entries.

When reflection practices were used, both *content-based reflection* and *metacognitive reflection* were identified (Grossman, 2009). For most teachers the *content-based reflection* entries were used most significantly. Only one teacher mentioned utilizing entries that encouraged *metacognitive reflection*. The teacher stated that the students completed self-assessment by “reflecting on what they learned, to monitor their own learning and to reflect on their quality of work.”

Teachers used the journals for in-class assignments, homework assignments, projects, and one teacher had students complete test questions in their journals. However, the journals were predominantly used as a formative assessment tool, with limited use for summative assessments. One teacher stated that, the journal is “a great tool for assessment because you can see progression and monitor understanding.” As a formative

assessment tool, the journals were used to "tap into background knowledge" and "reflect on [their] knowledge." In particular, one teacher pushed to make sure the observational activities were complemented by "higher level thinking skills, exploring the students' ability to apply observations that they made."

Teacher responses from the questionnaire supported the theme of development of *sense of place* in southwestern Africa. Regarding use of the field journal in development of students' *sense of place*, one teacher stated "I think field journals are the key to creating a truly place-based science class motivated by curiosity." Three teachers stated that field journals allowed students to relate the class lectures to their environment. As the class traveled from place to place, journals were utilized to record observations of their surroundings. One teacher stated that they did not intentionally use the journal for *sense of place*, but the use of the journal did enhance that for the students, as they were required to "stop, think and observe quietly the small and detailed aspects of an environment."

Analysis of Data Collected During Treatments II and III: Field Journals and Formative Assessment Techniques

Field Journals: Input/Output Strategy's Effects on Student Engagement

From the Post-Treatment Interview (n = 3), two students stated that one of the most effective uses of the field journal was the *input/output* structure. They identified specific classes that demonstrated the most effective use of this structure. These included their journal entries based upon their visit to Table Mountain in Cape Town, South Africa (Figure 2) and the visit to Fish River Canyon in Namibia. With both of these classes, they used the left side for *input*, where I gave them the background information about the

geology and how the formation was created. The right side was then used for their *output*, which included a landscape based journal entry. The *output* side allowed for the students to draw and creatively observe and reflect on their surroundings, with a few set guidelines.

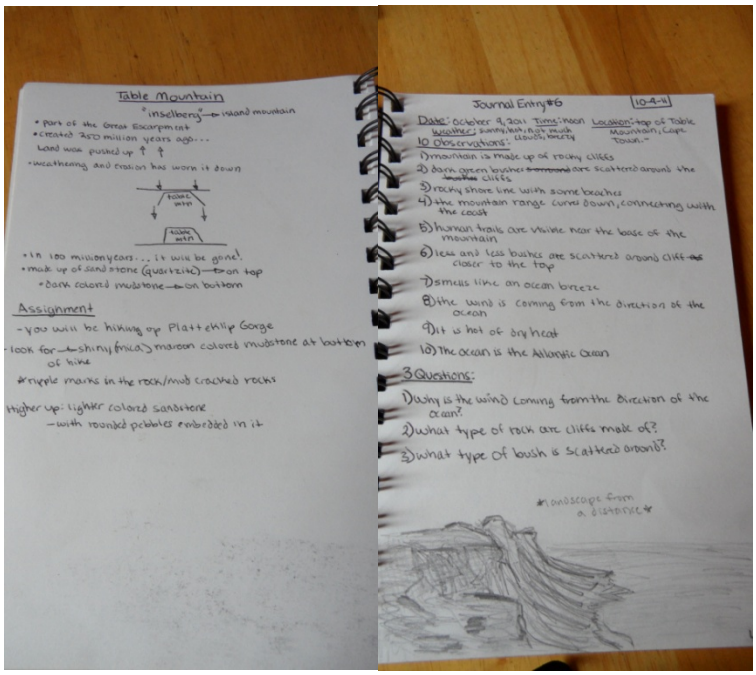


Figure 2. Sample Student Journal Entry from Table Mountain demonstrating the *input/output* technique.

This was written as a positive response in my Teacher Field Journal from October 1, 2011:

> Some students have noted obvious enjoyment of the new structure [of the journal]. With the introduction of the *input/output* structure, immediately students were positively responding in class. Asking questions about what each side is for and clarifying in the first few classes and with their first few assignments in the journal, about structure and ideas for what goes on each side.

Positive student perceptions of field journaling were found based on data collected during the Mid Treatment Student Interviews ($N = 10$). The group expressed common thoughts in terms of what they enjoyed most. Themes in responses included enjoyment of both observational and reflection based journal entries. One stated that they enjoyed the journal "as a tool for focusing on where we are and observing our surroundings." Another student stated that they enjoyed "getting to look back on notes and observations." More specifically the two techniques students identified as enjoyable were assignments that incorporated opportunities for "drawing" and the *input/output* structure of the field journal. The *input/output* structure of the field journal as a technique to promote *metacognitive reflection* was identified by a student who stated that it was beneficial in "help[ing] to develop ideas" and assisting with "organization of their thoughts." However, when describing what they enjoy the least about the use of the field journal, one student stated that the *input/output* structure was their "least favorite" part of the journal. Additionally, one student stated that the "limited time for entries" was the least enjoyable part. As this interview was gathered mid-treatment it allowed for personal reflection and adjustment to my treatment.

From my Teacher Field Journal written on October 25, 2011, I stated:

> Students this semester seem to have enjoyed the more consistent use of the field journal in day-to-day classes and assignments. I have noticed compared to previous semesters that they continue to put effort into their journal work, even as we are almost two months into the semester.

Formative Assessment Techniques Effects on Student Engagement

Formative assessment techniques were found to increase student connection to concepts. I reflected on the use of formative assessment strategies in combination with the *output* side of the student field journal. From my Teacher Field Journal on October 1, 2011 it was noted that:

> Within this unit, I worked on trying a few formative assessment techniques that I hadn't used yet. These assessments were developed to enhance the *output* side of the field journal. I helped students develop a variety of graphic organizers to process information on rock and mineral identification. Based upon journal entries, students showed connection to the concepts in very clear ways.

Colleagues' observations showed positive support for the new assessment strategies I introduced in my classes. After observing a class where I introduced a 3-2-1 Review strategy (list three things you learned, two things you wonder, and one symbol/picture that captures the essence of the topics of study), a colleague wrote:

> This was a creative assessment technique that I had not seen before. You set up the structure well, telling the students that this will be used again in the future and making sure that they knew exactly where to place their review. It allowed students to personalize the information and those students who might be held back from voicing questions in front of their peers were provided an opportunity to share. Also, it seems that this could be a positive tool for reflection, as the students are required to think about *what* they have learned and perhaps *how* they

have learned. It will be important to follow up with what was recorded and to develop this as a tool that will enhance their reflection.

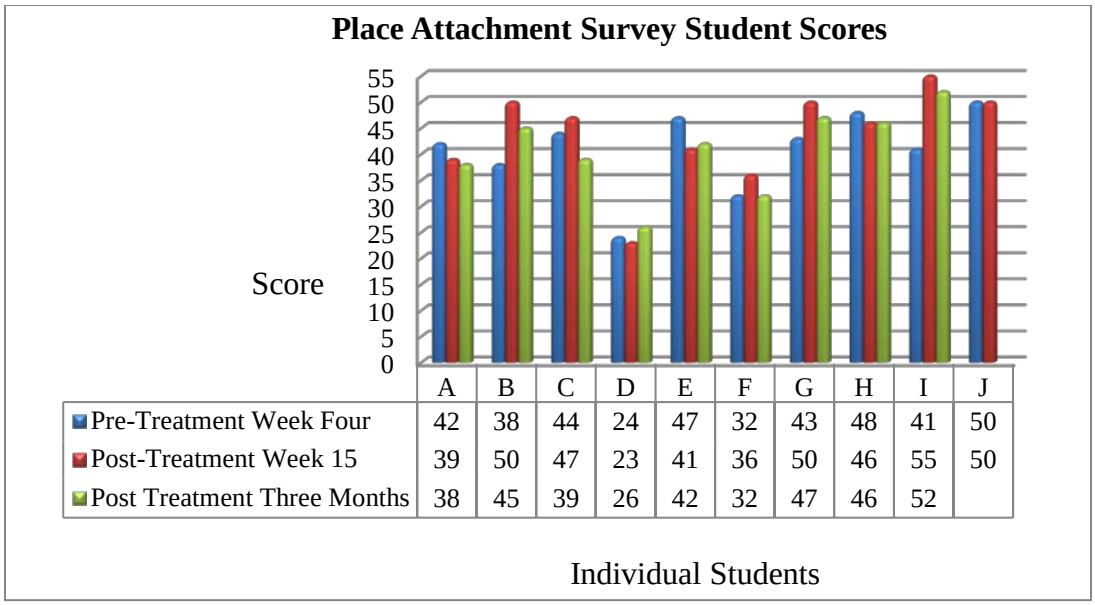
Field Journals: As a Reflection Tool and Effect on Student Engagement

In the Mid-Treatment Interview (N = 10), two students identified that *content-based reflection* assisted with their learning through "being able to draw what [they] see," having their journal available to "re-read [their] observations" and "recording details about a view/object that will be appreciated later." Enhancement of *content-based* reflection was also identified in the Post-Treatment Interview (n = 3) as 100% of the students noted that the use of the field journal was a positive tool for reflection. One student stated "it [field journal] provided reflection on the location and made the experience more real." Another student stated, "The R, R and R's [reflection papers written weekly for another class] are written *after* the experience, but these [field journal entries] you write *during* the experience. It provides an activity to help us reflect at the time we are completing it." All three students implied that their field journal would continue to be used for reflection when they returned home. One student stated they would be "…keeping it [field journal] for future information, and to remember the trip" and another stated they would "save it as a memento."

Analysis of Post-Treatment Data: Student Perceptions of *Sense of Place*

Analysis of the Place Attachment Survey showed eight out of 10 students (80%) in the pre treatment and seven out of nine students (77%) in the second post treatment showed positive *place attachment* to their hometown/region (Figure 3). This was demonstrated by an overall score of greater than 36. Therefore, 20% of students showed

place aversion to their home town/region at the beginning of the treatment. Three months after, 22% place aversion in shown. Per individual student, comparing scores at the beginning of the study and the end of the study, four out of 10 students (40% represented by students B, D, G, and I) had an overall increase in *place attachment* to their home town/region.



	A	B	C	D	E	F	G	H	I	J
Pre-Treatment Week Four	42	38	44	24	47	32	43	48	41	50
Post-Treatment Week 15	39	50	47	23	41	36	50	46	55	50
Post Treatment Three Months	38	45	39	26	42	32	47	46	52	

Figure 3. Place Attachment Survey Student Scores for Pre-Treatment Week Four (N = 10), Post-Treatment Week 15 (N = 10) and Post-Treatment Three Months (N = 9). *Note.* A score higher than 36 will indicate *place attachment*, while a score less than 36 indicates place aversion.

The statistical median, mean, minimum, maximum, and lower quartile and upper quartile for the Place Attachment Survey administered pre and post-treatment were calculated (Figure 4). The mean score increased between week four and week 15, from 40.9 to 43.7. Between week 15 and three months after the semester ended, a drop in mean scores occurred, from 43.7 to 40.77. The mean score from week four compared to post-treatment three months after showed an almost exact same mean *place attachment* of 40.9 and 40.77. Overall, the mean score for all three administered surveys show a

positive *place attachment* (greater than 36) of students to their home town/region.

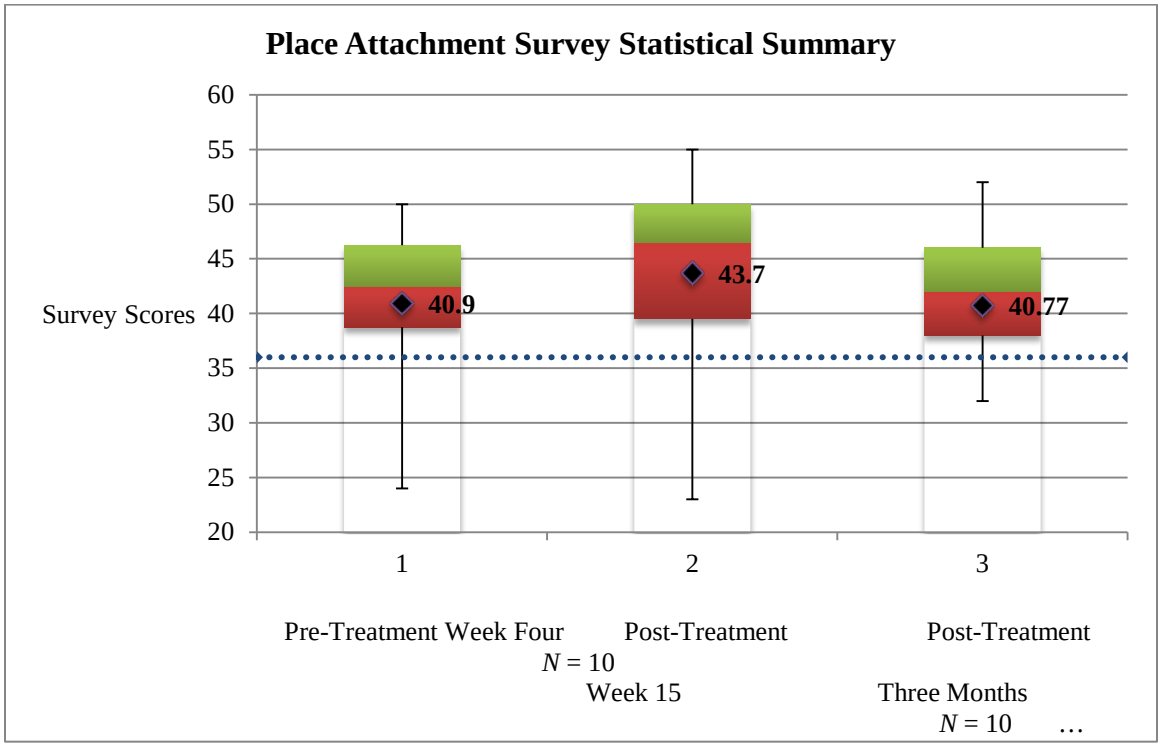
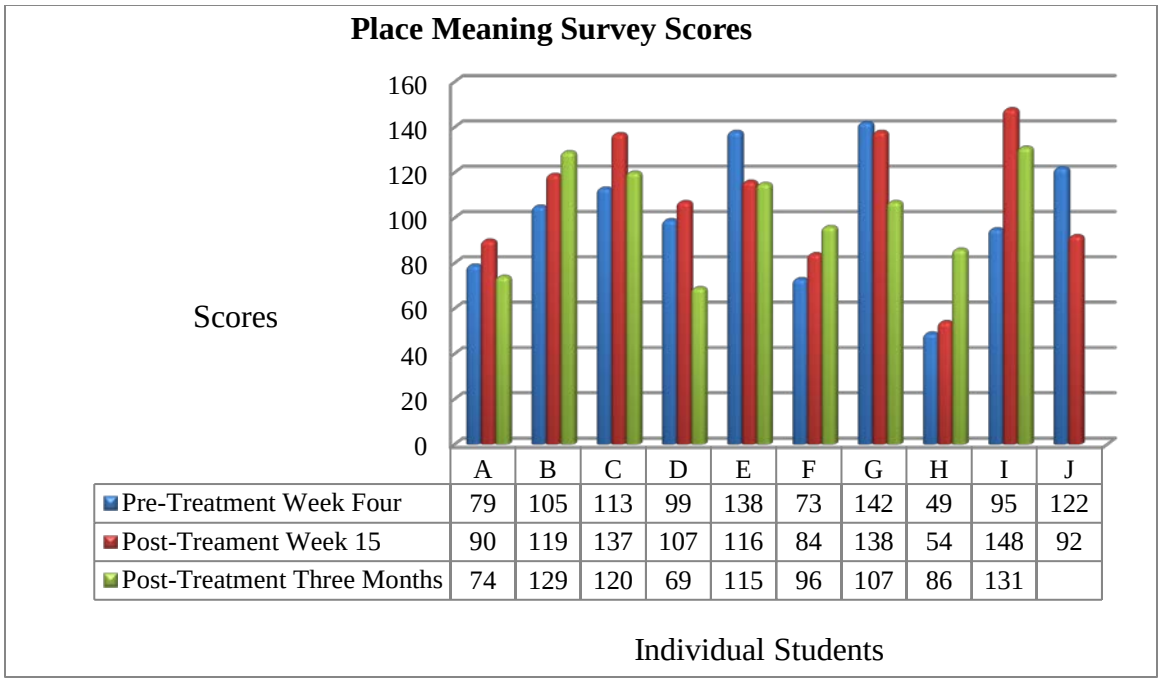


Figure 4. Box-and-Whisker Plot of Place Attachment Survey Statistical Summary of Pre-Treatment Week Four (*N* = 10), Post-Treatment Week 15 (*N* = 10) and Post-Treatment Three Months (*N* = 9).
Note. Boxes represent the inter-quartile range (25th to 75th percentile), and whiskers indicate the minimum and maximum values. The statistical median is where the green and red boxes meet. The black marker point and number represent the statistical mean. The dashed blue line is the numeric response equal to 36. Scores higher than 36 indicate *place attachment*, while scores less than 36 indicate place aversion.

Overall changes in student *place attachment* show that the range of scores (difference between minimum and maximum values) decreases from week 15 of the semester to three months after students returned home.

Analysis of the Place Meaning Survey shows that five out of 10 students (50%) had an overall increase in *place meaning* (Figure 5). This can be seen through the individual scores of students B, C, F, H and I.



	A	B	C	D	E	F	G	H	I	J
Pre-Treatment Week Four	79	105	113	99	138	73	142	49	95	122
Post-Treament Week 15	90	119	137	107	116	84	138	54	148	92
Post-Treatment Three Months	74	129	120	69	115	96	107	86	131	

Figure 5. Place Meaning Survey Student Scores for Pre-Treatment Week Four (N = 10), Post-Treatment Week 15 (N = 10) and Post-Treatment Three Months (N = 9).
Note. A minimum possible score equals 31 and a maximum possible score equals 155.

The statistical median, mean, minimum, maximum, and lower quartile and upper quartile for the Place Meaning Survey administered pre and post-treatment were calculated (Figure 6). The mean score of week four pre-treatment compared to the week 15 post-treatment showed an increase from 101.5 to 108.5. A subsequent drop in mean score from week 15 to three months after occurred with a change from 108.5 to 103.

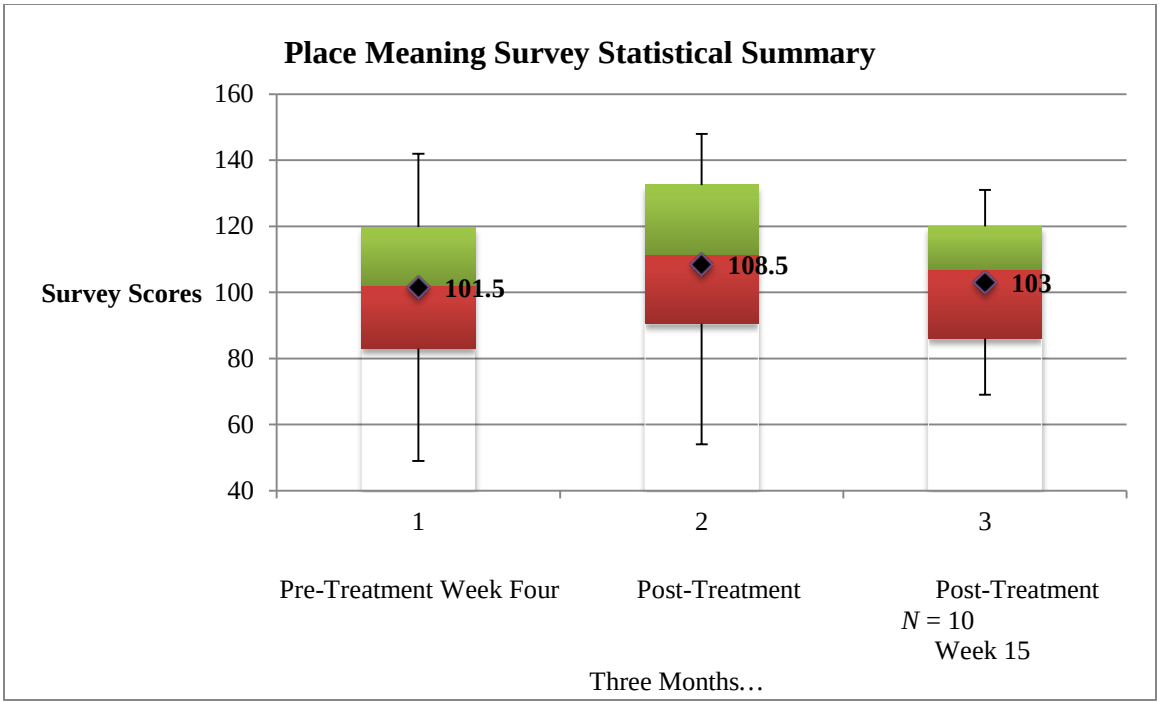


Figure 6. Box-and-Whisker Plot of Place Meaning Survey Statistical Summary of Pre-Treatment Week Four (N = 10), Post-Treatment Week 15 (N = 10) and Post-Treatment Three Months (N = 9).
Note. Boxes represent the inter-quartile range (25th to 75th percentile), and whiskers indicate the minimum and maximum values. The statistical median is where the green and red boxes meet. The black marker point and number represent the statistical mean.

Overall changes in *place meaning* for students showed that the range of scores (difference between minimum and maximum values) was smallest three months after the students returned home.

Through analysis of the Place Attachment and Place Meaning Surveys, there was an increase in *place attachment* and *place meaning* from week four to week 15, with a subsequent drop in both *place attachment* and *place meaning* between week 15 and three months after students returned home. The data shows that scores in both *place attachment* and *place meaning* are rising and falling together. With a small sample size of 10 (and nine) this change in mean for both *place attachment* and *place meaning* demonstrates a change in only a few students' perceptions of *sense of place*.

Other perceptions of *sense of place* were observed through the Post Treatment Student Questionnaire (n = 3), administered three months after students had returned home. There was a 100% positive response to the question, "Did the class [natural science] alter your *sense of place* at home? How?" The responses indicated a positive increase in *sense of place*. Student responses included, "I notice things I haven't before and am more aware of what the biomes are that I am in and how the ecosystem I am living in is doing" and "it [the natural science class] made me more interested in what is going on in the natural environment." Both of these responses indicate an increase in *place attachment* and *place meaning*.

INTERPRETATION AND CONCLUSION

Best practices identified by other TTS natural science teachers enhanced my treatment by highlighting similar best practices identified in the literature review. The theme of creating structure through daily use, rubrics and clear expectations were stated. Additionally, using the field journal for more assessments was suggested. I utilized this information to alter my treatment with the field journal.

Effectiveness of the field journal treatment and formative assessment strategies were analyzed through the Teacher Field Journal and colleague feedback. It was seen that the increase in structure and guidance of the field journal was beneficial to the students and to myself as the teacher. I used the journal in a more methodical way and allowed for the students to interpret what they were learning through increased reflection and interpretation. Based upon student interviews mid and post treatment, positive responses were seen.

Based upon observations and notes in the Teacher Field Journal, the holistic approach to development of unit plans using Lewicki's (1997) three strands of study, enhanced student connections between what they learned in southwestern Africa to topics from their own countries and home regions. To gain a better perspective on specific aspects of the treatment that impacted development of *sense of place*, additional data collection would be needed.

Regarding development of *sense of place* demonstrated by survey responses, minimal change was found in terms of both *place attachment* and *place meaning* for students home town/region pre and post treatment. However, there was an increase in mean *place attachment* between week four (40.9) and week 15 (43.7) and *place meaning* from week four (101.5) to week 15 (108.5). With the small sample size of 10, this change in mean for both *place attachment* and *place meaning* demonstrates a change in only a few students' perceptions of *sense of place*. The increase in *sense of place* from week four to week 15 could potentially be the result of the treatment applied during the semester. However, survey data alone does not provide a strong conclusion as to which piece of the treatment was the most effective. The Post-Treatment Questionnaire that was implemented three months after students returned home demonstrated a 100% (n = 3) response rate that the natural science class at TTS increased the students' connection to their home town/region. Again, the questionnaire did not ask specifically which piece of the treatment led to the students' further development of *sense of place*. There is a gap in data to assess which particular aspects of the treatment were the most significant in increasing students' *sense of place* to their home town/region. Tools to measure *sense of place* should be further adjusted if used again in the TTS setting.

Through the data analysis of this project, I realized that there were many areas of my treatment that I did not properly triangulate data for in terms of data collection. This left me with a lack of data, and lack of ability to fully analyze the effectiveness of all aspects of the treatment. For the action research process in the future, I would focus on one treatment area, instead of several, and I would further enhance data collection strategies for that one specific treatment.

However, the nature of place-based education in the TTS natural science class remains a strong tool in enhancement of student learning. The review of the literature assisted with defining concepts of *sense of place* to create a more accessible guiding theme for future natural science teachers. This study supports the benefit of place-based education for TTS and use of reflective tools to assist with student learning in the natural science class. Structured journaling and use of reflective practices are examples of methods that actively engage students and enhance learning in the natural science class at TTS.

VALUE

The experience of developing and conducting this capstone project has led to several changes in my approach to teaching. One change was my comfort level in creating and implementing new teaching techniques. I now feel more comfortable in applying new techniques in my class. Techniques include using formative assessment tools, and field journal structure.

Another significant area of growth occurred through implementation of the action research model to complete the Capstone Project. I gained perspective on how I would better develop data collection instruments to enhance data analysis. After data analysis I

realized the particular data collection strategies I used did not provide me with the data that I wanted. For example, the Place Attachment Survey and Place Meaning Survey were a good start, but did not provide enough data that could be analyzed for themes. A survey or questionnaire that ranked effectiveness of each aspect of the treatment would possibly provide a better picture of what in particular enhanced student learning and development of *sense of place*. With the interviews that I used, I did not gain much insight into student perceptions of each of the treatments. Lesson plan development and use of particular reflective practices could not be analyzed outside of my own observations and some colleague feedback.

This study presented information and techniques that will assist with further development of teaching techniques and curriculum development in the natural science class at TTS. This information most significantly came from feedback from previous natural science teachers and personal reflections in the Teacher Field Journal.

Next year, my teaching goals will focus on assisting with coaching of new teachers for the natural science class at TTS. As this study has supported, there is always room for improvement and enhancement of these techniques. Specifically, the incorporation of structure, reflection and assessment in the field journals will be provided to new teachers as a potential tool in their class. Also, unit and lesson plan development provided the opportunity to write new lesson plans that will be archived at TTS, and will be provided as a resource for new teachers. Additionally, gathering data from former natural science teachers through the Best Practices Questionnaire was useful for this project, but also for archiving TTS teacher best practices. Overall, the action research model can be applied to TTS in a variety of ways to increase the quality of teaching. I

look forward to sharing the steps of this process that encourage (specific) actions that support teacher growth in the natural science class at TTS.

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APPENDICES

APPENDIX A

BEST PRACTICES QUESTIONNAIRE

Best Practices Questionnaire

1. Describe how you incorporated the field journal into the Natural Science class.

2. Did you incorporate observation-based entries vs. reflection-based entries in the field journal? If you did, please describe how you did this.

3. How do you feel the field journals worked as a reflective tool? As a tool for assessment (formative & summative)? As a tool for development of *sense of place*?

4. Describe your grading rubric for the field journals.

5. How did your students respond to the use of the field journal?

6. What worked well and what could be improved with the use of the field journal?

7. What do you think can be incorporated into the Natural Science curriculum to help the students' enhance their *sense of place* both during the semester and after they return home?

8. Please describe your most effective assessment tools in this class. (Projects, labs, tests, etc.)

9. Anything else you would like me to know that to assist with my development?

APPENDIX B

GEOLOGY UNIT PLAN

Geology Unit Plan
TTS Natural Science Class

ECOLOGY STRAND: *students' learn about Earth systems*

Lesson 1: Mountain Building & Plate Tectonics

Goals: Students will understand the main process driving mountain building and plate tectonics globally. Students will observe major features of Fish River Canyon, and along the Orange River to understand concepts.

Lesson 2: Weathering and Erosion

Goals: Students will understand the processes of weathering and erosion on geologic features in Namibia.

Lesson 3: Rocks and Minerals (focus on diamonds)

Goals: Students will understand the rock kingdoms and the process of mineral identification. Students will understand the process of diamond formation including a brief history of significant diamond formations in southwestern Africa.

THINKING STRAND: *students analyze issues from a variety of perspectives, demonstrating their knowledge and showing their ability to problem solve.*

Lesson 4: Geologic Timeline

Goals: Students will understand a basic geologic timeline. Students will discuss the human impact on the planet vs. length of time present in relation to the age of the earth.

Lesson 5: Case Study: Diamond Mining in Namibia

Goals: Students will observe the historical impact of diamond mining in Namibia through a visit to Kolmanskop, a ghost town Museum. Students will begin to understand the role of DeBeers Diamond Corporation in the history of Namibia. Students will analyze perspectives through interviews with a tour guide from museum and interviews from Namibian and South African river guides on their thoughts of off shore diamond drilling in Namibia.

SOCIAL STRAND: *developing the students' social connection with their surroundings and taking action within their community and world.*

Lesson 6: Global Diamond Trade

Goals: Students will examine the steps in the process of the diamond trade globally. Students will understand the general impact of the diamond trade at all levels.

Lesson 7: Diamond Consumption in the United States

Goals: Students will analyze the contributions of consumers in the United States to the drive of diamond mining. Students will analyze their impacts of consumerism and the diamond trade.

APPENDIX C

LESSON PLAN: ENVIRONMENTAL PERSPECTIVES

The Traveling School
Lesson Plan for Natural Science in Southwestern Africa

Lesson Title: ENVIRONMENTAL PERSPECTIVES
(Potential for interdisciplinary lessons with History of Southern Africa and Global Studies)

Previous Lessons/Knowledge covered:
Students will have had the opportunity to...
1. discuss and understand values vs. ethics.
2. begin to develop their own set of environmental values and ethics.
3. understand the importance of ecosystem services.

Lesson Description: Human interactions with the land (scientific and historical viewpoints). How attitudes and viewpoints impact our understanding/use of the land around us.

Background: Environmental issues are complex and have social, economic and ecological implications. Humans bring a variety of attitudes and viewpoints to their values and ethics towards the natural world. Challenges in managing the environment can be linked to conflicting human values and beliefs. In particular, land use issues are directly related to human perspectives. To study the science and history of land use requires the ability to analyze the variety of human perspectives.

Montana State Standards (Goals):
History/Global Studies**:**

1. Students will apply geographic knowledge and skills - including location, place, human/environment interactions, movement and regions.
2. Students will demonstrate understanding of the impact of human interaction and cultural diversity on societies.

Science:

1. Students will investigate the characteristics, structures and function of living things, the process and diversity of life, and how living organisms interact with each other and their environment.
2. Students will learn about historical developments in science and technology and understand how scientific knowledge and technological developments impact our society.

Objectives: Students will be able to...
1. list several factors that influence environmental attitudes.
2. define anthropocentric, bio-centric and philosophical viewpoints.
3. explore the connection between land use issues and human perspectives.

Materials and Resources:
student science field journals
writing utensils: pen, pencil, colored pencils

whiteboard & markers
textbook: as needed to supplement local landscape issues/information

Vocabulary:
Three major types of environmental attitudes/viewpoints:
anthropocentric: values personal need and interest
bio-centric: values all plants and animals as worthy of consideration
philosophical: values a balanced system of living and non-living things (ecosystem function)

Procedure:
Part A: Students' Perspectives:
1. Take students to a small "observation" site outdoors with distinct parameters. This should not be a large landscape, but a small natural area. Tell the students to make observations for 15 minutes. They can write down what they sense in the area. Students should stay in one location to make their observations.
2. Have students share their observations/attitudes about the observation site.
3. Discussion: Are all our observations/attitudes the same? No. What determines how people feel about the environment? Have students brainstorm. Factors that influence attitudes/viewpoints toward the environment: political, economic, religious, ecological, scientific, cultural, educational, aesthetic, social, recreational, egocentric, health-related, ethical/moral, historical, etc.
4. Introduce the terms: **anthropocentric, bio-centric**, and **philosophical** environmental viewpoints.
5. Have the students evaluate the type of attitude they had toward this environment.

Part B: Incorporating *Visual Thinking Strategies: discussion of visual images* to develop student critical thinking skills
1. The following discussions and journal entries will happen periodically throughout the semester. Students will observe a variety of landscapes with a variety of habitats including areas that have been impacted significantly by humans (development: cities, towns, industrial, etc.). *Depending on structure of writing/drawing/discussing - allow 15 minutes to 1 hour for completion.*
2. Place students at a high vantage point in a particular landscape. Have students draw the landscape roughly.
3. Guided Prompts for writing/discussion:
    a. Allow students a few minutes to just observe.
    b. Ask: What do you see? Only share identification/literal description of what you see.
    c. For each description shared, what is your interpretation of what is going on?
    d. Keep the discussion going with asking the students what else they see.
4. What are your observations about the environment/land use?
5. What are your interpretations about the environmental interactions? Specifically between humans and landscape?
6. If you analyzed the landscape below from a different viewpoint, what might you observe differently? Attempt to change your lens. What is you were a wildlife scientist?

What if you were a farmer? A tourist? A tourism operator? A local politician? A mine worker? How would you summarize their environmental attitudes/viewpoints?
7. This can be expanded in many directions. Students could spend time looking at local issues through one specific lens in order to gain a holistic understanding.

Assessment:
1. Graded journal entries
2. Participation in discussions.
3. Incorporation of information into a larger project (presentation, role play, paper, etc.)

Extensions/Follow-up Lessons:
1. Interview a variety of people from varying socioeconomic backgrounds. What are their attitudes/viewpoints towards local environment/environmental issues?

2. This class can be done with a historical lens. Looking at current land use issues, how have attitudes/viewpoints changed throughout history? Have students research/write/present.

3. Current Events: Have students take one local environmental issue (Cheetah protection on farmlands in Namibia) and have them analyze the variety of viewpoints/attitudes through research or interviews. Look at this through a scientific and historical perspective.

4. *Sense of place* at home. Have students describe their environment at home. What are their observations and interpretations? What is the larger perspective of human viewpoints represented in their landscape? Looking at a local environmental issue, what are the viewpoints represented and how can the issue be managed? What do humans need to do to move forward?

Written by Leah Knickerbocker
July, 2011

APPENDIX D

LESSON PLAN:
BIODIVERSITY AND WILDLIFE MANAGEMENT ISSUES IN THE UNITED STATES AND NAMIBIA

The Traveling School
Lesson Plan for Natural Science in Southwestern Africa

Lesson Title: BIODIVERSITY AND WILDLIFE MANAGEMENT ISSUES IN THE UNITED STATES & NAMIBIA
UNIT FOUR: Land Management Issues & Conservation Biology

Previous Lessons/Knowledge covered*:*
Wildlife/Land Management in Namibia
Students will have the opportunity to...
1. review the threats to biodiversity in Namibia through the lens of the Cheetah.
2. begin considering strategies for maintaining biodiversity in Namibia.
3. examine several land management strategies in Namibia.
    - Communal Wildlife Conservancies in Namibia. Case Study: Waterberg Conservancy - location of the Cheetah Conservation Fund (CCF).

Background: In this unit and previous units, students will have studied how evolution generates biodiversity, benefits of biodiversity, and primary causes of biodiversity loss. Students will have a general overview of the habitats in Namibia, and will have completed a focused study on the genetics of the Cheetah. Students will understand the causes and impacts of the lack of genetic diversity of the Cheetah. The students will have already discussed land management agencies/strategies in the United States and in Namibia. The pre-lesson(s) focus on the overview of land management in Namibia through the lens of the Cheetah population. This lesson uses a case study of the bison herd in Yellowstone National Park as a way to bridge land management issues from Namibia to the United States.

Montana State Content Standard:
Students will investigate the characteristics, structures and function of living things, the process and diversity of life and how living organisms interact with each other and their environment.

Goals: Students will have the opportunity to...
1. compare and contrast biodiversity issues in Namibia and the United States.
2. consider the strategies for maintaining biodiversity in the Greater Yellowstone Ecosystem.
3. understand the management plan and threats to the Bison herd of Yellowstone National Park.

Objectives: Students will be able to...
1. name and describe the federal land management agencies in the US and their mandate.
2. list the threats to the Bison Herd in Yellowstone National Park.
3. compare three similarities and three differences of the management of Cheetah and Bison.
4. plan one action that they (student) have in maintaining biodiversity.

Materials & Resources: (included in Natural Science text or as separate handouts)

- Bison Site Management Bulletin http://www.nps.gov/yell/parknews/loader.cfm?csModule=security/getfile&PageID=537687
- Fuller, Alexandra. "Africa's Super Park: Cheetahs and elephants are lucky to live in the eco-minded nation of Namibia." National Geographic. June, 2011 p. 60-69.
- Cheetah Educator's Guide. Cheetah Conservation Fund, 2004. Lesson plans for studying the Cheetah.
- Communal Wildlife Conservancies in Namibia http://en.wikipedia.org/wiki/Communal_Wildlife_Conservancies_in_Namibia
- "Rare Breed" Smithsonian Magazine. March 2008. http://www.smithsonianmag.com/specialsections/making-a-difference/rare-breed.html

Vocabulary:

Bison
Greater Yellowstone Ecosystem
National Park Service
National Forest Service
Communal Wildlife Conservancy
Endangered Species

Procedure:

1. To generate ideas for class discussion, start with this True/False quiz: from http://www.pbs.org/buffalowar/lesson2.html
   - Buffalo are extinct. (False.)
   - There is no difference between a buffalo and a bison. (False. Buffalo technically refers to a species in Africa and Asia, but the two names are often used interchangeably.)
   - Bison are the largest terrestrial mammals in North America. (True)
   - Most of the North America's bison are found on commercial ranches. (True)
   - The last free-roaming herd of bison found in Yellowstone National Park is in the center of a major controversy. (True.)
2. Present the idea of the Greater Yellowstone Ecosystem to the students (use map from Bison Site Management Bulletin). Remind them of the land management agencies in the US and their mandates (Forest Service and Park Service).
3. Discuss: How does the presence of Bison impact the biodiversity of the Greater Yellowstone Ecosystem?
4. In small groups, give the students the most recent Bison Site Management Bulletin. Have them read it with the following questions to answer:
   a. List as many threats as you can to the Bison population using a Concept Map.
   b. What are the differences in regards to the biological diversity threats between the Cheetah and the Bison? Are the bison prone to extinction? Do you think that the Bison needs special help (management) to survive? Why or why not?

c. Of the threats listed above, what is the biggest threat facing the Yellowstone Bison herd?

d. Summarize the Bison management plan currently.

e. What do you think of the Bison management plan currently? How would you manage the herd if you were a Natural Resource Manager in the Greater Yellowstone Ecosystem? Reference your Concept Map regarding threats to Bison. How will you manage for these threats?

Formative Assessment:

1. Venn Diagram: Create a Venn diagram showing the similarities/differences between the management of the Cheetah and the Bison.

a. How does land ownership/management impact the Cheetah/Bison populations?

Extensions/Follow-up Lessons:

1. Have students discuss a previously Endangered Species in the US: the gray wolf. Use the Endangered Species Act to analyze management of this predator.

Resources on wolves in Yellowstone and the Endangered Species Act:

- http://blogs.smithsonianmag.com/science/2009/03/wolves-to-lose-protection-in-idaho-and-montana/
- http://www.theatlantic.com/politics/archive/2011/06/endangered-species-the-environmental-issue-for-2012/241150/

2. Research a biodiversity issue in your home town. What is the threat to the habitat? What role do humans play? How can this be managed? What can you do to protect biodiversity?

Written by Leah Knickerbocker
June, 2011

APPENDIX E

FIELD JOURNAL STRUCTURE

Natural Science Class
Field Journal Structure

1. You will keep a Table of Contents in the first two pages of your journal. Include page numbers, dates, and label/title of each journal entry.

2. Your journal pages will have the following structure:

Left side – Input	Right Side - Output
This is where you put incoming information: notes and data.	This is where you personally reflect on the information on the left side.
1. Date, label and number each page 2. Write down information from: *lectures *readings *presentations *guest speakers *labs	1. Date, label and number each page 2. Complete exercises (self driven or teacher guided) such as: *summarizing information *3-2-1 reviews *one word/one image summaries *graphic organizers, tables/graphs *flow charts or concept maps *Venn diagrams *Pictures/drawings *Observation Based Journal Entries

Adapted from Chesbro (2006).

APPENDIX F

GRADING RUBRIC FOR FIELD JOURNALS

Natural Science Class
Grading Rubric for Field Journals (overall structure):
Adapted from Chesbro (2006).

Basic Standards for Field Journal:	**Maximum of 10 points**
Page numbers, dates, and proper placement of work, neatness.	* All pages are numbered and dated. * All items are in their proper place (input vs. output). *Work is neat, organized, and legible. * All page numbers correspond to Table of Contents.
Input Side	**Maximum of 20 points**
(Detail of input)	* Very detailed * Shows care and attention to concepts (no gaps in concepts) * Data are clearly set up in proper place.
Output Side	**Maximum of 30 points**
(Personal connections)	*Shows in-depth processing of info * Shows deep personal connections to learning concepts *YOU come through in the personalization.

Assessment and Rubric for Observation Based Field Journal Entry/Output pages

Observation Based Field Journal Entry**:** You will complete an observation based field journal entry approximately 2 times per week. I will collect your journals every few weeks for grading. You will follow the standard field journal rubric unless otherwise instructed.

Standard Journal Rubric:

- Date, Time, Location (include Biome), Weather - 2 points
- 10 Observations (minimum of 3 senses) - 10 points
- 3 questions - 3 points
- Sketch - 2 points
- Depth & Quality - 3 points

TOTAL: 20 points

APPENDIX G

PLACE ATTACHMENT SURVEY

Place Attachment Survey

Please respond to the following items by drawing a circle around the response that most likely reflects your opinion. Please complete the following with your **home town/region** as the **place** that the survey is asking you about. *Adapted from Semken and Freeman (2008).

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. I feel that this place is a part of me.	SD	D	N	A	SA
2. This place is the best place for what I like to do.	SD	D	N	A	SA
3. This place is very special to me.	SD	D	N	A	SA
4. No other place can compare to this place.	SD	D	N	A	SA
5. I identify strongly with this place.	SD	D	N	A	SA
6. I get more satisfaction out of being at this place than at any other.	SD	D	N	A	SA
7. I am attached to this place.	SD	D	N	A	SA
8. Doing what I do at this place is more important to me than doing it in any other place.	SD	D	N	A	SA
9. Being from this place says a good deal about who I am.	SD	D	N	A	SA
10. I wouldn't substitute any other area for this place.	SD	D	N	A	SA
11. This place means a great deal to me.	SD	D	N	A	SA
12. The things I do at this place I would enjoy doing just as much at a similar site.	SD	D	N	A	SA

APPENDIX H

PLACE MEANING SURVEY

Place Meaning Survey

Please complete the following survey with your **home town/region** as the **place** that the survey is asking you about. How well do these terms describe your home town/region? *Adapted from Semken and Freeman (2008).

	Poor	Fair	Good	Very good	Excellent
1. Ecologically important	P	F	G	VG	E
2. Important to preserve	P	F	G	VG	E
3. Educational	P	F	G	VG	E
4. Unique	P	F	G	VG	E
5. Important to learn about.	P	F	G	VG	E
6. Scientifically important	P	F	G	VG	E
7. Fragile	P	F	G	VG	E
8. Interesting	P	F	G	VG	E
9. A privilege to visit	P	F	G	VG	E
10. A privilege to live here	P	F	G	VG	E
11. Tranquil	P	F	G	VG	E
12. Scenic	P	F	G	VG	E
13. Relaxing	P	F	G	VG	E
14. Wilderness	P	F	G	VG	E
15. Beautiful	P	F	G	VG	E
16. Exotic	P	F	G	VG	E
17. Remote	P	F	G	VG	E
18. Unspoiled	P	F	G	VG	E
19. Authentic	P	F	G	VG	E
20. Adventurous	P	F	G	VG	E
21. Unusual	P	F	G	VG	E
22. Important for local culture	P	F	G	VG	E
23. Historical	P	F	G	VG	E

24. Ancient	P	F	G	VG	E
25. Spiritually valuable	P	F	G	VG	E
26. Important to know about	P	F	G	VG	E
27. Important to take action to protect	P	F	G	VG	E
28. Overdeveloped	P	F	G	VG	E
29. Dangerous	P	F	G	VG	E
30. Crowded	P	F	G	VG	E
31. Threatened	P	F	G	VG	E

APPENDIX I

MID-TREATMENT STUDENT INTERVIEW

Mid-Treatment Student Interview

1. What does the term "*sense of place*" mean to you?

2. How has the Natural Science class helped you connect with your surroundings thus far on your Traveling School semester?

3. Have the field journals assisted with developing a connection to your surroundings?

4. What do you enjoy the most/least about the use of the science field journal?

5. What could enhance the use of the field journal?

APPENDIX J

POST TREATMENT INTERVIEW

Post Treatment Interview

1. What was the most effective use of the field journal?
2. What would you change or what did you find least effective?
3. Tell me about the use of the field journal as a tool for reflection? Give specific journal assignments in your answer.
    a. reflection about what you learned this semester
    b. and reflection about your learning style/needs

APPENDIX K

POST TREATMENT QUESTIONNAIRE

Post Treatment Questionnaire

1. Did the Natural Science course help you develop a *sense of place* while on the Traveling School semester?
2. Did the field journals help with developing a connection to your surroundings in southwestern Africa?
3. Did this class alter how you connect to your surroundings at home (*sense of place*)?
4. Compared to prior to your TTS semester, do you spend more, the same or less time outside?
5. Did this class change your outlook on environmental issues?
6. Has your awareness of environmental issues changed since your semester ended? For example do you spend more, the same or less time reading articles, discussing issues, etc?
7. Has your participation in environmental activities changed? (More, the same or less time per week?) For example: volunteering, donating money/resources, etc.
8. Have your behaviors at home/school related to reducing your impact on the environment changed? (Ex: less driving, water use, recycling, etc.)
9. Do you contemplate your environmental impact/choices more since your semester has ended?
10. Is there anything else you would like me to know?

APPENDIX L

TEACHER FIELD JOURNAL SAMPLE

Teacher Field Journal Sample

Date: November 5th, 2011
Treatment Method: Unit Plan Development – Feedback on effectiveness of Geology Unit

1. Flow and effectiveness of lesson plans:
With this unit, I felt that the unit structure provided more opportunities for development of the three strands. Overall, the lessons were smooth, as I have taught most of the topics before. The biggest challenge sits with developing the social strand. The final sets of lessons are challenging to create connections back to the students' home town/region. This is due to lack of resource access (internet). The limited resources we have brought attention to the United States' impact on diamond use.

2. Effective teaching strategies and techniques:
Within this unit, I worked on trying a few formative assessment techniques that I hadn't used yet. I helped students develop a variety of graphic organizers to process information on rock and mineral identification. Based upon journal entries, students showed connection to the concepts in very clear ways.

3. Development of *sense of place*:
As I noted above, the connection to their home town/region with this geology unit was a stretch. This unit did provide significant opportunities for connection to their surroundings in Namibia. We explored several environments and learned about the geology of the region in several hands-on locations.

4. Changes for the next unit?
If I can find a place for students to access the Internet, then a final unit wrap-up for the end of the semester will be possible. The social strand development of this unit was limited in terms of students finding connections to their home town/region. I continue to find this part of the curriculum development the most challenging while traveling overseas. How do I create an assessment that assists students with taking action in their own community?

APPENDIX M

FORMAL COLLEAGUE FEEDBACK FORM

Formal Colleague Feedback Form

Date:

Lesson Title & Unit:

Observations (formative assessment techniques, lesson plan development):

1. Please note (+/-) for:
    a. Overall effectiveness of the lesson plan

    b. Student engagement during assessment techniques

    c. Specific areas for improvement

    d. Suggestions for future use of the assessment technique

2. Additional Feedback
    a. Any other observations that were significant to my overall teaching?

APPENDIX N

INFORMAL COLLEAGUE FEEDBACK FROM TEACHER JOURNAL

Informal Colleague Feedback from Teacher Journal (sample)

Date: October 1st, 2011

Lesson/Activity: Table Mountain Geology & Hike

Summary of feedback:
I asked two of my colleagues for feedback in teaching techniques and use of the science field journal in conjunction with an academic activity. Both colleagues thought the lesson went well and students were engaged. There were positive statements about the lesson setting the students up well for their hike of Table Mountain.

After the lesson and hike, I asked for feedback on the student response to completing a self-guided observational field journal entry during the hike. It seemed that the students were not overall excited and perhaps not as engaged with the assignment. There are many factors that could contribute to the lack of motivation for completion of the assignment, including environmental variables and having to self-regulate their own exploration time, with sitting and reflecting.

Action:
Because this treatment (use of the field journal) is still quite new to the students, I will continue to focus their attention and provide structured time for them to fill out their entries/complete their work. Based upon the feedback, it appears that perhaps an increase in structure (time) will assist with student motivation.