

# Fostering Environmental Stewardship in Young Adults through an Experiential Natural Science Curriculum

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A capstone project professional paper submitted in partial fulfillment of the  
requirements for the degree

Of

Master of Science in Science Education

MONTANA STATE UNIVERSITY

Bozeman, Montana

July 2007

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## **INTRODUCTION**

The impetus to live a responsible life does not often come about by chance. More often than not, it is an accumulation of experiences that heighten individuals' awareness of their surroundings and the connection they have for any given community. Family values often begin the cycle, and it is assumed that schooling further enhances the process of genuinely understanding what responsibility is all about. However, with a population growing in exponential fashion and individual voices and impact becoming smaller by the day, it can be easy for the mind to travel down a road of "my actions have no effect." This line of thinking can undermine educational efforts and result in "why do I need to know this?" mindsets where it can be easy for one to think that their actions are futile.

Fortunately, education is a dynamic entity that changes with the times. New schools of thought, first introduced by John Dewey, that take learning beyond the classroom have emerged in recent decades. Lecture-styled lessons are being increasingly replaced with alternative methods with titles such as outdoor, experiential, and environmental education that provide skills to tackle real-life needs. As this movement has gained strength, teachers of traditional classroom subjects have begun to incorporate alternative methods to enhance the learning experience and enable students to transfer skills learned in school to the world at large.

I have recently concluded that my classroom efforts may not be helping students with this transfer process as effectively as I would like. While there is little doubt that they leave my class with a renewed appreciation for the natural world, I am unsure that this will later affect their desire to be a responsible citizen. Whether they will disseminate the information they are given concerning an issue in the future is up to them, and although I hope that they will take a side and make important choices, it is more important to me that they at least know all the facts, processes, and have the ability to interpret issues using this rather than taking someone's word at face value. Possession of the tools necessary to scrutinize facts, take in varying perspectives, and make informed decisions will help students choose a college, buy a car, plan a career, or even save the world. These learner skills are outlined in Bloom's Taxonomy, but just how does one incorporate them all into a curriculum? And once that is done, can we measure which of the six factors (Knowledge, comprehension, application, analysis, synthesis, and evaluation) or other variables have the greatest impact in regard to fostering civic responsibility? I think we can, and by engaging in the process I can rekindle the very sense of learning that got me interested in teaching in the first place.

In this Action Research project, you will see the effect of a place-based, natural science curriculum on students' development of an environmental ethic and stewardship practices. By gleaning information from over 120 past participants of my class, I hope to shed some light, for my own as well as the discipline's benefit, on inherent strengths found within this type of learning situation, and areas needing further adaptation and improvement. The "ideal" environmental education curriculum is explored and explained, as are the benefits and challenges of outdoor and experiential education models. Given that the Natural Science course these participants engaged in combines elements of all three education styles, it should prove interesting to see what themes and trends result and, moreover, how to make the curriculum even more effective in leading to responsible social behavior.

## **PROJECT CONTEXT**

I teach Natural Science at the Rocky Mountain Semester (RMS), a semester long program for high school juniors from all over the country, run by the High Mountain Institute in Leadville, Colorado. The High Mountain Institute (HMI) is a non-profit organization devoted to connecting students to the natural world. These connections are fostered through three distinct, yet intertwined, components of each semester: academic, wilderness, and residential life. The RMS just concluded its eighth year and was founded by a husband and wife team, currently the executive director and head of school, respectively,

who are grounded in outdoor education and small, private institutions. They led outdoor trips for the National Outdoor Leadership School (NOLS), Deerhill Expeditions, Wilderness Ventures, and worked in private schools in the west prior to founding HMI.

The RMS is a boarding program that can accommodate up to 38 students per semester. Eight to twelve students live together among four separate cabins heated by wood burning stoves and lit by solar power. Students chop their own wood and cook all the meals on campus. They also elect student representatives, one per cabin, that meet with the faculty once a week to discuss and plan semester happenings. It is a small community, so commitment to the group as a whole is essential for the semester to be successful. The majority of students come from Caucasian middle to upper class families who are deeply invested in the development and schooling of their children. A scholarship has also been set up for one local Lake County High School student to attend the RMS each semester, and approximately 60% of all semester participants receive some financial aid. All students must apply to the program and gain admittance by demonstrating investment in the program, strong academic skills, and a willingness to try something new. They come to HMI for a variety of reasons, but mostly for an experience that is a significant change from the school systems they have been in, sometimes since kindergarten.

Six apprentices also join the RMS community each semester as a part of the Apprentice Program. These apprentices have recently graduated from college and are looking to gain experience in the three main components of life at HMI. They begin the semester with a multi-week wilderness experience, share campus responsibilities with the faculty, and join one academic discipline whose faculty act as a mentor.

Ten weeks of the semester are dedicated to traditional academics. Two buildings serve as the focal points on campus and house three classrooms, a library, kitchen, dining hall, faculty and administrative offices, eight computer stations, and wireless internet for laptops. English, US history, natural science, Spanish and French, and a variety of math course are offered, and the majority of students take all five courses. Each emphasizes issues of the Rocky Mountain West, the surrounding environment, and other related issues. The academic component is a rigorous college preparatory program, and the subjects of English, history, and science are also taught in the field. That is, students take homework with them on each wilderness expedition that must be completed before returning to campus. Practices and Principles: Ethics of the Natural World is a sixth academic class that all students must take to graduate. This class focuses on wilderness skills, both hard and soft, Leave No Trace ethics, and developing a wilderness ethic.

The wilderness component of the RMS happens over the remaining six weeks, separated into three two-week long backpacking expeditions to various locations in Colorado, Wyoming, and Utah. The three expeditions are staggered throughout the semester and the students gradually gain their independence. After two trips to learn the skills necessary to be competent backcountry campers and travelers, the third trip empowers the students to elect expedition leaders, plan routes, and ration food on their own. Instructors "shadow" the groups for safety purposes during the final expedition.

As a faculty member, I hold a number of other responsibilities on campus and in the field. Each faculty is the Faculty on Duty (FOD) once a week and is present on campus for a 24 hour shift beginning at 8:30am, helping the students cook dinner, overseeing study hall from 7-9pm and checking the students into their cabins at 10pm. I also serve as an expedition leader during trips and instruct the students in wilderness travel and camping basics.

This combination of roles is what drew me to HMI four years ago. The opportunity to engage with the students in a variety of settings and situations offers the chance to gain a rapport seldom seen between student and teacher in traditional academic settings. I am a teacher, mentor, and friend. I share the same experiences, whether it's a three day blizzard in October, chopping wood for the cabins, dressing in costumes for dinner, or simply enjoying an autumn game of Frisbee golf. The entire community is on

a first name basis, and we act as one extended family. Students are motivated for the betterment of the community as a whole while enhancing their own learning environment. This makes for an ideal situation to practice taking action on thoughts and ideas and potentially seeing quick results.

My Natural Science class is primarily about understanding the intricacies of the natural world. We dabble in ecology, meteorology, geology, stream morphology, sustainability, and environmental issues. My goal for the course is to enlighten students about the processes happening in the places they visit on expeditions with the desire that they can then effectively scrutinize any and all of the environments they are likely to visit in the future. Deeply rooted in this is my desire for students to take a personal interest in learning about the natural world. I believe that if students are informed and have a connection to nature, are informed about the processes found within, and have the opportunity to practice positive behavior, the more likely it is that they will take the necessary time to be up to date on global issues and consider them at length and with proper research.

The students are not just learning to connect with nature, they are also learning about what it means to be a contributing member of a community. The RMS does not function for the individual, but for the collective group as a whole. Everyone gives back to the community through chores, cooking, and being a positive participant every single day. In my class, I aim to integrate this idea of community at the RMS within the natural science curriculum. By gaining a thorough understanding of the timeless natural cycles and processes at work in nature, I hope to have students adopt a land ethic such as Aldo Leopold (1949) describes in *A Sand County Almanac*. It is my firm belief that students will carry this "community" mindset into the world with them. With a solid foundation of content knowledge in place concerning natural happenings and an investment to bettering society by recognizing their own place in the "community" of the world, they can hopefully make better decisions and will become responsible citizens.

## **FOCUS QUESTION**

My primary research question asks: how does my place-based, natural science curriculum develop environmental stewardship?

## **PERSONAL CONTEXT**

After fifth grade, I ceased to be interested in learning at school. Once the fun, hands-on experience of school was replaced by lecture-styled lessons, I could no longer readily assimilate the information. None of the material seemed of consequence to my everyday experience, so it hardly seemed worth the time and energy necessary to excel in school. It wasn't until I found areas of my life I wanted to enrich that I decided to re-engage in the learning process. Spending time in the outdoors instilled in me the desire to amass all the information I could about the natural wonders that tickled my senses and imagination. The journey of researching the environment was as thrilling as it was painful. Immersed in all the wonderful landscapes I read about were underlying themes of resource depletion and companies exploiting the natural world prior to government regulations and then fighting regulations mandated. After a few seasons of teaching the bulk of natural science topics offered on NOLS courses, I secured a job teaching science in Switzerland for the Winter Term. The program offered 7<sup>th</sup> and 8<sup>th</sup> grade students from America a three month abroad opportunity. This began my career as a classroom educator.

I have actively been teaching science, both in the classroom and in the field, since 1999. I completed only one science-based course as an undergraduate at the University of Vermont, preferring to spend my college years exploring the state's open spaces. I found a passion for learning about the places I visited and cherished. After two years teaching environmental education and natural science in Switzerland, it became apparent that I had taken myself as far along the road to ecological

enlightenment as I could go at the time. I decided to pursue more formal education at the Teton Science School (TSS) in Jackson, Wyoming. The instruction at TSS emphasized developing connections to and forming values about the natural world. During the year-long Professional Residency in Environmental Education, weeks alternated between academics and teaching week-long residential programs within Grand Teton National Park. While at TSS, the science position at HMI became vacant, and I immediately applied, jumped through the hoops, and was eventually hired.

The ability to form longer relationships with the students over a full semester through a variety of experiences was what made the RMS so enticing, and to date I have enjoyed every minute here. I've just finished my fourth year/8th semester at HMI. Every semester my curriculum changes based on student interests, global issues, expedition locations, and weather restrictions and season. The fall semester is heavy on ecology and succession themes. The spring semester begins with three weeks of winter ecology. This is another aspect of the RMS I have grown to appreciate. While it is difficult to find time to plan new curriculum from scratch, having the freedom to create my own course schedule has been a refreshing experience. After several semesters I noticed certain areas of the curriculum I can continue to improve. The vision of HMI is to "connect people with the natural world" (Barnes, 2003), a concept expanded upon by the school's mission statement. "HMI nurtures personal growth through the interaction with nature and participation in a strong community. We promote intellectual, physical, and personal development through insistence on academic excellence, our philosophy of mentoring and apprenticing, and rigorous experiential learning. We seek to promote independent thinking and to develop skills of learning and habits of mind that both enhance self-reliance and transfer beyond the boundaries of HMI." (Barnes, 2003)

After several semesters, it became apparent that my curriculum was possibly not meeting the "transference" aspect of the school's mission to the extent I would like. The course was mostly content-based, with little focus on how the students could use their new knowledge beyond simply appreciating the outside world. I knew the content well enough to teach without notes, and planning became relatively unnecessary. While this offered some spare time, I longed to break into new areas but lacked the knowledge base to feel confident experimenting with new content. The apprentices I have worked with over the years have brought in numerous new ideas, many of which I have incorporated into the regular material offered. In the spring of 2005, during RMS 14, my apprentice had extensively studied alternative resources in college and designed a week-long unit on sustainability that she taught in the final weeks of the semester. Inherent to understanding the possibilities of sustainable living is a sound foundation of knowledge in ecologic principles. My curriculum had always covered this, yet applications proved harder to incorporate. A detailed unit on sustainability, I realized, was the perfect bridge between content and (potential) action. Students loved the sustainability unit, and it was one of the highlights of their semester. Student evaluations revealed praise for the ability to apply learned knowledge to real-life scenarios. They were able to see the wisdom in sustainable living from an ecological perspective. This spurred me to research how I could improve students' investment in environmental science through a place-based natural science curriculum. Teaching this unit on my own, I re-discovered that passion to learn new material that got me hooked on science in the first place. By making ecology content tangible, I find I am learning along side the students. I am deeply invested in this aspect of teaching science, and going through the act of changing my curriculum to fit this model has offered its own challenges that I have learned from.

## **CONCEPTUAL FRAMEWORK**

### *Outdoor, Experiential, and Environmental Education*

The past three decades have produced a wide variety of new educational theories and disciplines. Classrooms have expanded to include the out of doors as a teaching and learning tool, especially for curriculums that include a study of ecology, nature, or outdoor experiences. Three distinct models of education incorporating the above are currently popular: outdoor education, experiential education,

and environmental education.

Phyllis Ford (1986) best summed up outdoor education following the model proposed by Donaldson and Donaldson (1958) as "education 'in', 'about', and 'for' the out-of-doors." She breaks further down the where, what, and why spelled out in the definition. We use the outdoors to learn about it and how to protect it. Others have separated outdoor education from the environmental component as of late. The distinct three aforementioned education styles are widely recognized as different disciplines that can be readily intertwined. Adkins and Simmons (2002) illustrate the relationships inherent among the disciplines and noted that "One can easily consider educational purposes that build from the strengths of all three approaches."

The AEE suggests that "Experiential education is a process through which a learner constructs knowledge, skill, and value from direct experiences"(2002) while Ford (1986) had this simply as "learning by doing or experience." The interconnectedness of the three models is clear when Hanna (1995) noted that "The research indicates that outdoor educational and recreational experiences play an important role in influencing higher levels of environmental concern and activism." This combination of disciplines leading to environmental stewardship is supported by Boss (1999), who identifies three outdoor education approaches that are experiential learning activities that ultimately lead toward student investment in civic responsibility: adventure education, cultural journalism and participatory research, and service learning.

Environmental education is defined by Ford (1986) as education about the total environment. This would include not just a knowledge base, but also an understanding of issue topics such as resource limitations, ecological dynamics, and population growth. Stapp (1969) had earlier highlighted the goal of civic responsibility when he defined environmental education to be "aimed at producing a citizenry that is knowledgeable concerning the biophysical environment and its associated problems, aware of how to help solve these problems, and motivated to work toward their solution." Taking this idea during the early stages of the environmental movement, the Tbilisi declaration from the Conference of Environmental Education in 1977 stated that "Environmental education, properly understood, should constitute a comprehensive lifelong education, one responsive to changes in a rapidly changing world. It should prepare the individual for life through an understanding of the major problems of the contemporary world, and the provision of skills and attributes needed to play a productive role towards improving life and protecting the environment with due regard given to ethical values." (UNESCO, 1978)

David Orr supported this pro-active participation in the life process in his 1994 book *Earth and Mind: On Education, Environment, and the Human Project*. Pulling from the works of Lopez, Leopold, and Snider, Orr argued strongly for a revamping of the educative process and offered a definitive list of curriculum topics, including basic principles of ecology, sustainable agriculture & forestry, and environmental ethics, which he believes is paramount instruction that any graduate of an institution should be offered.

William F. McComas' (2002) two part series on the ideal environmental education offers detailed looks at the evolution of the term. McComas notes that there is a strong difference between the terms environmental science and environmentalism, the former referring more to "concepts" of ecology and the latter considered a strong "action" component. He uses the work of Cuban (1992) to separate the taught curriculum from the curriculum actually received by the students. Priest (1988) takes this content/action idea even further, breaking the transference process into more pieces in his Ladder of Environmental Learning: receptivity (opportunity, interest, ability), recognition (awareness, appreciation, understanding), response (empathy, ethical action, evaluation).

While it is not clear whether action needs to be a part of effective environmental education, Woodhouse and Knapp (2000) demonstrated that a place-based education, one that takes place in, is about, and is for the surrounding environment, can lead to Orr's ideal of a citizen. Much has been said to promote the strengths of a local, place-based education in regard to development of an ethic in the model of

Leopold and others. Wendell Berry has long been a proponent of rural education, suggesting that a close understanding of and a tie with the land is essential in contemporary education. "[Education]'s proper use is to enable citizens to live lives that are economically, politically, socially, and culturally responsible." (Berry, 2001) Woodhouse and Knapp further purport this type of schooling. "One of the most compelling reasons to adopt place-based education is to provide students with the knowledge and experiences needed to actively participate in the democratic process." (Woodhouse & Knapp)

#### *Defining the Goal of Outdoor, Experiential, and Environmental Education*

The reason for producing some synthesis of the three education styles is apparent, but the defining curriculum for doing so is not in place. Hungerford, Peyton, and Wilke (1980), in their paper *Goals for Curriculum Development in Environmental Education* suggest that the Tbilisi goals outlined in 1977 were not being met by environmental education programs. The authors propose that most EE programs focus too much on the knowledge and appreciation aspects of the natural world and do not spend the time teaching students possible ways to solve the problem(s). McComas (2002) also found that classroom textbooks were more focused on the knowledge base rather than the problem solving aspects, and noted that "...participation in outdoor-recreation activities encourages an affinity for the natural environment, fostering a generalized opposition to unnecessary degradation."

Hungerford, Peyton, and Wilke (1980) went on to suggest a detailed outline for an environmental curriculum that is broken into several sections that, over time, meet the goals experts on a panel have deemed "most important" aspects of environmental education. These goals fall in line with McComas' study, Cherrett's (1989) rank order survey of the members of the British Ecological Society, and Orr's list of "must be taught" subjects. While not all incorporate a definitive "action" component, Matthews and Riley (1995) supported a model that "holds that an increase in knowledge will lead to a change in attitude which will in turn influence behavior".

This has been the dominant "default" model used by numerous educators for decades, despite Hungerford and Volk (1990) providing evidence that this model is far too simplistic. They suggest that even with extensive knowledge on a subject, behavior often will *not* change just because knowledge increases or attitude is positively changed. There are often challenging social or economic factors that more likely impact citizen behavior. While attitude may offer the desire to do one thing, life's realities may force another outcome altogether. Hungerford and Volk (1990) point out that the exact manner in which this link works, however, is considerably complicated. They note that behavior changes based on knowledge "can be perceived as so very complicated as to make instructional planning difficult." Despite this sentiment, it does appear that some sort of link is attainable within the context of an appropriately designed curriculum.

The converging of outdoor, experiential, and environmental education as proposed by Adkins and Simmons (2002) suggests that this combined approach will best offer students the opportunity to begin the journey toward environmental responsibility proposed by Hungerford and Volk. It is the combination of these three distinct, yet intertwined, modes of education that can ultimately offer extended practice with environmental action skills that offer students ownership and empowerment in the process. When appropriately mixed, the outcome should mirror McComas' notion that "...possessing knowledge of ecology enables individuals to make useful explanations and accurate predictions while informing decision making and 'action-taking'." This combination approach appears to hold the right elements to meet the goals of environmental education as outlined below from the Tbilisi Declaration. (UNESCO, 1978)

1. to foster clear awareness of, and concern about, economic, social, political, and ecological interdependence in urban and rural areas;
2. to provide every person with opportunities to acquire the knowledge, values, attitudes, commitment, and skills needed to protect and improve the environment;

3. to create new patterns of behavior of individuals, groups, and society as a whole towards the environment.

In order to achieve the overall outcome of creating a "new pattern of behavior" sought after by the Tbilisi Declaration, in accordance with Hungerford and Volk, educators need to focus on more than just creating awareness. Ownership and intention to act; along with a baseline knowledge and skill set, need to be in place. The combination of outdoor (place-based), experiential, and environmental education techniques stands the best chance leading students along the path toward environmental/citizenship behavior.

#### *A Method of Evaluating*

While there are numerous ideas on what the ideal environmental science curriculum should look like, many overlap. Hendricks (1994) suggests that the biggest challenge lying ahead is for educators to determine just how experiential education works. What experiences are deemed most important for successful transference of knowledge into actions and contexts that mirror the ideas of Orr, Hungerford et al, and McComas. The Tbilisi Declaration (UNESCO 1977) listed five tenets for successful environmental education (See Below) that, in time, should promote greater environmental stewardship. A curriculum geared in the knowledge-attitude-behavior model's method of effectively promoting/influencing positive behavior should be researchable within the context of these five tenets. In an effort to make this a reality, I have continually designed my curriculum after the desired outcomes of environmental education as declared at the 1978 Tbilisi Intergovernmental Conference:

Table 1

Awareness	to help social groups and individuals acquire an awareness and sensitivity to the total environment and its allied problems (and / or issues)
Sensitivity	to help social groups and individuals gain a variety of experiences in, and acquire a basic understanding of, the environment and its associated problems (and/or issues)
Attitudes	to help social groups and individuals acquire a set of values and feelings of concern for the environment and motivation for actively participating in environmental improvement and protection
Skills	to help social groups and individuals acquire skills for identifying and solving environmental problems (and/or issues)
Participation	to provide social groups and individuals with an opportunity to be actively involved at all levels in working toward resolution of environmental problems (and/or issues)

(Adapted from H. Hungerford and T. Volk (1991), *Journal of Environmental Education*, 22, P 8 – 17)

It is clear that an approach that combines the finer points of outdoor, experiential, and environmental education would potentially allow for successful transference of knowledge and ethics by students as they move into times of greater responsibility in their lives. By utilizing the inherent strengths of these three distinct yet intertwined disciplines through the application of the Tbilisi ideas, an educator can help foster stewardship and gain a more thorough understanding of the specific processes that lead to success in the endeavor. Moreover, one can test varying aspects of effectiveness regarding the five main tenets of the Tbilisi Declaration. The criteria of the Tbilisi Declaration seem an appropriate way to model an "ideal environmental science curriculum" in the spirit of Orr, Hungerford et al, and McComas while simultaneously fostering environmental awareness and stewardship through an increase in overall environmental awareness.

## METHODS

Research was conducted on students, both current and former, from my Natural Science courses. Rocky Mountain Semester (RMS) students are high performing and motivated. Semester groups of 27-35 students come all over the country and sometimes abroad. The student population comes from both public and private schools, with generally more from the latter. Most students were Caucasian and represented families from the middle to upper class. One other important demographic is that approximately two-thirds of each semester's student population was female. All participants were high school juniors or seniors when they attended the RMS, and all were aged 16 – 21 during data collection. What the participants have done since graduating from the Rocky Mountain Semester varies greatly, yet it was exactly that aspect of the study that was compelling: have they developed a strong environmental ethic since taking the Natural Science class? In this section, I will describe the data collection instruments used for this study. For each instrument utilized, a description of its development is offered, along with a summary of how and when it was administered. Each instrument section then concludes with a description of how the data was analyzed.

A potential bias I will need to account for is the fact that these students have chosen to participate in the RMS. This fact, in its own right, predisposes this particular student body toward a conscious (or subconscious) desire to engage in the learning process in a new and refreshing way. Thus, they are naturally more open and accepting of new ideas and thoughts, so they are relatively predisposed to incorporate a new environmental ethic. In fact, the P&P class I recently began teaching during the RMS has a large focus on helping students determine their own environmental ethic. However, only one group of participants (RMS 17) had me as their P&P teacher, and prior to that semester the curriculum for that class was more heavily focused on hard skills, leadership, and communication and thus should not factor into the results in a significant manner.

### Quantitative Data Instruments

While much of the data for this project is qualitative in nature, I believed it useful to incorporate a quantitative instrument to help measure students' personal attitudes toward stewardship and environmental issues after leaving the RMS. A Likert survey (Appendix A) was utilized for the students to complete during the month of March 2007, meaning that some students recently concluded their semester while others left the RMS up to three years ago. Having past students complete the survey provided an interesting look at behavior and attitudes one, two, and three years out of the Natural Science classroom. Also, I was able to compare each semester individually in an effort to determine the effect of the unit on sustainability that was introduced in RMS 14 (Spring 2005).

In an effort to determine how my place-based, natural science curriculum develops environmental stewardship, I asked all students who were enrolled in my Natural Science course over the previous four years to complete a Likert survey (Appendix A). The survey was designed around the five tenets of the Tbilisi Conference, asking five questions each under the headings *awareness*, *sensitivity*, *attitude*, *skills*, and *participation*. The five questions under each tenet were designed through the adaptation of multiple existing surveys, the most notable being from the Selborne Project conducted through Pennsylvania State University. After examining these other surveys, I began to get a sense of how the questions would flow. I constructed the questions by phrasing them in a manner that I believed would offer responses that represented the students' feelings for each particular tenet. This proved to be an arduous task, and at no point did I feel that the questions perfectly addressed the tenet they were designed for. None the less, given time constraints the survey was deemed finished and administered.

Feedback from the students who have taken my Natural Science class over the prior seven semester offered quality information regarding the curriculum. By separating the questions into the five Tbilisi tenets, I was able to better infer particular areas of strength and weakness within those specific criteria as outlined by Hungerford et al (1990). The five questions under each heading were designed to

specifically address that component of environmental education and ask the student how strong an impact the course had in each area. Constructing the survey was not without its challenges, and many revisions were made in an effort to ensure that each question was narrow enough to address the tenet *and* specific enough to link back to the Natural Science class. There is the potential for bias in the survey. This would be in a manner akin to students linking the question back to the greater institutional experience of the Rocky Mountain Semester rather than specifically my science class.

My research question is focused on curriculum and what has worked well to achieve the tenets of Tbilisi mentioned above over the past four years. The samples represent four different age groups, varying from high school junior to college sophomore. The older the student, the more years my curriculum has had time to either make an impact or fade from memory. Each student received the survey once. Since I am aiming to determine how I can improve my curriculum based on developed stewardship, a pre-test was not necessary.

The survey was administered in early March via email to each of the seven groups of Rocky Mountain Semester (RMS) students I have had in class – the semester as a whole (#s 11 – 17). Each semester varied slightly in total number of science students, but the average is approximately 30 per semester. In addition, current email addresses could not always be obtained, so the survey link was sent to the most up to date address available. The above factors resulted in less than 100% response rate. Respondents were given two weeks to complete the survey, which was designed using an internet survey tool [www.surveymonkey.com](http://www.surveymonkey.com).

The break down of data was done within the scope of each of the five tenets: awareness, sensitivity, attitude, skills, and participation. By examining each of these individually, I furthered assessed areas of curriculum to improve and what is already strong. I attempted to create the survey in a fashion that should make this analysis simple. Each question addressed the student's opinion regarding a specific within the context of awareness, sensitivity, attitude, skills, and participation. By systematically cataloging these, I determined what specific areas need attention in my effort to develop environmental stewardship through a place-based natural science curriculum.

I examined both the overall data trends and changes in the response to the specific tenets from each semester group. There proved to be an enormous amount of data, and in order to simplify the analysis, I evaluated the responses from two perspectives: the overall mean scores for each Tbilisi tenet from all participants, and the mean scores for each Tbilisi tenet *per semester* (See Tables 2 and 3). In order to calculate the mean score per tenet, responses from the five questions were given a value number 1 – 5. Responses of “Strongly Disagree” denote a value of one, “Disagree” a value of two, and so on up to “Strongly Agree” with a value of five. The values were then multiplied by the number of responses in that category, and the mean score was taken for the five questions under the corresponding tenet.

Table 2  
Individual Question Example:  
I notice nature more often since the Natural Science class.

Response	Response Total	Value	Total Value
Strongly Disagree	0	1	0
Disagree	3	2	6
Neutral	19	3	57
Agree	56	4	224
Strongly Agree	47	5	235
N=125		Mean	4.31

Thus, the closer the mean score is to 5, the higher the perceived strength of the Natural Science curriculum to address the specific issue within the question.

The same process above was employed to score mean response scores for individual semesters as well. Once mean scores per question were tabulated, I could then determine the mean score *per tenet category* as shown below. Through this analysis process, I was then able to separate out each semester and note trends in the data, as well as get the overall trend from the entire group of 128 respondents.

Table 3  
Five Question (Entire Tenet) Example:

<b>AWARENESS</b>	Mean Score
The Natural Science class made me more aware of environmental processes and concepts.	4.64
I notice nature more often since the Natural Science class.	4.31
The Natural Science class made me more aware of environmental problems.	4.42
I notice more often when there is litter where it shouldn't be since the Natural Science class.	3.86
I am aware of various perspectives people have in regard to environmental problems.	4.26
<b>TOTAL MEAN SCORE FOR AWARENESS (ALL RESPONDENTS)</b>	<b>4.30</b>

While further examination of individual questions could also be done, I opted to look for the big picture trends in the data as determined by all the respondents from each particular RMS semester. This allowed more in-depth analysis of large-scale trends without going into detail over the minutia of each particular question.

### Qualitative Data Instruments

To further assess how my place-based, natural science curriculum develops environmental stewardship in students who have taken the Natural Science class, I interviewed RMS 17 students and kept a log of personal observations from unsolicited correspondence from both current students and alumni specifically pertaining to the science class. Feedback from the students in a context less constructed and narrow than the survey questions allowed me to interpret further the impact of various course offerings on environmental stewardship attitude, sensitivity, awareness, skills, and participation. By gaining a more thorough understanding in these areas, I can continue to design improved curriculum to better meet the five tenets of the Tbilisi Conference and more effectively merge the inherent strengths of outdoor, experiential, and environmental education.

### Interviews

Interviews were conducted with five students from RMS 17, the most recent students to complete the Natural Science course in its entirety. The feedback they offered went beyond the simplicity of the Likert survey and allowed me to interpret meanings based on my knowledge of the particular students interviewed. It also gave me extraordinary access to the thinking of these teenagers as they trust me and I have a high degree of rapport that enabled me to understand their statements at a deeper level. This offered deeper insight into exactly what students are taking away from the course in terms of the five Tbilisi tenets, something that will enable me to better tailor the course to address specific areas that need development.

Interview questions were developed to address the five Tbilisi tenets, and two specific questions within the interview focus on one tenet (See Appendix B). Questions were determined in a manner I felt would provoke responses in regard to each tenet during the interview discourse. The Tbilisi tenets are defined in Table 1, and both of the interview questions addressing the tenet were designed to illicit a response of the students' attitude toward the Natural Science class's ability to address them. This resulted in a ten question interview. While the interviews were to be conducted on campus during free time in one on one fashion, this was not realistic. As I tried to pinpoint the impact of the sustainability unit, and that

happens to be the final unit of the semester and carried into the final days with this particular group of students, finding time during the final few days proved to be a greater challenge than anticipated.

Students were interviewed on the final day of the semester in Denver International Airport as they were preparing to leave. Given the time constraints of this fact, students were randomly chosen based on nothing more than availability for a fifteen minute interview before their flight home.

The RMS is a small enough program with a strong emphasis on community that by semester's end, I have a good rapport with most, if not all, of the student body. With this in mind, I simply interviewed willing students who had the time before their flight to sit down and chat. All five of the interviewees were in the Natural Science class during RMS 17 and, as it turned out, there were three females and two males interviewed. These five were a fair representation of the two sections of Natural Science I taught, and their academic ability was equally mixed. Two high achieving students, two middle range students, and a lower ranging student were interviewed.

#### Analysis of Interviews

An audio recorder was utilized for the interviews to record actual dialogue so I did not have to take scrupulous notes and could focus on the questions. I then transcribed the audio tapes.

An inductive method was used to tabulate the data (Appendix C). I took statements from the interview transcript and categorized each one of them into one of the five tenets of the Tbilisi declaration. Several of the tenets are so similar in concept that I often inferred the general meaning of the statement, based on my knowledge of each student and my rapport with them, into one of the five tenets the statement was addressing.

With the statements then categorized, I reviewed them again to note themes and inferred meaning, again based on my knowledge of the individual student. Having saturated myself with this information, I summarized each category and the strength of the natural science curriculum in addressing the five tenets.

#### Personal Observations

Upon recent reflection, I noticed how often students, both past and present, describe to me their new-found interest or future plans to develop their understanding and involvement in environmental issues or sustainable practices. These unsolicited offerings transpire in face to face conversations with current students and alums, although the latter group often emails me with news about their course of study or sustainable programs they are engaged in.

As this seems to be a wealth data, I decided to keep a record of who has interacted with me in this manner and what the context of the conversation was. Collecting this data took many forms of "response," including: emails, letters, second-party word of mouth, and face to face discussions. Of particular note is the open ended question students had the option of answering at the end of the emailed Likert survey: *"Any news to share? What have you been up to lately? I'd love to hear. (Your response is total voluntary...)"* While this prompt may be considered "solicitation," I would like to point out that only half of the survey respondents chose to share news, and roughly less than half of those that shared mentioned anything of interest in regard to this study. Therefore, I feel comfortable considering the situation as simply my getting back in touch with former students, some of which felt compelled to share with me what they have been doing since leaving the RMS. Appendix D is a record of all the personal observation data, and those passages directly from the survey prompt are italicized.

Maintaining a record of each observation proved to be challenging in its own unique way. I have corresponded for several years with various alumni over email, yet I rarely saved many of those messages. I know the context of what was being conveyed, but the "hard data" is really my own memory and interpretation. The same is true for discussions, as I never sat and steno graphed those

conversations. The chief method of compiling these personal observations was to keep a Word file on my computer that I could add to as new information came to me. Determining the exact dates of these interactions was not necessary since the content of the interaction was of decidedly more interest than the point in time it took place.

For direct conversations and word of mouth information, I would open the Word file, add the student's name and RMS semester they were a member of, and describe the most interesting part of the interaction. If I received an email, I would copy and paste the pertinent passage into the Word file, again noting name and semester.

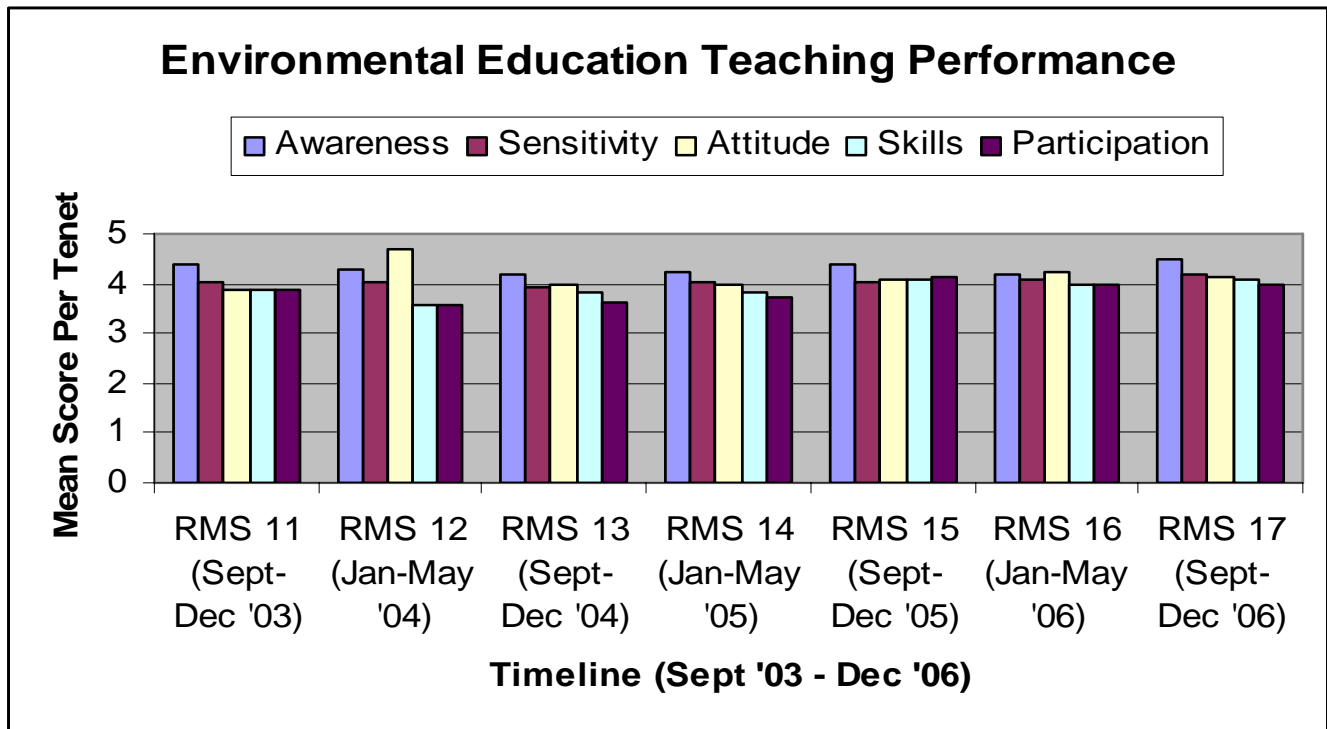
As of April 1, 2007, I stopped recording personal observations. The analysis process involved reading and re-reading the Word document with all of my personal observations, and then separating each statement into its relevant Tbilisi tenet based on my inference of the meaning (Appendix D). I utilized the exact definition of the tenets (Table 1) in an effort to categorize the responses. Once separated into individual tenets, I then read through all observations in the category to further ensure they were listed appropriately by my understanding of the tenet's definition as outlined by Hungerford and Volk (1991). Once I felt comfortable about the placement of the responses under their tenet, each Tbilisi tenet was again read over several times until I felt saturated by the overall meanings of the students, and I summarized the trend of each tenet.

## DATA AND ANALYSIS

### Likert Survey Data

A total of 128 students responded to the survey. Participation from each semester was mixed, with a high of 22 from RMS 16 and a low of 8 from RMS 13. The overall trend in the data demonstrated curriculum strengths to be in areas of *awareness*, *sensitivity*, and *attitude*. *Skills* and *participation* were clearly noted as being less influential aspects of the Natural Science class; however, there does appear to be a trend of improvement in these two tenets over the past several semesters.

Table 4

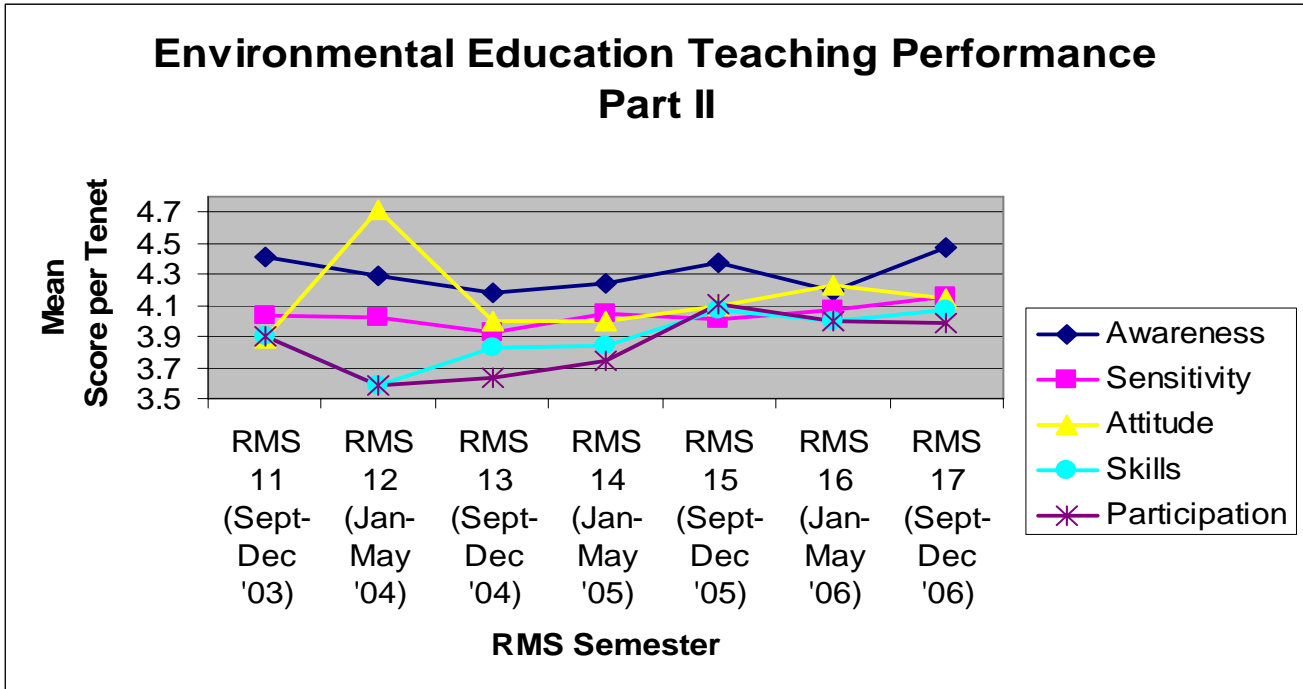


Responses were assigned a value of 1-5, where one point was assigned to a response of "strongly disagree," two points were assigned to "disagree" and so on, up to five points for "strongly agree" responses. Scores represent the mean value for each tenet as responded by each semester group (See Methods), and the higher the score, the better the Natural Science course is perceived at addressing the corresponding tenet.

Table 5 provides a closer look at specific performance per tenet over time. It is clear from the survey that students reported that there was a stronger emphasis on Skills and Participation since the introduction of the sustainable practices unit in RMS 14. Awareness, Sensitivity, and Skills remained fairly constant over the seven semesters.

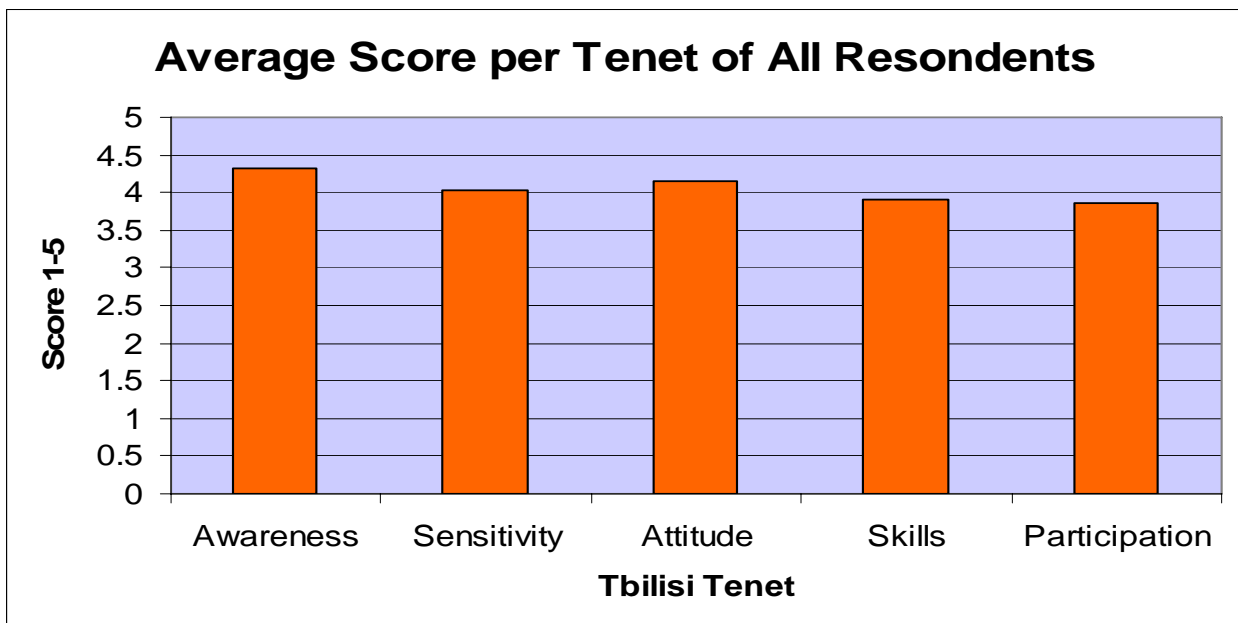
Awareness, sensitivity, and attitude scored consistently higher than the latter two Tbilisi tenets. As can be noted from Tables 4 and 5, with the exception of RMS 12, these three tenets show little variation and appear to remain steady, trending neither up nor down.

Table 5



This does not come as a surprise, especially considering the context in which the class takes place. RMS students come from all over the country to Colorado, and then we spend six weeks of the semester *living* in outdoor settings in both the Rocky Mountains and the canyons of Utah. This inherent component of the RMS offers ample opportunity for students to expand upon their appreciation for natural places. Complimented with a knowledge base that tackles why those places are the way they are, the experience lends itself perfectly to developing a new attitude toward the wilderness. While the Natural Science class informs students about the processes taking place and the fragility of natural cyclical systems, it would be audacious to claim that the delivery of curriculum alone would produce such results as found in Table 6.

Table 6



There is no doubt that the Natural Science course utilizes the “wilderness” component of the RMS program by tailoring the curriculum around where the students are going, or have been, on their expeditions. Thus, the data may well be a reflection of the *combination* of outdoor, experiential, and environmental education. This is not a pre-requisite to meet the ideals of the Tbilisi tenets, according to Hungerford and Volk (1991), but it does lend support to Donaldson and Donaldson’s (1958) assertion that outdoor education is about, for, and *in* the outdoors. By combining the outdoor education component with experiential education through field-based lab classes, and taking it further by introducing and examining relevant and timely global and national issues, touching upon the environmental education philosophy, the Natural Science class at the RMS appears to do well at addressing the first three Tbilisi tenets of *awareness*, *sensitivity*, and *attitude*. It is not the class as a stand alone, but the combination of the curriculum of the class within the context of a program with the outdoor and experiential components in place that makes for success in meeting the goals of these three Tbilisi tenets.

While *skills* and *participation* are certainly lower than their counterparts and warrant further emphasis within the Natural Science course curriculum, they each show an improvement trend since the implementation of the sustainable practices unit during RMS 14. The addition of this unit has been of great interest to me in regard to the experiential component of the course and being able to offer the students practical applications of abstract ecological topics. Since adding the sustainability unit, it has become *the* focus of the final third of the semester, with all preceding material geared toward ensuring student understanding of concepts for this one section. As a final project, students research a sustainable topic and present information about the practice, its current usage and applications, and areas for further investigation. In addition, students conclude the semester examining current practices at HMI and recommend strategies for the school to reduce its ecological footprint. The improving trend in these two areas leads me to believe that implementing this particular unit has had a positive effect in meeting the skills and participation tenets of the Tbilisi declaration.

Furthermore, through continued development of practical and meaningful curriculum that has a focus on implementing skills and participation as outlined by the Tbilisi tenets (Table 1), I may be able to continue this upward trend to a point where they rank equal to the first three tenets as “effectively achieved” through the Natural Science course. The first three tenets appear strong, and much of that could be due to the inherent nature of the RMS program’s emphasis on outdoor and experiential education. The last two tenets, skills and participation, fall squarely in the experiential arena while being a pivotal piece of ideal environmental education. Since the RMS does not address these tenets by default, there is more onus on myself to bridge the gap and make up for the lack of programmatic emphasis on these areas through effective implementation of new curriculum addressing skills and participation within the Natural Science course offering.

It has been made clear to me through the process of this project, and especially in analyzing this survey, that the Natural Science class is the direct beneficiary of the strengths of the RMS program as a whole. It is quite possible that the bias of willing participants in a program vested in wilderness expeditions are pre-disposed to new-found appreciation (*awareness*, *sensitivity*, and *attitude*) for the environment. In fact, the Natural Science course may have little to do with past participant attitudes concerning these Tbilisi tenets. It would be interesting to compare the few students who did not take the Natural Science course to those that did in regard to these tenets. Comparing the two may offer further evidence of the effect of the Natural Science curriculum on environmental stewardship.

### **Interview Data**

As mentioned in the methods section, student interview responses were categorized into the tenet the student seemed to be most addressing with the statement, from my perspective. All responses under each tenet were then re-read to ensure that my interpretation of them fit within the definition of Hungerford and Volk’s (1991) five tenets of the Tbilisi Declaration (UNESCO, 1978). Once satisfied with their placement/categorization, I then read all responses under one tenet until I felt saturated by the

overall message being conveyed in regard to the ability of the Natural Science class to effectively address that particular tenet and summarized what I learned.

### *Awareness & Sensitivity*

Separating *awareness* from *sensitivity* proved to be a greater challenge than anticipated, as many statements from the students could have fit under either, or both, categories. In the effort to discern the context of these statements, it has become clear that those two tenets of the Tbilisi declaration are closely linked. So close, in fact, that awareness is even defined as "acquire[d] awareness and sensitivity to the total environment." For this reason, interpretation of interview data for these two tenets is combined here.

Still, some differentiation is possible. Based on students comments from the interview, the science class curriculum is strong in connecting students to the natural world and giving them perspective. The discovery of these "connections," in my opinion, follows under the *awareness* tenet. Student A from RMS 17 notes "*What's most interesting, in my opinion, is just how everything's connected. So, succession plays some role on what lives there, as in animals, and then what type of effect those animals have on their environment and what effect they have on any other animals in the environment.*" (Appendix E, Student Interview #1, 12/17/06) Student A was not aware of the inherent connections within the natural world before the class, and now has the knowledge to identify and understand the role, or niche, every species plays in the ecosystem. This quote also serves as indirect evidence of the power of the context in which the Natural Science course is taught. Without ever saying so, based on my own contextual knowledge, the wilderness experience of the RMS helped this student find the "connections" mentioned. Student A happened to be one of the more outspoken students from the Natural Science class, yet student E, a much quieter student, said "*I like that Thanksgiving assignment, where we had to research a current environment issue in our neighborhood. It kind of pertained to us. It concerned us, rather than this omnipresent idea of global warming. That's bad, but it's happening to everyone. The environmental issue that you made us look up in our area and do research about - that is affecting me.*" (Appendix E, Student Interview #5, 12/17/06) While he does not outright mention the connections formed, it seems clear to me that his experience with the Thanksgiving assignment offered him just that: a connection to the environmental issues around his home. This quote seems to counter the prior in regard to need for programmatic context, since the assignment mentioned appears independent of the RMS. However, under closer examination this assignment was made more powerful for this student due to the nature that it was about home, not Colorado. The boarding aspect of the RMS and the place-based nature of the class combined to form a lasting impression, one that might not have been possible had the student simply driven a few miles home for Thanksgiving break rather than fly across the country. Studying local (i.e. Western) issues made researching issues closer to home more meaningful. Students become connected to the locale where the class takes place, but this is then transferred to home and made powerful courtesy of the distance making the paying attention at home more interesting.

The take away message from the student interview responses under the *awareness* tenet stresses the fact that they are no longer separate from nature, but a part of it. Their awareness has been heightened through both the introduction of knowledge about the natural world offered in class as well as the experiences they have had while living within the ecosystems during expeditions. Students have gained knowledge of the existence of natural phenomena. The expeditions are a key component to the RMS experience. It is not only the Natural Science class that provides increased awareness, but the outdoor and experiential components of the wilderness expeditions of the RMS as well. The two appear to be linked, according to the interview data.

As for *sensitivity*, the major theme emanating from student interview responses was that of "perspective." Students reported becoming aware that what they thought they knew was not the whole story, their perspective on issues and concepts seemed to have shifted, opened up in a way. Student D, the strongest science student of RMS 17, said "*Some issues are probably very similar, but definitely there are different issues in different places, based on the climate there because the climate always*

*affects the environment and based on how changed it is by humans.*" (Appendix E, Student Interview #4, 12/17/06) Student D's notion of issues concerning the natural world appears to be opening up, and by its context I would say that time spent in the field while at HMI deepened this student's appreciation for the environment, thus heightening sensitivity to issues surrounding it. This student noted the varying perspectives to all issues and processes, and that to understand environmental change is to understand the effect humans have on the land. Student C, a strong science student from Panama mentioned his new view, or perspective, on flora: *"You honestly see things in a completely different manner. For example, now, when I see a lodge pole tree, I'll never just-- When I see a conifer, it's not going to be just a conifer. I'm going to try to identify it."* (Appendix E, Student Interview #4, 12/17/06) This student adds later that *"It's amazing to see things in a different perspective, because I think that's a lot of what the RMS has done."* (Appendix E, Student Interview #4, 12/17/06) This piece is interesting in that it, too, highlights the effect of the entire RMS experience in changing perspectives, not just the science curriculum. Both of these quotes demonstrate the influence of the outdoor and experiential components of the class, made possible by the RMS program. As noted in the discussion of the survey data, the ability of the Natural Science class to address the Tbilisi tenets of awareness and sensitivity appear directly linked to the fact that it is integrated within the larger context of an experiential and outdoor educational program with a large focus on place-based learning.

So, while it seems clear the Natural Science curriculum addresses these two tenets, there is a strong argument that such may not be the case within the context of a traditional high school setting. Separating the Natural Science course experience and lessons from those of the RMS program as a whole has been noted as a potential bias in this study, and the data presented here warrants further investigation into the effect of just such an environmental class within the context of a unique program like the RMS. Could the Natural Science course, as a stand-alone curriculum in a traditional high school setting, produce equally strong results in regard to the Tbilisi tenets defining awareness and sensitivity?

#### *Attitude*

Student feedback in regard to the *attitude* tenet of the Tbilisi declaration points toward a strong shift in attitude after taking the natural science course. Based on the comments, students' increased awareness and sensitivity of the environment has given them a new perspective on global issues on the whole. The quotes below represent the clearest and most articulate examples of themes of "interest" and "desired involvement." Student C describes this new-found "interest" in the natural world: *"I'm definitely going to pursue more natural kinds of science,"* and goes on to say *"I'm really going to yearn to be able to define things that are around us like what you taught us in science class."* (Appendix E, Student Interview #3, 12/17/06) Similarly, Student B explains: *"I found alternative energy really interesting...I liked hearing about wind energy and Gaviotas and how people are trying to build sustainable communities."* (Appendix E, Student Interview #2, 12/17/06) It seems that students interviewed are expressing their new interest in the environment and issues surrounding it.

As for "desired involvement," the quotes could have been categorized during data analysis under participation. However, based on the context of the statements, I felt they more clearly addressed a change in attitude and thus placed them here. The following quotes are a sampling that most clearly demonstrates students' "desired involvement" as a result of their change in attitude:

*"And I definitely want to do something about it; for example, the biodiesel. When I get to my grandmother's house today-- Tomorrow we're probably going to go to Barnes & Noble or the public library, and I'm going get a book on biodiesel. – Student C (Appendix E, Student Interview #3, 12/17/06)*

*"I'll definitely try to participate and partake in the process as much as I can" – Student E (Appendix E, Student Interview #5, 12/17/06)*

*"I'd like to maybe kind of share my ideas and share what I've learned at HMI with others, so they can*

*know what's been done to our environment and they can be helpful.*" – Student A (Appendix E, Student Interview #1, 12/17/06)

*"I don't [pick up trash], but I should"* – Student B (Appendix E, Student Interview #2, 12/17/06)

Whether it is student B feeling like she *should* pick up trash or student A wanting to be more environmentally friendly, students interviewed reported a strong pro-environment stance that appears to be linked to what they learned in the science class. They want to be informed and actively participate in solutions based on what they now know. The connection they made with the natural world through class, and by virtue of participating in the RMS, has given rise to a strong stance concerning the natural world and how they view it. Once again, we can see a trend emphasizing the key role of the entire RMS program affecting student responses to the *attitude* tenet, not necessarily just the Natural Science curriculum. The values disclosed by the interviewees could have been equally affected by their participation in the class as in the Rocky Mountain Semester. Environmental education notes *values* as one of five objectives defined as "...to help individuals, groups and societies acquire feelings of concern for issues of sustainability as well as a set of values upon which they can make judgments about appropriate ways of acting individually and with others to promote sustainable development." This happens to be an inherent piece of the RMS experience, so one cannot clearly differentiate between the Natural Science curriculum and the RMS in terms of responsible party for this alteration in personal values.

### *Skills*

Student feedback on skills development reveals some trends, both positive and negative. It is clear that the contextual learning approach implemented within the Natural Science class has been beneficial in helping students connect to the natural world and develop awareness, appreciation, and sensitivity toward it. Students also note their newfound "ability" to scrutinize the natural world and identify problems and issues pertaining to it, as student D explains: *"I think it's interesting to learn full processes as opposed to learning just pieces of it. Like when we went to the canyons and learning how the entire canyons were formed. And then learning the entire process-- not just the forming of glaciers, but expanding on what they do to shape the environment."* (Appendix E, Student Interview #4, 12/17/06) Student E further supports this notion when saying *"It's nice to know how and why something happened and what it is that you're actually looking at. It's something deeper than when people say, "Wow! This is beautiful." If you know the background information you can say, "Yeah; this is beautiful because of this natural phenomenon."* (Appendix E, Student Interview #5, 12/17/06) The above quotes again represent the connection between the Natural Science course and its place within the context of the RMS. They each note knowledge gained through the course curriculum, yet also convey the increased interest in *utilizing* their new knowledge in the naturally beautiful environments visited during expeditions. In addition, it cannot be overlooked that a fair share of Natural Science content is taught while in these places, whether on expeditions or during the weekly labs. Outdoor education is represented within these quotes, since the material is being taught "in" and "about" these places.

What is less clear, however, is how well the science class has prepared these students for *solving* environmental problems and issues. Finding provocative learning opportunities that are equally kinesthetic, the interviewees' preferred learning style, is challenging and seems to be an area lacking within the course curriculum. While discussions in the science class have often revolved around solutions for environmental issues, finding a place-based, practical, or "real-life" issue for the students to work through by applying what they know has proven challenging. I have been meaning to find an assignment that would broach this area, but have yet to find or implement anything to date. It seems clear that the natural science class would better meet the *skills* tenet of the Tbilisi declaration with some practical unit in place that would draw upon student knowledge and understanding of an issue and better allow them to apply what they know toward solutions. Integrating this approach in a place-based manner would perhaps be the ideal method of tackling the *skills* tenet, but this is more challenging to accomplish than one would imagine. Given all of the evidence suggesting the power of the RMS program as a whole, with the Natural Science integrated within, the utilization of activity periods and

service learning opportunities may provide applicable lessons from which to more clearly hit upon the learning of skills as defined by the Tbilisi declaration.

### *Participation*

Based on the limited feedback from students in regard the *participation* tenet of the Tbilisi declaration, it is clear to me that this is a key element missing from the natural science curriculum. If the curriculum was addressing this tenet, students would have a clear idea what the term "stewardship" meant. This is clearly not the case, as illustrated by student D when she says "*I have no idea. That's [sustainability] one of those words where you know you've heard it, and you know you have heard what it means; but I have absolutely no idea what it means.*" (Appendix E, Student Interview #4, 12/17/06) Student A provided another example when attempting to define the term: "*I may not even know what stewardship means. That would mean-- Responsible in an ethical manner?*" (Appendix E, Student Interview #1, 12/17/06) Considering that these quotes come from a couple of the strongest students in the Natural Science class, it can be assumed that they are accurate representations of the entire class body. Thus, the data suggests that I am not adequately meeting this Tbilisi tenet within the curriculum, or not spelling out the idea of "stewardship" well enough at the least. There is more to "participation" than knowing the definition of this one term, however, as student D attests: "*I'd say that I think of watching the effect that humans have on the environment as they try to enjoy it and making sure the wilderness isn't changed too much from its original state for future generations to also love to be in.*" (Appendix E, Student Interview #4, 12/17/06).

Participation is closely tied to skills, and the same problems implementing skills, as interpreted by Hungerford et al (1980), apply to making participation in environmental issues a challenging area to hit upon within the limited confines of the curriculum. In order to tackle both of these tenets effectively, more time needs to be allotted to finding local issues to research, problem solve, and then become active in implementing the solution. Of the five tenets, participation feels to be the hardest one to hit upon in any classroom, but given the information offered by the students in regard to experiential learning situations, this tenet has the potential to be an incredibly powerful learning tool. As mentioned previously, utilization of service learning opportunities could be one way to offer participation within a science curriculum and adequately address the notion of *participation* as defined by the Tbilisi declaration.

### **Personal Observations Data**

Personal observations were categorized into the five Tbilisi tenets in the same manner as interview responses (Appendix D). Below are the summaries of the dominant themes found under each tenet upon analysis of the personal observations.

#### *Awareness*

Being so linked with sensitivity, awareness proved to be a formidable tenet to categorize student offerings into. The samples below each refer to the impact of the Natural Science course on the students' awareness of environmental issues and concepts.

*I have to say that your class changed my perspective on almost everything I do. Before HMI, I did not care that much about the environment and did not know about the current problems with waste. RMS 15*

*I'm an Environmental Science/Policy major at Barnard College in NYC and I think about HMI and your class all the time! Honestly, HMI is where I truly first fell in love with the environment and I credit you with having great influence in choosing my major. RMS 11*

Again, the theme of perspective comes up, as it did in the interview data. One could not claim that science curriculum was the lone factor in heightening this awareness, as the programmatic focus on wilderness expeditions at HMI no doubt influenced the statements as well. This is clear in the above

statements as students from different semesters note the impact of "HMI" and not specifically the Natural Science class. One thing is clear: a course about ecological concepts taught throughout a semester where students spend upwards of six weeks living in nature, is conducive to creating a heightened awareness of the natural world and the problems facing it. This integration of a natural history course that is place-based within an academic institution that inherently allows students to connect to the natural world by providing profound experiences in such is what appears to have the greatest impact on students.

### *Sensitivity*

The Sensitivity and Awareness tenets of the Tbilisi Declaration are awfully similar in their definition, so much so that sensitivity is *a part* of the definition of awareness. To this end, determining under which category each observation fell was a considerable challenge. I separated them based on my own inference about how the Natural Science course played a role each student's offering. The two observations under the sensitivity category were quite strong in how they hint at the class's effect on their own sensitivity to the environment.

*The best part about that class was that we actually got to experience everything we learned and it was so INTERESTING, and not just some type I force myself to read in a text book and spit back out on a test.*

*I loved having the flexibility to study what interested us as a class. I was interested and cared, so I learned more than if the topics had been pre-picked... RMS 15*

It seems clear that the outdoor, experiential components of the class had an impact on these students, and not just about the environment, but in regard to *learning* in general. Their "interest" in the natural world grew, and while this data is actually appears tied directly to student experiences from the Natural Science curriculum, it is very likely that the wilderness experiences of the RMS engaged that particular interest. The science course simply attempted to feed them what they wanted to know.

### *Attitude*

Most of these statements hinge on the notion that these students have experienced an "attitude adjustment" while at HMI and have subsequently found that furthering their understanding of environmental science through educational opportunities will be either a rewarding experience or something they are keen on achieving. This could be thematically summarized as "desired involvement" like the data on *attitude* from student interviews.

*I also think it's important to mention in this survey that the science course at HMI was a huge factor in why I want to major in environmental conservation (and outdoor education.)*

*I've recently been asked to talk to the whole upper school as one of three speakers for our academic recognition assembly. I'm writing a ten minute speech about how the environment has played a role in my life and a lot of that comes from RMS.*

*I've been really focused on water rights and water systems in my studies. also on ecology and what you can do it with the natural materials around you, I feel compelled to learn these things since I'm going to be instructing the sustainability portion of a summer program and want to teach the kids some fun things as well as academic.*

In addition to the above records, approximately a dozen students noted that they will be continuing the natural history education they began at HMI through Environmental Science-type courses in college. It seems clear that these students have "acquired a set of values and feelings of concern for the environment" and are motivated to pursue further education in the field of environmental science. "Motivation for actively participating in environmental improvement and protection" is harder to decipher, and I would propose that this phrase of the attitude tenet is closely tied with the theme of the

participation tenet. While this group of students is not directly participating as of yet, they seem to have shifted their attitude based on the knowledge they garnered from a Natural Science curriculum imbedded within a program that incorporated a great deal of wilderness experience.

### *Skills*

Little personal observation data was made available to determine the lasting effect of the Natural Science curriculum on students' ability to put their knowledge to work through the use of certain skills.

*I took a sample AP Environmental Science test on the College Board website the other day and I passed-- the only class I've taken on environmental science was Natural Science at HMI. I feel totally prepared to take APES next year.*

*RMS 16 student Leif Amber is working on installing a micro-hydro set-up at his home in Vermont after seeing Read's installation and doing his research presentation on the same topic.*

However, much of the data noted under the participation category could also fall here into skills. Without the skills to take on the challenge of becoming a participant in environmental processes and issues, they possibly would not have succeeded in the manner in which they have. To this end, I am still pleased with these findings and was confounded as to which tenet to list them under, as both seem to apply.

### *Participation*

I am at once overwhelmed at how many students have taken an active role in becoming a steward for the Earth since leaving the RMS. All of the statements note some sort of involvement, or participation, in an environmental cause.

*I've talked to at least 8 or 9 people from my semester who were similarly affected by Read's house and want to do environmental studies. Bravo to RMS XVII for the grocery bag initiative! My big environmental project for my school right now is getting my entire grade free nalgens with the Packer logo on them, something that will hopefully convince people to quit buying a new water bottle every day and then throwing it out. I got the parents association to agree to pay for them as a gift and I found a site will customize them very cheaply for us.*

*I'm president of our schools AWAC (Environmental Awareness in Action Club) so I've been able to improve our recycling program (now we're the #1 school for recycling in RI).*

*Since HMI, I've started the conservation club at my school. I've organized one showing of "An Inconvenient Truth" at my school and one for the public. Along with my friend Deb, we raised enough money for our school to afford the switch to wind power. Basically, I am very passionate about the environment. Ultimately, I want to become a green-home architect. Out of all the classes at HMI, the science and P&P classes affected my everyday life.*

*I'm also writing a Venture grant to study on an organic, sustainable coffee farm in the Dominican Republic this spring break.*

*I run a strong environment/outdoors club with about 20 people in it and have been activist-like around school.*

*I also helped start CSSP, Coalition for a Sustainable Sandia Prep. So far we have started a recycling program at school and are working on more ways to make our school eco-friendly.*

*I have actually been very involved in my school's efforts to become greener since I got back last year. I joined the sustainability task force as one of two students (the rest being all faculty*

*and staff). This year I have been nick-named Captain Planet for being the student leader of my school's part of the Green Cup Challenge, a competition between 15 New England prep schools to reduce the amount of energy they use per student. This season I did a special project where I continued a compost of the dining hall's food scraps, and succeeded in ordering recycling bins for almost all the dorms on campus. I have also gotten pretty interested in The Coyote Project which tracks coyotes on Aquidneck Island (where my school is). If I hadn't taken your class I can honestly say that I would probably never have done any of this.*

While this data does not directly support the idea that the Natural Science class alone was instrumental in helping these students become active citizens, it does demonstrate a strong correlation in terms of knowledge leading to awareness. Awareness seems to be a key element of the Natural Science course, and given the above data, there does appear to be a potential cause and effect relationship between awareness and participation. While it has already been argued that this model does not hold water, the evidence here suggests that something is strengthening the link. When one considers the context in which the awareness happens, within the RMS program, some light is cast upon the potential reason for the stronger link.

Much of what is done on an everyday basis at the RMS could be considered participation in Earth friendly practices. Whether it is recycling, minimizing food waste, using water bottles instead of cups, or towels made of cloth rather than paper towels, students are engaged in responsible behaviors everyday simply due to the fact that the RMS does things that way. Hungerford and Volk (1980) point out that practiced behavior is what leads to lasting change in actions and behaviors. This suggests that an element of the students' education while at the RMS does touch on *participation* as defined by the Tbilisi Declaration. It may not be occurring within the hours of the Natural Science course, but it is an integral piece of the education they receive while a member of the RMS community. The Natural Science curriculum potentially supports this learning by offering increased awareness as demonstrated by the data, yet it is once again clear that the immersion of the course within the RMS program is what allows for effective environmental education as defined by the Tbilisi declaration.

### **Overall Data Summary**

In regard to the focus question asking how my place-based, Natural Science curriculum develops environmental stewardship, and using the Tbilisi Declaration (1978) as a model to work from, it was found within the data from the Likert survey that this particular Natural Science course adequately meets all five tenets of the proposed ideal environmental education. Average scores for awareness, sensitivity, and attitude were all greater than four. While scores for skills and participation tended to average just below four, they are still strong. Clearly, this is the area that the curriculum struggles most to meet, yet there is a trend of improvement since implementation of a unit on sustainability that utilizes skills learned in contemporary problem solving assignments. It appears that this unit is a step in the right direction for offering a more well-balanced curriculum in regard to the Tbilisi Declaration. The key piece of the sustainability unit has been the trip to an earth-rammed, off-the-grid home during a lab day. The visit to the home of Read McCulloch (the owner) has always been a bit hit with the students and has yet to fail to have a considerable impact on the students.

*I've talked to at least 8 or 9 people from my semester who were similarly affected by Read's house and want to do environmental studies.*

Feedback on end of semester evaluations has never failed to note the entire unit on sustainable practices as a major highlight of the class, and students are enthusiastic about their research projects that conclude the course. From the interview data, student B sums up the impact of the unit in succinct teenage language: *"I liked that they're not completely ditching civilization in order to form a community that doesn't destroy the planet. Like when we went to Read's house – that was really cool."* Based on the data, the implementation of this unit appears a likely candidate for the heightened skills and participation tenet scores over the past few semesters.

It was also surmised from the quantitative data of the survey that the higher scoring of awareness, sensitivity, and attitude were possibly the result of the Natural Science course's role *within* the greater context of the Rocky Mountain Semester program that is centered on outdoor, experiential, and environmental education. The High Mountain Institute's (HMI) motto is "Where Nature and Minds Meet," so the science class is certainly not the only arena for students to learn about the environment and issues facing it. Wilderness expeditions, three per semester, allow students abundant "face time" with nature in a manner that fosters a strong connection with the places visited. Students do not necessarily need a science class to tell them that nature is special, they learn that themselves over the course of spending six total weeks roughing it in the mountains of Colorado and the canyons of Utah.

This notion of concurrent participation within the Natural Science course and the Rocky Mountain Semester as a large cause for the success in meeting the Tbilisi Declaration tenets does not only stem from the qualitative data. Both instruments utilized to collect qualitative data, interviews and personal observations, provide evidence that it is the integration of the Natural Science class within a place-based semester program that offers students the ideal environmental curriculum.

*Before HMI, I did not care that much about the environment.*

*It's amazing to see things in a different perspective, because I think that's a lot of what the RMS has done. It makes you look at things in a different perspective...*

*HMI is where I truly first fell in love with the environment...*

Some of the data pointed specifically to the wilderness expeditions lending a hand to students' awareness of and sensitivity about the environment:

*I guess [I've become curious as to] just how everything works together. I know that's probably a really bad answer. But, when we were in the canyons, and everything was different...*

*I think you experience the outdoors differently when you're with more different people, because you get all those different perspectives.*

From what I can ascertain from the data, it is not the Natural Science curriculum alone that offers students a complete environmental education as defined by the Tbilisi Declaration. The placement of this particular class within a program that inherently emphasizes a connection to the environment is the real key here, especially in regard to touching upon the tenets of awareness and sensitivity.

The Tbilisi Declaration defines awareness: "to help social groups and individuals acquire an awareness and sensitivity to the total environment and its allied problems (and / or issues)." Awareness could be further broken down to mean the knowledge of the existence of something. The wilderness trips that are such a centerpiece of the RMS offer just that – the knowledge of the existence of natural world through direct experience. Students know that nature is out there prior to the RMS, but the extended time to experience it over multi-week backpacking trips offers a greater "connection" to the environment as discussed earlier. The Natural Science class is designed to utilize this strength of the program by studying the wild places students travel and focusing the curriculum around informing them of the processes and phenomena that create those places and continue to shape them. Students do not just learn about the places they visit, but they learn about the places they visit *while* in those areas. While this design was intentional, it was not until this study that the importance of the combination was made so clear.

Sensitivity is defined by the Tbilisi Declaration in this way: "to help social groups and individuals gain a variety of experiences in, and acquire a basic understanding of, the environment and its associated problems (and/or issues)." There is zero doubt that the wilderness experiences students have during

their six weeks in the field while at the RMS offer a "variety of experiences" in the environment. The Natural Science class, as mentioned above, helps hit upon the rest of the definition by offering a "basic understanding" of the environment and its associated issues. Sensitivity has been likened to owning not just an awareness of something, but also a love for it. The wilderness experiences provided by the Rocky Mountain Semester provide students the opportunity to appreciate, or love, their surroundings while in the field. Many of the students participating in the program have little to no prior experience with backpacking before attending the RMS. Simply getting them out and into nature apparently helps foster a greater appreciation for the places visited.

Attitude also garnered a strong score from the Likert survey, and this too seems to have its roots in the fact that the science course is complimented, or compliments, the outdoor, experiential education in place within the Rocky Mountain Semester experience. This idea is further supported by qualitative data from interviews and personal observations.

*The key part of the learning experience was hands on research and surveying. While I had problems focusing in class, as soon as we got out of the classroom and ventured out into the woods to record samples and take surveys, I was able to focus and understand the material much better and more clearly.*

*The environment is part of our ethical compass. I don't see how somebody from HMI can't think of it anymore. It's completely-- we talk about it all the time.*

*I think just because [wilderness is] so different from cars and stop lights and supermarkets and houses. I don't know. It's silent to some degree. It doesn't have the noise pollution the cities do. It just feels comfortable, I think.*

Attitude is defined by the Tbilisi Declaration as: "to help social groups and individuals acquire a set of values and feelings of concern for the environment and motivation for actively participating in environmental improvement and protection." The first quote above lends support to the notion that an ideal environmental science curriculum, certainly in terms of attitude, is best realized through a Natural Science course that is integrated within a wilderness based program. The active learning components of observations and research done in the field appears a key component to realizing this. The second quote notes the importance of the wilderness curriculum, not science, in shaping attitude. The reference to an "ethical compass" comes straight from the RMS curriculum taught in the field on leadership and reinforced on campus, within the science course as well as throughout the semester in everyday experiences. Finally, the last quote describes the power of the wilderness in offering that particular student something new and different; something that helped shape his/her attitude toward the environment. As a stand alone course, Natural Science most likely would not have elicited such feelings. Despite the strong quantitative data on the Natural Science courses ability to meet the attitude tenet of the Tbilisi Declaration, qualitative data suggests that it is the combination of ecological and issues-based course content within a wilderness program that provides the powerful, attitude shaping experiences reflected here.

Skills and participation scored slightly lower on the Likert survey. This was not surprising considering the challenges involved in creating a Natural Science curriculum that touched upon the active aspects of the Tbilisi definitions. Skills is defined as: "to help social groups and individuals acquire skills for identifying and solving environmental problems (and/or issues)," and participation as: "to provide social groups and individuals with an opportunity to be actively involved at all levels in working toward resolution of environmental problems (and/or issues)." Both of these definitions suggest that working on an environmental issue would help meet the criteria for ideal environmental education. I will admit that this has proven to be a challenge for me to fit in to the curriculum and is an area I have never been formally schooled in. That said, these areas have been touched upon the least by the Natural Science curriculum, and this is evident from the Likert survey data. However, my own lack of knowledge in this area has not necessarily created a huge gap in meeting these two tenets. Instead, they fall just short of

the other three tenets on the Likert survey. How is this possible? Qualitative interview and personable observations data provide some clues, and I am again awed by the power of the semester context within which the Natural Science is allowed to work.

While the Natural Science course offers a wide gamut of skills revolving around gaining a thorough understanding of the processes at work in the natural world, and offers some chances to apply them, tackling contemporary issues has not been much of a focus within the class. It is again the wilderness arena provided by the RMS program as a whole that offers opportunities for students to work on their skills. Each expedition allows five hours of science homework to be assigned. The major assignment for each trip involves field based research projects, both alone or in teams, that focus on identifying patterns within the natural environment being traveled through. This may offer some practice for applying skills to make connections regarding the natural world and ecosystem dynamics, but it does not necessarily provide opportunity to solve contemporary environmental issues.

*It's nice to know how and why something happened and what it is that you're actually looking at. It's something deeper than when people say, "Wow! This is beautiful." If you know the background information you can say, "Yeah; this is beautiful because of this natural phenomenon.*

*It's something that I found satisfying, to be able to understand things and not just be completely curious about them the whole time.*

*I think it's interesting to learn full processes as opposed to learning just pieces of it. Like when we went to the canyons and learning how the entire canyons were formed. And then learning the entire process-- not just the forming of glaciers, but expanding on what they do to shape the environment.*

These quotes highlight the strength of the course to provide skill at understanding what shapes the environments students visit, but they fail to convey a message that the current Natural Science curriculum offers practice at solving environmental issues. What's interesting is that in this instance the RMS program does *not* lend support to the Natural Science curriculum in terms of meeting the Tbilisi definition of skills. There is no inherent aspect of the program that offers the opportunity for students to practice solving environmental issues. Given this fact, it seems reasonable that the Natural Science curriculum needs to better address this tenet throughout the semester, since it does not benefit from the program as a whole in doing so. The introduction of the sustainability unit has been my attempt at filling this void, and the personal observation below suggests that this strategy may be working.

*An RMS 16 student is working on installing a micro-hydro set-up at his home in VT after seeing Read's installation and doing his research presentation on the same topic.*

This is one example of the curriculum offering something wholly separate from the RMS program, and it reaffirms my desire to improve further this unit through the practice of applying skills to solving environmental problems. However, based on the findings under the categories of awareness, sensitivity, and attitude, additional effort in helping the RMS program as a whole support the application of skills may enhance the ability for the Natural Science curriculum to meet the Tbilisi ideal environmental education criteria.

This would be a profound undertaking, so one might also argue that within the context of a wilderness based program, a Natural Science curriculum could spend a bit less time focusing on the first three tenets and offer ample opportunity to address the skills criteria. This seems to be plausible idea, to work with the inherent strengths of the semester by allowing it to reinforce what tenets it naturally supports and implementing a stronger skills curriculum to make up for areas that the semester does not address through the program.

As for participation, the Natural Science curriculum again does not fully address the criteria of the Tbilisi Declaration. In fact, active participation in a local environmental issue has rarely been a major part of the curriculum. This is mostly due to the challenge of making such happen during a busy semester full of time constraints. In addition, finding a local problem that we can work on or address is not as easy as it sounds, and scheduling restraints make traveling somewhere to do this that much more challenging. Yet, participation still scored strongly on the Likert survey, and personal observations support the notion that students are, in fact, participating in environmental causes after leaving HMI.

*My big environmental project for my school right now is getting my entire grade free nalgene water bottles with the Packer logo on them, something that will hopefully convince people to quit buying a new water bottle every day and then throwing it out. I got the parents association to agree to pay for them as a gift and I found a site that will customize them very cheaply for us.*

*I'm president of our school's AWAC (Environmental Awareness in Action Club) so I've been able to improve our recycling program (now we're the #1 school for recycling in RI).*

*Since HMI, I've started the conservation club at my school. I've organized one showing of "An Inconvenient Truth" at my school and one for the public. Along with my friend Deb, we raised enough money for our school to afford the switch to wind power.*

*I run a strong environment/outdoors club with about 20 people in it and have been activist-like around school.*

*I also helped start CSSP, Coalition for a Sustainable Sandia Prep. So far we have started a recycling program at school and are working on more ways to make our school eco-friendly.*

It is clear that numerous students are involved in environmentally active organizations after their time at the RMS. Despite the Natural Science course not fully tackling this tenet of the Tbilisi Declaration, students are none the less engaged and participating in environmental issues and problems.

I see two potential reasons for this outcome. The first again hinges on the RMS program as a whole offering opportunities for students to be participatory. HMI works hard to be as low impact on the planet as possible. Recycling is a norm, and the campus was designed around efficiency, even installing solar lights in the student cabins a few years ago. Some students helped with the installation, and all participate in campus upkeep with daily chores and always recycling. All of these opportunities offer the chance to be a participant. In addition, the student body is one community that works together. All decisions are channeled through the entire community, and no one has more of a say than anyone else. This offers more chances to be engaged in the problem solving and decision making processes around campus. Of final note is the Leave No Trace (LNT) ethic HMI teaches students in the field during expeditions. One of the top priorities, and grading criteria, is LNT. To this end, students are engaged in limiting their impact from day one. This becomes a basic practice for the whole community, so once again the RMS program as a whole promotes behavior in tune with the Tbilisi definition of participation.

The second potential reason why students appear to be active participant in environmental issues despite the Natural Science curriculum not fully addressing this tenet involves the recent addition of the unit on sustainable practices. As mentioned earlier, during RMS 14 in the spring of 2005, the Natural Science course began actively studying various alternative practices and technologies that limit the depletion of natural resources and minimize global impact. A key component to this unit is a trip to an earth-rammed, off the grid home south of campus. The owner, Read McCulloch, hosts the class and provides a tour of the facility while explaining the concepts and design. Students are regularly impressed to the point of awe at his home. They tend to gain a sense of inspiration from the visit, as attested below:

*I am very seriously considering majoring in Environmental Studies... I want to get involved in America's push for sustainability. It is something I have been thinking about ever since we visited Read's house back in December...*

This inspiration often carries over into the research projects students then complete on a form of sustainable living. These projects range from organic farming to bio-diesel to green architecture. On end of semester evaluations, this unit consistently scores as a favorite. Considering this, although the Natural Science curriculum may not adequately offer opportunities to participate in environmental problems, students do spend time examining their potential solutions.

In conclusion, it appears that the Natural Science curriculum successfully meets the overall criteria of the Tbilisi Declaration for an ideal and effective environmental science curriculum. While three of the five tenets are more strongly addressed through the course, all five are, in fact, helping students become better citizens of the planet as highlighted by the declaration. Exactly *how* this place-based, Natural Science curriculum develops environmental stewardship, however, warrants further discussion.

### **INTERPRETATION OF DATA**

Based on the analysis of available data from this study, it has been made clear to me that the Natural Science course would be considerably less effective in meeting the criteria of the Tbilisi Declaration that defines ideal environmental education, thus promoting environmental stewardship, were it not offered within the context of a wilderness based residential program such as the Rocky Mountain Semester. The qualitative data suggest that it is the *combination* of outdoor, experiential, and environmental education that allows for the course to be successful. What changes might be seen in a traditional classroom setting with the same curriculum, but without the wilderness expeditions so inherent to the RMS experience? Student offerings, through both interviews and personal observations, regularly attest to the link between the RMS curriculum and that of the Natural Science course.

This insight, by far, has been the most profound piece of learning I have gained from this study. I had always appreciated how easy it was to design a curriculum within the context of the RMS, and that the program lent itself to my class perfectly, but not until analyzing the specific data did I fully comprehend how essential one is to the other. I have often remarked that I could not teach science in a traditional school setting due to the lack of the wilderness piece, and now I understand why I have always felt this way.

The best way to examine this issue is to break environmental education down along similar lines as Hungerford and Volk did in their 1990 work. The authors investigated and proposed a model for ideal environmental education, with increased change of learner behavior, utilizing the tenets of the Tbilisi Declaration. Hungerford and Volk suggest six "critical components of a total educational program for environmental education if changes in learner behavior are desired." The Tbilisi Declaration's definition of ideal environmental education hinges on this notion of learner behavior, and Hungerford and Volk offer the following critical components of just this below:

1. Teach environmentally significant ecological concepts and the environmental interrelationships that exist within and between the concepts;
  2. provide carefully designed and in-depth opportunities for learners to achieve some level of environmental sensitivity that will promote a desire to behave in appropriate ways;
  3. provide a curriculum that will result in an in-depth knowledge of issue;
  4. provide a curriculum that will teach learners the skills of issue analysis and investigation as well as provide the time needed for the application of these skills;
  5. provide a curriculum that will teach learners the citizenship skills needed for issue remediation as well as the time needed for the application of these skills; and
  6. provide an instructional setting that increases the learners' expectancy of reinforcement for acting in responsible ways, i.e., attempt to develop an internal locus of control in learners.
- (Hungerford and Volk, 1990)

In an effort to answer how the place-based, Natural Science curriculum at the RMS affects environmental stewardship, it seems appropriate to utilize the above criteria, which was designed to address specific needs within a curriculum to best meet the Tbilisi Declaration tenets, to ascertain strengths and weaknesses of not just the curriculum, but how it is integrated within the context of the Rocky Mountain Semester as a whole.

Clearly, the current Natural Science curriculum alone does not fully meet Hungerford and Volk's criteria. As a stand alone class, it would be sufficient in meeting the first and the third criteria on the list through traditional classroom practices. The course is designed around ecological concepts and environmental interrelationships that, hopefully, result in baseline knowledge of pertinent issues. How in-depth of knowledge *is* something that the curriculum can be changed to meet.

The second and fourth criteria, based on the data from this study, appear most tenable through a curriculum that also incorporates a good deal of time spent out experiencing and studying the environment. Not that it would be impossible to meet the criteria through traditional approaches, but the model lends itself best to a combination of outdoor and experiential education to meet the criteria. Hungerford and Volk pose that adequately enables the best environmental education true to the Tbilisi Declaration. In this case, the curriculum can be designed to meet, or fit, with the inherent parts of the overall program in an effort to best meet the second and fourth criteria. But it is the concurrent offering of an ecologically grounded course with a wilderness based experience that can best meet these two criteria.

The fifth and sixth of Hungerford and Volk's criteria are the most challenging to implement in a traditional classroom, yet they lend the most credence to the current progressive education being offered in some programs. Each center around the idea of educating students to become "responsible citizens," something that has proven challenging to do in classroom practices. However, given what has been demonstrated within this study, it seems that a program placing a high value on community while simultaneously promoting individual responsibility through a deliberately increased *liaise-faire* practice as students learn how to live and travel in the wilderness has the potential to meet the criteria. Any given curriculum alone would be challenged to meet these criteria. It seems to not be just about curriculum, but the *context* in which the curriculum is presented.

Given the incredible amount of external factors influencing students on an everyday basis, curriculum alone, no matter how incredible, would still be challenged to influence behavior. It has been noted that attitude may change based on new knowledge, but that in turn does not necessarily influence behavior. Hungerford and Volk's model of changing learner behavior, and the curriculum that needs to be designed to attain such, seems ill suited to the confines of a classroom. However, within a larger program that emphasizes the development and practice of responsible citizen behaviors, the prospect of attaining the model seems tenable. Hungerford and Volk suggest that "locus of control can be improved as a consequence of teaching citizenship action skills." (1990)

The Rocky Mountain Semester at HMI has a programmatic focus on just this. "*The development of a strong sense of community is central to the mission of the Rocky Mountain Semester. Participation in the RMS assumes a commitment to the community of the High Mountain Institute. Many things help a small community run smoothly. Honesty, integrity, trust, personal responsibility, and a commitment to the intellectual goals of the program are essential. We spend time together throughout the semester articulating some of the ways individuals can foster a healthy community.*" (HMI, 2003) The whole program centers on being an active and responsible community member. During the initial days of any semester, the faculty constantly reminds students of this in an effort to get them to "buy into" ideals that create the most successful semester. In general, students uphold these standards and, more often than not, subconsciously integrate this ideal into their everyday life through continual practice, and the reminder to do so, throughout their time as a member of the RMS.

While traditional school settings can help to foster the same, students in these situations can choose to ignore such once off campus. At the RMS, students are never off campus and their peers offer "external variables" that promote responsible behavior. Through such a designed program, students at the RMS are not exposed to the external variables they would be at their home school. This factor, noted as the largest hurdle to overcome in changing learner behavior, is largely mitigated through the boarding program in place.

Add the Natural Science curriculum within the wilderness component of the semester, as well as all six of Hungerford and Volk's criteria for changing learner behavior, and one has a program in line with the Tbilisi Declaration's ideal environmental education.

It was not until this project that I fully understood how to maximize the potential of a Natural Science curriculum. All of the components are in place, as noted above, for me to look at the larger picture of the course being a part of the program as a whole. While it was clear that the Natural Science course benefited from the wilderness expeditions, it is only now that I see a far greater potential, and not just within the scope of my own class, but within the entire institution of education.

Without the context of the RMS for this Natural Science class to happen, the course would fall short. Teaching this particular curriculum in another setting, especially a tradition education setting, would hinder the ability to provide a truly effective environmental education according to the results of this study. Having students come from a wide range of schools throughout the country has often evoked questions surrounding the course. Why do we not teach chemistry or biology or physics? For me, that question has been answered with this study. Given the inherent strengths of the RMS to minimize external factors and foster responsible citizenship, what other course is there to offer? In my mind's eye, there exists here the perfect framework for providing a curriculum that actually meets the Tbilisi Declaration's ideal for environmental education. Surely, I will need to step back and take a long look at how I can improve upon the current curriculum in an effort for it to best utilize the programmatic strengths – this much is not lost on the researcher. Through this study, I now see enormous potential to better tailor the course to improve how well it, with and within the RMS, can meet the ideals of skills and practice.

There are abundant opportunities I can utilize *outside* of the Natural Science course to foster the outcomes of the Tbilisi Declaration's tenets and Hungerford and Volk's criteria. Through the utilization of opportunities outside and separate from the Natural Science curriculum, I can best utilize the RMS program to bridge the gaps within the curriculum to meet the Tbilisi Declaration tenets by implementing Hungerford and Volk's criteria more successfully. Service learning is just one example of a way to hit upon the fifth and sixth criteria, as I can utilize activity periods or weekends to offer opportunities for practice in citizenship behaviors. During the fall semester, students engage in a service project to help maintain the trail system on Mt. Elbert and Mt. Massive, Colorado's two highest peaks and the back drop of the HMI campus. Through increased discussion and pertinent readings, either within the Natural Science class or separately, I may be able to make this more of a learning opportunity for the students in regard to skills and participation as outlined by the Tbilisi tenets. Spring semester students used to do a three-day service activity, but this aspect of the semester was removed three years ago due to time constraints. While I always felt we should continue this practice, this study has made it clear that re-instituting these service days could go a long way to compliment the Natural Science course in offering a more complete environmental education as defined by the Tbilisi Declaration.

Service learning is not the only potential area to utilize the context of the RMS to aid the Natural Science curriculum. As of this year, I am also co-teaching the Practices and Principles: Ethics of the Natural World (P&P) course. This course is the center-piece of the RMS academic curriculum and is a core class that all students must pass in order to graduate. The course is focused on the leadership training, wilderness skills, and environmental ethics. Since all Natural Science students must take the P&P class, and due to the inherent nature of P&P to address responsible citizenship (teamwork, communication, leadership, etc...), it seems an appropriate avenue to utilize the strengths of this

course to compliment what is being taught within the Natural Science curriculum. This is another link that I had been aware of but that this study has proven further how interrelated and essential one is to the other. It is just one more example of how the Natural Science class benefits from the overall context of the RMS to meet the Tbilisi Declaration through completely addressing Hungerford and Volk's criteria for changing learner behavior.

## VALUE

This study attempted to answer the primary research question of how my place-based, Natural Science curriculum develops environmental stewardship. The key word in the question is "how." Looking at the question after doing the research, it seems that the question pre-supposes that the curriculum *does* develop environmental stewardship and that I was looking into determining just *how* this happens. From what has been discussed above, how environmental stewardship is developed within my particular place-based, natural science curriculum is centered on having the curriculum occur as *a part* of the larger context of a program like the Rocky Mountain Semester. Thanks to the inherent programmatic values and practices of the RMS, the active components of an ideal environmental education as defined by the Tbilisi Declaration can be attained through a Natural Science course. In other words, how it happens is through a parallel progression of curriculum between the science class and the semester as a whole. They work with one another. The RMS minimizes many of the external factors that have been shown to impede citizenship behavior and, through a separate but related curriculum on values and responsibility, lends indirect support to the Natural Science course by offering multiple opportunities for students to practice citizenship behavior.

The implications of the findings suggesting the overwhelming impact of matching a curriculum within the context of an institutional program are fascinating to me. How well the two can compliment each other suggests that curriculums, in general, should not be confined to the classroom. It gives credence to the ideas of outdoor, experiential, and environmental education as legitimate and effective forms of instruction. Furthermore, it suggests that much of the institutional structure of education be re-examined to determine how effective traditional classroom teaching is at influencing changed behavior in a positive fashion. If providing knowledge, and thus the potential change in attitude, has not been proven to necessarily affect behavior, perhaps it is time to change the generally accepted model of education.

I will admit that the different learning approach offered at the Rocky Mountain Semester is what drew me to the program in the first place. Having struggled with lectures and even readings, I have always been keen on the kinesthetic aspect of outdoor education. Now, having completed this research, it has become clear to me that the experiential model employed at HMI, and other institutions to varying degrees, has the potential to offer a more complete education, one where you do not just leave what you have learned at the door. When learning is complimented by the fostering of responsible behavior in a supportive environment that places high value on individual responsibility those positive changes in learner behavior have a greater chance of becoming a reality.

Upon reflection, I realize now that I have always believed that the learning within the classroom must be complemented by external factors, but it was a subconscious belief. Looking back a why I became interested in natural science, it becomes clear as day that I was potentially being influenced by similar programmatic values and responsibilities repeated almost daily. It was during my outdoor pursuits that I first took a liking to learning about the environment around me and the processes that shaped it. How I traveled about was the direct influence of two institutions where I learned backcountry skills: Kieve and NOLS.

Kieve is a summer camp for boys located on Damariscotta Lake in Nobleboro, Maine. I spent four summers there as a camper, embarking on longer canoeing and hiking trips each year. It was along the rivers and in the mountains of Maine that I began to coexist comfortably with nature. Our daily routine was fairly set, and we abided by a general Good Samaritan ethic that pre-dated Leave No Trace where

we "took only pictures and left only footprints." I later returned to Kieve as a counselor/trip leader for four years, during which I passed along to the campers all that I was taught to value and practice.

A year after leaving Kieve, I began instructing backpacking courses for the National Outdoor Leadership School, based out of Lander, Wyoming. At NOLS, we taught Leave No Trace ethics as a key piece of outdoor living practices. The daily routine on those trips hinged on taking responsibility for one's self so that you could be of greatest service to others. I was once again coexisting with nature, and this time around I began to take an interest in the places I was visiting and calling home. Granted, I was teaching myself what I wanted to know, but the outdoor and experiential components of my education were in place all along.

Should it be of surprise that I left those two institutions with a desire to act as a steward for the Earth? Based on the results of this study, I was offered the ideal environmental education the whole way through. The biggest difference was that I was hitting upon the skills and participation tenets through my role as an instructor. Especially when with NOLS, I had to teach some basic natural history courses and, on the longer semester courses, wilderness ethics. Who I am today was largely shaped through my participation in these two programs, and each provided daily routines incorporating responsibility and Earth-friendly practices – exactly what Hungerford and Volk (1990) propose lead to long-term behavior change.

Given my own personal background in terms of development into what I would like to think of as a responsible citizen, it is not surprising that teaching Natural Science at the High Mountain Institute was such an appealing prospect. The program offers the same learning situation as the two institutions most responsible for my own personal values and offers the opportunity for me to instill the same level on respect for and understanding of the environment in others.

This study is pertinent well beyond explaining my own journey toward stewardship, as the implications for education as an institution are quite interesting. If positive learner behavior change is the desired outcome of education, it is clear that traditional classroom approaches exposed to tremendous external factors run the risk of falling short of this goal. I have always worked in private schools, mainly due to the increased potential for rapport building with the student body and the opportunity to teach outside the walls of a classroom. From what I have learned in this study, I am both exhilarated and saddened at the same time. Exhilarated that there exist programs inherently set up to offer such a complete education as will produce thinking, problem solving students who stand the chance of becoming responsible citizens in the future, yet saddened that much of our educational system is designed in a way that allows external factors to potentially be the dominant administer of lessons.

I will admit to my own bias of wanting education to focus more on the environment and living within the means supportable by the planet, and this view is not necessarily supported by other educators or institutions. It does not need to be. I am comfortable, however, with a small leap of faith that suggests all educators and institutions do, in fact, want to support the growth of students into responsible citizens. Should this be true, the results of this study warrant that we all take a closer look at the methods with which we aim to educate the next generation of young adults.

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## APPENDIX A

### Student Survey

The following statements represent various degrees of agreement. Please rate these according to your personal level of agreement:

(0 = Strongly Disagree; 1= Disagree; 2 = Neutral; 3 = Agree; 4 = Strongly Agree)

#### Awareness:

1. The Natural Science class made me more aware of environmental processes and concepts.

0      1      2      3      4      5

2. I notice nature more often since the Natural Science class.

0      1      2      3      4      5

3. The Natural Science class made me more aware of environmental problems.

0      1      2      3      4      5

4. I notice more often when there is litter where it shouldn't be since the Natural Science class.

0      1      2      3      4      5

5. I am aware of various perspectives people have in regard to environmental problems.

0      1      2      3      4      5

#### Sensitivity:

1. I become upset when reading about environmental issues.

0      1      2      3      4      5

2. I take into account all perspectives when deciding on a stance concerning the environment.

0      1      2      3      4      5

3. I like to remain abreast of natural resource and environmental issues.

0      1      2      3      4      5

4. I actively work to reduce my ecological footprint.

0      1      2      3      4      5

5. I notice when others are not acting in an Earth-friendly manner.

0      1      2      3      4      5

#### Attitude:

1. The Natural Science class inspired me to become concerned over the current state of the environment.

0      1      2      3      4      5

2. The Natural Science class inspired me to demonstrate more stewardship for the environment.

0      1      2      3      4      5

3. The Natural Science class inspired me to I notice when people do something good or bad for the environment

0      1      2      3      4      5

4. The Natural Science class inspired me to feel an urge to be a participant or become involved when I am informed of an environmentally minded organization hosting an event.

0 1 2 3 4 5

5. The Natural Science class inspired me to more quickly befriend people who hold the same values I do regarding environmental stewardship.

0 1 2 3 4 5

**Skills:**

1. I can regularly identify the ecosystem dynamics of areas I visit.

0 1 2 3 4 5

2. I can identify the root problem of environmental problems since the Natural Science class.

0 1 2 3 4 5

3. The Natural Science class taught me how to identify future issues pertaining to environmental problems.

0 1 2 3 4 5

4. The Natural Science class taught me potential ways to mitigate environmental problems.

0 1 2 3 4 5

5. I have the background knowledge to look for solutions to environmental problems.

0 1 2 3 4 5

**Participation:**

1. The Natural Science class inspired me to try and live as though most all my actions affect the environment.

0 1 2 3 4 5

2. The Natural Science class inspired me to encourage friends and neighbors to recycle.

0 1 2 3 4 5

3. The Natural Science class inspired me to purchase products made from post-consumer materials.

0 1 2 3 4 5

4. The Natural Science class inspired me to make a conscious effort to consume less.

0 1 2 3 4 5

5. The Natural Science class inspired me to purchase previously owned (rather than new) products whenever possible.

0 1 2 3 4 5

**Adapted from "Environmental Activism/Behavior Scale" B. Hug**

## APPENDIX B

### Interview Framework

"I appreciate your willingness to take the time out of your busy schedule to answer a few questions. As you are aware, I am collecting information on the impact and quality of the curriculum and would like to ask you a few questions. Please understand that this has no bearing on your grade, so you are free to speak candidly. I am attempting to learn what works best in the course and what needs improvements, and your feedback will help me further improve the science material and grow as a teacher."

#### Questions:

1. What is your general impression of the natural world? Are there any issues that you find interesting?  
*Awareness*
2. Have you seen trash where it shouldn't be? How does this make you feel? *Awareness/Participation*
3. What are your thoughts concerning the environment? Please explain. *Sensitivity*
4. Given all that we've discussed in class, what strikes you most? What makes you think this way?  
*Attitude*
5. When you take a walk in a natural area, what do you think about? Would you say this feeling about wilderness has changed? Why or why not? *Attitude*
6. If I showed you a picture of a natural area, what might be your first thoughts? *Skills*
7. Will you take others out into the woods? Friends or family? *Attitude*
8. Are there any interests you've developed while at HMI? Where do these come from?  
*Attitude/Participation*
9. What were some aspects of the class that you enjoyed? Why? *Participation*
10. When in the natural world with others, what might you do with them? Why? *Attitude*
11. Can you suggest anything I might try to do in future Natural Science classes? *Over-arching theme of Stewardship.*

"Thank you for taking the time to meet with me. I appreciate your help and thoughtful responses – they will help me become a better teacher for you and your peers. Please feel free to ask me any questions you may have, and if something comes up later that you would like to add to your responses do not hesitate to let me know. Thanks again."

## APPENDIX C

Interview Data grouped into relative Tbilisi tenet.

### **AWARENESS:**

[Wilderness] is often even in urban areas, but it's very different natural world than the Sawatch – Student D

But, I think that when I'm in nature, I often don't start with one thing I'm thinking about, but I end up thinking about the little things that I see on the side of the trail and the bigger things as well. - Student D

There are various times, when I first got there, that I've thought wilderness areas themselves are so very pristine and preserved. But, I think things are encroaching on them, buildings and civilization and that stuff. That's kind of too bad, but, at the same time, I think it's good to see that lots of people get to enjoy the outdoors. – Student D

Deforestation is one thing I definitely want to strive to help with in Panama in some way. I'm not sure how, because there's way too much deforestation. - Student C

I like that Thanksgiving assignment, where we had to research a current environment issue in our neighborhood. It kind of pertained to us. It concerned us, rather than this omnipresent idea of global warming. That's bad, but it's happening to everyone. The environmental issue that you made us look up in our area and do research about - that is affecting me. – Student E

I kind of knew a little bit about the toxins in the Hudson River, but I think it's something that has been resolved. And it's going to be a long process before it actually physically resolved. But, as of now, GE has agreed to start the process of removing the sludge from the Hudson River. – Student E

I think that what I found most interesting is how everything is connected... - Student A

What's most interesting, in my opinion, is just how everything's connected. So, succession plays some role on what lives there, as in animals, and then what type of effect those animals have on their environment and what effect they have on any other animals in the environment. – Student A

I just think it's really interesting, so I tell people about it. People like my mom would find it interesting, and other people may not. – Student A

I don't like it. I generally pick [trash] up. – Student A

After taking P&P, I see it everywhere. I was just talking to Susannah about how this airport reminded me of *Flight Maps* because it has everything Jennifer Price talks about. – Student B

On my solo, I thought of you a bunch of times. I found myself looking at those little black bugs. "I wonder what those are? – Student B

I think I became more aware of sustainability issues and more interested in that. – Student B

That and how English and Science kind of overlap because we discuss the issue of sustainability and the environment. And it can make you consciously think about it. - Student B

**SENSITIVITY:**

Some issues are probably very similar, but definitely there are different issues in different places, based on the climate there because the climate always affects the environment and based on how changed it is by humans – Student D

I like interactive [classes] best. I like the labs. My guess is that lots of HMI students like interactive [classes], given that we go out and interact with lots of stuff. – Student D

But, I think that when I'm in nature, I often don't start with one thing I'm thinking about, but I end up thinking about the little things that I see on the side of the trail and the bigger things as well. – Student D

But, I think you experience the outdoors differently when you're with more different people, because you get all those different perspectives. - Student D

You honestly see things in a completely different manner. For example, now, when I see a lodge pole tree, I'll never just-- When I see a conifer, it's not going to be just a conifer. I'm going to try to identify it. – Student C

It's all how you put concepts into action - how you put us right there with the ecosystem. For example, the ungulates experiment. After that class, we clearly understood it. Or, when we went to the aspens, we were there. You could see the mark where the elk were eating. You could touch the bark. And, for identifying the trees, you get the needles and feel them. It's something that you can see. You can't see a cell. You can't see all of that. I mean, it's interesting, but... - Student C

It's amazing to see things in a different perspective, because I think that's a lot of what the RMS has done. It makes you look at things in a different perspective, because, I'm sure that, if you asked my dad something like, "Okay, what kind of tree is that?"-- I mean, he doesn't think of it. It's just a tree; it's just a rabbit. It's just a wildfire. There's no catalyst. There's no community to it. - Student C

Most of the science classes that I've taken, like biology, which is more general, and chemistry-- and physics was more like mathematical and logic. But, in the course here, it was really-- you kind of have an intimate relationship and a close connection with nature because you're right there. We spend two hours a week doing the Monday lab, so it was definitely something that I've never had in any other science classes. – Student E

That's the trouble with classroom teaching - you do all of these things in class; but, most of the time, these classes are removed from the things that you're learning about. But, here, you're learning about things, and you see it firsthand. You really make that strong connection. – Student E

[The natural world is] Really interesting and amazing and more intricate and complex than I had expected it to be. – Student A

Now, more than before, because I guess I wasn't really that curious about anything scientific before-- but, now, I think just walking outside when there's snow I like looking at the tracks and where they're going. I see a bunny, and I'm curious as to where it came from and what type of food it's eating. I don't know. Pretty much everything. I just look around and I'm curious. – Student A

I guess [I've become curious as to] just how everything works together. I know that's probably a really bad answer. But, when we were in the canyons, and everything was different. There was tamarisk, and there were cottonwoods. You'd just be walking, and, all of a sudden, you'd come upon this green, lush area that I can't even find in Florida or in Colorado. I'm curious as to why it happened, and I would look around and try to piece things together. – Student A

My favorite part was probably the last one or two weeks, where we talked about sustainability. I really, really enjoyed that. I thought it was awesome. And, I really liked going the Read's house. I'd never really been exposed to it before, so I didn't really know what was out there in the way sustainable living or sustainable anything. I just found it really interesting that there was some way to help the environment and still live a relatively conventional life. – Student A

Something I was thinking about-- I was talking to my mom about how we have lots of lots of fires in Florida because it's so dry. I was thinking about maybe getting a bunch of people together and clearing underbrush. So, it would—obviously [the fires] would still spread, but it wouldn't be so detrimental to the environment and the ecosystem. Maybe that. But, then again, I was talking to my stepdad, who is a transportation manager. He said-- he seems to know quite a bit about it. He said that stuff had already been done, and there are contained fires already. And the brush is there for a reason, or something. I don't know. I think that it would overall be better for the community, including the people, because it affects the people and nobody likes that. So, if we were to get rid of that, it could be less harmful. – Student A

I liked that they're not completely ditching civilization in order to form a community that doesn't destroy the planet. Like when we went to Read's house – that was really cool. - Student B

I guess it's easy to find quiet spots, but you have to find somewhere where there's not a lot of people around you. – Student B

I think it conveyed the point that you were trying to teach. Like, there's all different kinds of plant adaptations in the desert so animals don't eat them. And, then, it really puts things in perspective with the mammals foraging, and know about it and what they go through. - Student B

#### **ATTITUDE:**

[Getting into the natural world is] definitely a good way to get away from the everyday hustle and bustle of society. And, it's a good way to get to know people even better and to get to know yourself even better. In doing that, you get to be in a really nice place. - Student D

Especially in Panama, with all the bio-diversity, it's been-- I'm sure the environmental course is going to be extremely fascinating. I'm definitely going to pursue more natural kinds of science. - Student C

Cells, mitochondria, whatever, it's interesting. I'm really going to yearn to be able to define things that are around us like what you taught us in science class. - Student C

Deforestation ends up hurting the whole ecosystem. For example, going back to the previous question-- you ask my dad, okay, deforestation. Okay, deforestation - cut down more trees. But, really, there's a whole-- think about it. There's animals that live in that environment. The whole ecosystem is affected, changing the ecotone, and then nearby ecosystems have to change. And how it affects everyone. Natural sciences at the High Mountain Institute has definitely been a very beneficial course. - Student C

The environment is part of our ethical compass, I don't see how somebody from HMI can't think of it anymore. It's completely-- we talk about it all the time. I'm definitely going to think about it. And I definitely want to do something about it; for example, the biodiesel. When I get to my grandmother's house today-- Tomorrow we're probably going to go to Barnes & Noble or the public library, and I'm going get a book on biodiesel. - Student C

I'll definitely try to participate and partake in the process as much as I can. – Student E

I think just because [wilderness is] so different from cars and stop lights and supermarkets and houses. I don't know. It's silent to some degree. It doesn't have the noise pollution the cities do. It just feels comfortable, I think – Student A

If I take anything away from [class], I just want to be more environmentally friendly. That's really important to me. – Student A

I think that maybe it's a scary idea and that it's something that I'd like to take on in helping environment and showing people how to help it as well, if that's kind of what you're getting at. Yeah. I would really like to do something like that. – Student A

I think that, as far as size wise, what I'd want and what I heard-- it seems the United States aren't really following the European trend of being more environmentally friendly, and that concerns me. I'd like to maybe kind of share my ideas and share what I've learned at HMI with others, so they can know what's been done to our environment and they can be helpful. – Student A

I think that we should definitely work on that more as the community and in the world. – Student B

It's gorgeous. Like, when we went in the Sawatch Range and even the canyons. I didn't expect that I'd like them. - Student B

I found alternative energy really interesting. – Student B

I liked hearing about wind energy and Gaviotas and how people are trying to build sustainable communities. – Student B

I don't [pick up trash], but I should. – Student B

Because it's like what you read us about that man who plants all the acorns...one person can make a difference. - Student B

### **SKILLS:**

I don't think I've heard enough of both sides, with the whole global warming issue to actually decide my stance on it. But, I've definitely heard some things that make me think that the climate needs to be watched, at least – Student D

I've always liked geology and glaciers – I've been to a lot of them. I knew some stuff about them but it was interesting to fill in what I didn't know in class

I think it's interesting to learn full processes as opposed to learning just pieces of it. Like when we went to the canyons and learning how the entire canyons were formed. And then learning the entire process - not just the forming of glaciers, but expanding on what they do to shape the environment. – Student D

I wanted to see it. That's what I want and how I learn.

Remember that test you gave us when we had to look at the pictures and then see how you identified it? I'm so psyched when I see my family in a week. I'm going to be talking the whole time about, like: okay, this is this because of this and just explain to them the whole detail. - Student C

More in depth and not be so ignorant about things and why things work. It's something that I found satisfying, to be able to understand things and not just be completely curious about them the whole time. I want [my dad] to be able to also know that. - Student C

I actually really did learn-- I always have questions on what kind of tree is that or how to identify species and stuff like that. The class that you taught really taught me a lot of things. – Student E

It's nice to know how and why something happened and what it is that you're actually looking at. It's something deeper than when people say, "Wow! This is beautiful." If you know the background information you can say, "Yeah; this is beautiful because of this natural phenomenon." – Student E

I'd probably say something nerdy about adiabatic lapse rate. And I'd really enjoy it because then people would be confused, and I'd explain to them what it was and how that affected what grew where. I don't know. I'd probably start out with something scientific, and then I'd go into something that was not so nerdy sounding. – Student A

**PARTICIPATION:**

Stewardship...

I have no idea. That's one of those words where you know you've heard it, and you know you have heard what it means; but I have absolutely no idea what it means. – Student D

I may not even know what stewardship means. That would mean-- Responsible in an ethical manner? – Student A

I'd say that I think of watching the effect that humans have on the environment as they try to enjoy it and making sure the wilderness isn't changed too much from its original state for future generations to also love to be in. - Student D

I don't like it. I generally pick [trash] up. – Student A

## APPENDIX D

Personal Observation Data grouped into relative Tbilisi tenet

**Awareness:** to help social groups and individuals acquire an awareness and sensitivity to the total environment and its allied problems (and / or issues)

RMS 16 Sylvie L – Researching mining at school

RMS 17 Casey B – “I’m more interested in the environment now”

I have learned so much about the natural world due to you and I am more aware of my surroundings and how they were formed and why they were there.

*I have to say that your class changed my perspective on almost everything I do. Before HMI, I did not care that much about the environment and did not know about the current problems with waste. 15*

*I'm an Environmental Science/Policy major at Barnard College in NYC and I think about HMI and your class all the time! Honestly, HMI is where I truly first fell in love with the environment and I credit you with having great influence in choosing my major. 11*

*Did you know that the U.S. is actually ahead of England recycling wise? Also, their plumbing wasted so much water! 16*

*This year I am taking the APES class at my school and it is NO WHERE NEAR as great as Cooper's Class at RMS. At my school we all recently changed to fluorescent light bulbs, so steps are being taken! ?*

**Sensitivity:** to help social groups and individuals gain a variety of experiences in, and acquire a basic understanding of, the environment and its associated problems (and/or issues)

*The best part about that class was that we actually got to experience everything we learned and it was so INTERESTING, and not just some type I force myself to read in a text book and spit back out on a test. ?*

*I loved having the flexibility to study what interested us as a class. I was interested and cared, so I learned more than if the topics had been pre-picked... RMS 15*

**Attitude:** to help social groups and individuals acquire a set of values and feelings of concern for the environment and motivation for actively participating in environmental improvement and protection

RMS 16 Reidie M – Her first memory upon reflection of her time at HMI was sustainable house we visited

RMS 14 Annie B – Studying Environmental Science

RMS 12 Claire M – Interested in Environmental Science

RMS 12 Julia S – Studying Environmental Science at Cornell

RMS 16 student Hilary Burt is now taking environmental science for her senior year.

*I am very seriously considering majoring in Environmental Studies... I want to get involved in America's push for sustainability. It is something I have been thinking about ever since we visited Read's house back in December. 15*

*I don't know if the course changed much, but I felt for RMS 11, we didn't focus very much on conservation or environmental problems. That is not to say that it wasn't a great and informative class, it just seems to be a focal point of this survey and didn't seem to be one of our class (granted it has been 4 years now). 11*

*I can honestly say that I have learned more in our Natural Science class than I ever have in any other class since then. The key part of the learning experience was hands on research and surveying. While I had problems focusing in class, as soon as we got out of the classroom and ventured out into the woods to record samples and take surveys, I was able to focus and understand the material much better and more clearly. 11*

*I've decided to become a psych and art history major, and an environmental science and French minor. 12*

*I also think its important to mention in this survey that the science course at HMI was a huge factor in why I want to major in environmental conservation (and outdoor education.) ?*

*I've recently been asked to talk to the whole upper school as one of three speakers for our academic recognition assembly. I'm writing a ten minute speech about how the environment has played a role in my life and a lot of that comes from RMS. 15*

*I applied to the Adirondack Semester [at St. Lawrence University] for next fall. 15*

*I've been really focused on water rights and water systems in my studies. also on ecology and what you can do it with the natural materials around you, I feel compelled to learn these things since I'm going to be instructing the sustainability portion of a summer program and want to teach the kids some fun things as well as academic. 14*

**Skills:** to help social groups and individuals acquire skills for identifying and solving environmental problems (and/or issues)

RMS 16 student Leif Amber is working on installing a micro-hydro set-up at his home in VT after seeing Read's installation and doing his research presentation on the same topic.

*I took a sample AP Environmental Science test on the College Board website the other day and I passed-- the only class I've taken on environmental science was Natural Science at HMI. I feel totally prepared to take APES next year, thanks Cooper. ?*

**Participation:** to provide social groups and individuals with an opportunity to be actively involved at all levels in working toward resolution of environmental problems (and/or issues)

RMS 14 Hannah D – Attended conference on global warming in Antarctica during the summer of 2006.

RMS 11 Harden W –

Today I have to drive south to the Amish farms and pick up orders for the co-ops. That's a new job I have--local foods coordinator for all OSCA (so all of the co-ops). It is a pretty cool job, taking in orders, writing letters with those orders to Amish farmers, then driving a big ol' truck down to the farms and picking up the food.

RMS 15

I've talked to at least 8 or 9 people from my semester who were similarly affected by Read's house and want to do environmental studies. Bravo to RMS XVII for the grocery bag initiative! My big

environmental project for my school right now is getting my entire grade free nalgene's with the Packer logo on them, something that will hopefully convince people to quit buying a new water bottle every day and then throwing it out. I got the parents association to agree to pay for them as a gift and I found a site that will customize them very cheaply for us. Being a senior has really enabled me to put out for the Earth a lot more because I couldn't care less if kids younger than me think what I'm doing is lame so I make recycling announcements every week and yell at underclassmen who throw paper in the trash.

*I'm president of our school's AWAC (Environmental Awareness in Action Club) so I've been able to improve our recycling program (now we're the #1 school for recycling in RI) 16*

*Since HMI, I've started the conservation club at my school. I've organized one showing of "An Inconvenient Truth" at my school and one for the public. Along with my friend Deb, we raised enough money for our school to afford the switch to wind power. Basically, I am very passionate about the environment. Ultimately, I want to become a green-home architect. Out of all the classes at HMI, the science and P&P classes affected my everyday life. 15*

*My guidance counselor here saw me picking up litter around campus and he was pleased. I always turn lights off around the house when they don't need to be off... even if it means being scared because it's dark. I am always car-pooling, because I am car-less, but the reason isn't important. ?*

*I've been working full time at a co-op and playing ultimate frisbee for the Davis team. ?*

*I'm also writing a Venture grant to study on an organic, sustainable coffee farm in the Dominican Republic this spring break. 12*

*I run a strong environment/outdoors club with about 20 people in it and have been activist-like around school. 15*

*I also helped start CSSP, Coalition for a Sustainable Sandia Prep. So far we have started a recycling program at school and are working on more ways to make our school eco-friendly. 16*

*I am going to be organic farming, learning Italian, taking a course on the War on Terror, painting, rowing, and singing. I'm really excited for the organic farming, plus the food from the farm goes directly to soup kitchens in Boston. 15*

*I have actually been very involved in my school's efforts to become greener since I got back last year. I joined the sustainability task force as one of two students (the rest being all faculty and staff). This year I have been nick-named Captain Planet for being the student leader of my school's part of the Green Cup Challenge, a competition between 15 New England prep schools to reduce the amount of energy they use per student. This season I did a special project where I continued a compost of the dining hall's food scraps, and succeeded in ordering recycling bins for almost all the dorms on campus. I have also gotten pretty interested in The Coyote Project which tracks coyotes on Aquidneck Island (where my school is). If I hadn't taken your class I can honestly say that I would probably never have done any of this. 15*

## APPENDIX E

### COMPLETE INTERVIEW TRANSCRIPT

**Interview #1**                    **12/17/06**

Cooper Mallozzi:            What is your general impression of the natural world?

Student A:                    [The natural world is] Really interesting and amazing and more intricate and complex than I had expected it to be.

Cooper Mallozzi:            Can you elaborate on the intricacies and complexities?

Student A:                    There was so little that I knew about it. I guess when I starting taking the science class and then we went on the first expedition and you and Carrie were there. It was really helpful because I could ask about anything, and you guys always had information to give me. It was really awesome.

Cooper Mallozzi:            Were there any issues about that natural world you find interesting, fascinating or boring?

Student A:                    That's a really hard question to answer. I think that what I found most interesting is how everything is connected, which is really broad. But, at the same time, it's-- I don't know.

Cooper Mallozzi:            What's most interesting?

Student A:                    Is that the one I just answered, or no?

Cooper Mallozzi:            I don't know, but let's do it [again].

Student A:                    What's most interesting, in my opinion, is just how everything's connected. So, succession plays some role on what lives there, as in animals, and then what type of effect those animals have on their environment and what effect they have on any other animals in the environment.

Cooper Mallozzi:            When you're out there in the wild, around the house or here or a natural area, what thoughts do you have? What do you think about?

Student A:                    Now, more than before, because I guess I wasn't really that curious about anything scientific before-- but, now, I think just walking outside when there's snow I like looking at the tracks and where they're going. I see a bunny, and I'm curious as to where it came from and what type of food it's eating. I don't know. Pretty much everything. I just look around and I'm curious.

Cooper Mallozzi:            You said this [class] is a little different than what you've taken before.

Student A:                    Because, before when I was in Spain, I didn't take science. Before that, I did chemistry. So, it didn't have much to do with the natural world. I think I kind of lost my taste for it.

Cooper Mallozzi:            When you go to a new place, what are some of the first thoughts you have? A brand new natural area in Spain, in Florida, in Colorado - what might be some of the things going through your head?

Student A: I guess [I've become curious as to] just how everything works together. I know that's probably a really bad answer. But, when we were in the canyons, and everything was different. There was tamarisk, and there were cottonwoods. You'd just be walking, and, all of a sudden, you'd come upon this green, lush area that I can't even find in Florida or in Colorado. I'm curious as to why it happened, and I would look around and try to piece things together.

Cooper Mallozzi: And do you think you'll continue going out there into those places?

Student A: Yeah. Definitely.

Cooper Mallozzi: Just you?

Student A: My family always goes, and I go with them. I think I would actually like to do maybe some stuff independently or go with some friends, maybe a NOLS course, or something like that.

Cooper Mallozzi: So, when you're out there with those folks, what are some things you guys would be doing?

Student A: Observing, pretty much. I think when I go with my family, it's really important just to relax. We go out there, and we just lie down on a rock. Or, my stepdad goes fishing, and we just sit and soak it in. That's probably what I would be doing, no matter what group I'm with or even if I'm just by myself.

Cooper Mallozzi: What makes it relaxing? Tough question; I know. Sorry.

Student A: I think just because [wilderness is] so different from cars and stop lights and supermarkets and houses. I don't know. It's silent to some degree. It doesn't have the noise pollution the cities do. It just feels comfortable, I think.

Cooper Mallozzi: So, when you talk about those kinds of things with other folks, like the natural world/environment stuff, what are some things you talk about or say?

Student A: Good question. I'd probably say something nerdy about adiabatic lapse rate. And I'd really enjoy it because then people would be confused, and I'd explain to them what it was and how that affected what grew where. I don't know. I'd probably start out with something scientific, and then I'd go into something that was not so nerdy sounding.

Cooper Mallozzi: Start smart and then go for humor?

Student A: No. I just think it's really interesting, so I tell people about it. People like my mom would find it interesting, and other people may not.

Cooper Mallozzi: Great. Any aspects of the course you enjoyed more than other science courses?

Student A: Yeah. My favorite part was probably the last one or two weeks, where we talked about sustainability. I really, really enjoyed that. I thought it was awesome. And, I really liked going the Read's house. I'd never really been exposed to it before, so I didn't really know what was out there in the way sustainable living or sustainable anything. I just found it really interesting that there was some way to help the environment and still live as relatively conventional life.

Cooper Mallozzi: Any new interests developed at HMI in general?

Student A: If I take anything away from [class], I just want to be more environmentally friendly. That's really important to me.

Cooper Mallozzi: What does the word stewardship mean to you, responsible toward the environment with an ethical compass?

Student A: I may not even know what stewardship means. That would mean-- Responsible in an ethical manner?

Cooper Mallozzi: I'm trying to figure out what you think the word stewardship.

Student A: I think that maybe it's a scary idea and that it's something that I'd like to take on in helping environment and showing people how to help it as well, if that's kind of what you're getting at. Yeah. I would really like to do something like that.

Cooper Mallozzi: Any specifics?

Student A: Something I was thinking about-- I was talking to my mom about how we have lots of lots of fires in Florida because it's so dry. I was thinking about maybe getting a bunch of people together and clearing underbrush. So, it would— obviously [the fires] would still spread, but it wouldn't be so detrimental to the environment and the ecosystem. Maybe that. But, then again, I was talking to my stepdad, who is a transportation manager. He said-- he seems to know quite a bit about it. He said that stuff had already been done, and there are contained fires already. And the brush is there for a reason, or something. I don't know. I think that it would overall be better for the community, including the people, because it affects the people and nobody likes that. So, if we were to get rid of that, it could be less harmful.

Cooper Mallozzi: That's a small [feat]. Other specifics as far as the overall environment?

Student A: Like, what I want to do for it?

Cooper Mallozzi: No. Just your thoughts on and concerns for.

Student A: I think that, as far as size wise, what I'd want and what I heard-- it seems the United States aren't really following the European trend of being more environmentally friendly, and that concerns me. I'd like to maybe kind of share my ideas and share what I've learned at HMI with others, so they can know what's been done to our environment and they can be helpful.

Cooper Mallozzi: So, when you see trash on the ground, how does that make you feel?

Student A: I don't like it. I generally pick [trash] up. I liked when we were doing that candy exercise. I was like, "I can't grab that."

Cooper Mallozzi: That wasn't trash.

Student A: I know, but there was some trash. I tried.

Cooper Mallozzi: Thank you.

Student A: You're welcome.

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**Interview #2**

**12/17/06**

Cooper Mallozzi: You're not going to get graded on it. Brittany Haynes, ladies and gentlemen. I'll ask you to just tell me your general impression of the natural world. Your impression of the natural world.

Student B: After taking P&P, I see it everywhere. I was just talking to Susannah about how this airport reminded me of *Flight Maps* because it has everything Jennifer Price talks about.

Cooper Mallozzi: That's for sure. Are there any issues around that that you found interesting?

Student B: I found alternative energy really interesting. And, I think that we should definitely work on that more as the community and in the world.

Cooper Mallozzi: Like a global concern?

Student B: Yes.

Cooper Mallozzi: An environmental concern, would you say?

Student B: Yeah. It affects all of us.

Cooper Mallozzi: You say the sustainability unit. Was that an interesting section of the science class for you?

Student B: Yeah; that was really interesting.

Cooper Mallozzi: What were some of your favorite topics?

Student B: From the presentation?

Cooper Mallozzi: In general.

Student B: I liked hearing about wind energy and Gaviotas and how people are trying to build sustainable communities.

Cooper Mallozzi: Cool. What about the sustainable communities do you find interesting? What did you like about it?

Student B: I liked that they're not completely ditching civilization in order to form a community that doesn't destroy the planet. Like when we went to Read's house – that was really cool.

Cooper Mallozzi: What did you like about his house?

Student B: I liked how he took natural ideas and utilized them into one complete system.

Cooper Mallozzi: So the self-sustaining piece. *Yeah*. What do you think of when you go to natural areas?

Student B: Well, I-- what do you mean natural areas?

Cooper Mallozzi: You're in an airport right now. You're in anywhere that is not sort of built up; it just has that natural feel to you. What do you think of when you're in that area? You can be taking a walk. You can be backpacking. You could be doing anything.

Student B: It's gorgeous. Like, when we went in the Sawatch Range and even the canyons. I didn't expect that I'd like them.

Cooper Mallozzi: Are there some natural areas at home that you go to now and again? Some parks or woods?

Student B: Yeah. I go into the woods sometimes.

Cooper Mallozzi: Why do you go?

Student B: Because it's quiet.

Cooper Mallozzi: Is it easy to find quiet spots?

Student B: I guess it's easy to find quiet spots, but you have to find somewhere where there's not a lot of people around you.

Cooper Mallozzi: When you go, you go for the quiet. Is there anything you like to think about when you're there?

Student B: No; not in particular.

Cooper Mallozzi: Do you look at the place at all, or is it--?

Student B: Yeah.

Cooper Mallozzi: What do you think about it, besides that it's quiet. We got that part.

Student B: I like looking at the trees. When I was younger, I used to go into the woods that are in my backyard. And I'd look at the trees, and they had big vines wrapped around them. But I never knew what they were or what they did. I just used to wonder.

Cooper Mallozzi: Are you more curious now?

Student B: Yes. On my solo, I thought of you a bunch of times. I found myself looking at those little black bugs. "I wonder what those are? – Cooper...."

Cooper Mallozzi: Snow fleas. When you go to the woods or any of these places, is it usually just you? Do you go with friends? Do you go with family?

Student B: My parents used to take me on walks. But, when I was younger, I just used to go in my backyard to play.

Cooper Mallozzi: Where did you learn that you liked to do that, with your parents?

Student B: I think it's just a natural thing for humans to want [me time].

Cooper Mallozzi: Is that a good thing?

Student B: Yes.

Cooper Mallozzi:

Student B: I guess that's what causes us to preserve parks and stuff, but then we think of it as separate. So in an airport, I don't know many people in here who would think of this as a natural place.

Cooper Mallozzi: There are trees around the fountain.

Student B: True.

Cooper Mallozzi: If you're out there in the woods or the wilderness with your friends, what are some things you might be talking about or saying or doing?

Student B: Just having regular conversations and stuff.

Cooper Mallozzi: Any new friends or interests you've developed while at HMI?

Student B: I think I became more aware of sustainability issues and more interested in that.

Cooper Mallozzi: And, where did the ideas come from, just the way we do things on campus?

Student B: That and how English and Science kind of overlap because we discuss the issue of sustainability and the environment. And it can make you consciously think about it.

Cooper Mallozzi: Does that mean -- If you see trash around, how does that make you feel?

Student B: Bummed.

Cooper Mallozzi: Do you pick it up?

Student B: I don't, but I should.

Cooper Mallozzi: Why do you think you should?

Student B: Because it's like what you read us about that man who plants all the acorns...one person can make a difference.

Cooper Mallozzi: Any parts of the science class that you liked more than others? I don't mean the topics that we talked but the things we did?

Student B: I liked all the activities.

Cooper Mallozzi: Did you like the labs?

Student B: Yeah, and not the lectures. But, I guess—well you know that.

Cooper Mallozzi: You've got to have some lectures. Are there any particular of those activities you liked the most?

Student B: The brownies. And the chocolate.

People: So you mean plant adaptation brownies and foraging mammals? Why'd you like them – beside the food?

Student B: I think it conveyed the point that you were trying to teach. Like, there's all different kinds of plant adaptations in the desert so animals don't eat them. And, then, it really puts things in perspective with the mammals foraging, and know about it and what they go through.

Cooper Mallozzi: Do you know what the word stewardship means or to be a good steward?

Student B: No.

Cooper Mallozzi: It means like being responsible in a good way.

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**Interview #3**

**12/17/06**

Cooper Mallozzi: You enjoy natural science over biology? Why is that? I'm recording you, by the way, as an interview for my grad studies.

Student C: Why? You honestly see things in a completely different manner. For example, now, when I see a lodge pole tree, I'll never just-- When I see a conifer, it's not going to be just a conifer. I'm going to try to identify it. Cells, mitochondria, whatever, it's interesting. I'm really going to yearn to be able to define things that are around us like what you taught us in science class.

Cooper Mallozzi: What are the best parts? What are the parts that helped you figure that out or decide to do that?

Student C: It's all how you put concepts into action - how you put us right there with the ecosystem. For example, the ungulates experiment. After that class, we clearly understood it. Or, when we went to the aspens, we were there. You could see the mark where the elk were eating. You could touch the bark. And, for identifying the trees, you get the needles and feel them. It's something that you can see. You can't see a cell. You can't see all of that. I mean, it's interesting, but--

Cooper Mallozzi: You hit on exactly why I like the wildlife biology and why we sort of stop when we hit that biology piece. I can't see it.

Student C: Yeah. I wanted to see it. That's what I want and how I learn

Cooper Mallozzi: Is there anything you'll do or think differently about after the course?

Student C: [inaudible]?

Cooper Mallozzi: Did it change the way you think about anything?

Student C: Oh, yes; definitely. Like-- just the whole thing. Remember that test you gave us when we had to look at the pictures and then see how you identified it? I'm so psyched when I see my family in a week. I'm going to be talking the whole time

about, like: okay, this is this because of this and just explain to them the whole detail. With a cell, you can't really see it, and it's not that interesting for family conversation.

Cooper Mallozzi: So, being able to actually put it into practicality is--

Student C: Definitely.

Cooper Mallozzi: I'm really glad you enjoyed it. It was great having you in there, for sure.

Student C: Especially in Panama, with all the bio-diversity, it's been-- I'm sure the environmental course is going to be extremely fascinating. I'm definitely going to pursue more natural kinds of science.

Cooper Mallozzi: Are you going to take your family and friends out now, camping and hiking?

Student C: I don't know if I'm going to take them hiking in Panama because I'm so afraid of all the factors, like snakes, etcetera. But, when I'm checking out CC and colleges I'm making my dad go camping with me up here.

Cooper Mallozzi: What are some things you'll share with him? Why did you want to take your dad, and what are some things you want to do?

Student C: I sort of want him to see what I experienced in four months. It's amazing to see things in a different perspective, because I think that's a lot of what the RMS has done. It makes you look at things in a different perspective, because, I'm sure that, if you asked my dad something like, "Okay, what kind of tree is that?"-- I mean, he doesn't think of it. It's just a tree; it's just a rabbit. It's just a wildfire. There's no catalyst. There's no community to it.

Cooper Mallozzi: What's the perspective you want him to have on that?

Student C: More in depth and not be so ignorant about things and why things work. It's something that I found satisfying, to be able to understand things and not just be completely curious about them the whole time. I want [my dad] to be able to also know that.

Cooper Mallozzi: So, knowing all that stuff you know now, you want to share with other folks? Are there any issues that you find most pertinent for Panama or for here?

Student C: Deforestation. Deforestation is one thing I definitely want to strive to help with in Panama in some way. I'm not sure how, because there's way too much deforestation.

Cooper Mallozzi: How did you hear about it?

Student C: Deforestation ends up hurting the whole ecosystem. For example, going back to the previous question-- you ask my dad, okay, deforestation. Okay, deforestation - cut down more trees. But, really, there's a whole-- think about it. There's animals that live in that environment. The whole ecosystem is affected, changing the ecotone, and then nearby ecosystems have to change. And how it affects everyone. Natural sciences at the High Mountain Institute has definitely been a very beneficial course.

Cooper Mallozzi: We have a natural history steward in the making.

Student C: Oh, yeah.

Cooper Mallozzi: You're striving to be environmentally responsible in Panama. What is it mean to you when you hear the word stewardship, if I just said that one word?

Student C: Is it sort of like an apprentice?

Cooper Mallozzi: It's like being responsible toward the environment with an ethical compass.

Student C: Oh, definitely. Yeah. Definitely after HMI. The environment is part of our ethical compass, I don't see how somebody from HMI can't think of it anymore. It's completely-- we talk about it all the time. I'm definitely going to think about it. And I definitely want to do something about it; for example, the biodiesel. When I get to my grandmother's house today-- Tomorrow we're probably going to go to Barnes & Noble or the public library, and I'm going get a book on biodiesel.

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**Interview #4**                      **12/17/06**

Cooper Mallozzi: All right. We are recording. All right, Student D. What is your general impression of the natural world?

Student D: I guess, we've mostly, we talked about that as an actual impression of a P&P. It led me to believe, I guess, that the natural world is everywhere but it's very deformed. And that-- like, it's often even in urban areas, but it's very different natural world than the Sawatch.

Cooper Mallozzi: So, they're different issues affecting each one?

Student D: Some issues are probably very similar, but definitely there are different issues in different places, based on the climate there because the climate always affects the environment and based on how changed it is by humans.

Cooper Mallozzi: So, as far as an environmental concern, is the climate the big one, you think-- or, for you personally?

Student D: Yeah. Probably. I don't think I've heard enough of both sides, with the whole global warming issue to actually decide my stance on it. But, I've definitely heard some things that make me think that the climate needs to be watched, at least.

Cooper Mallozzi: So, given everything you've done in class, is there a thought or topic that you found most interesting?

Student D: It's hard to say. I've always liked geology and glaciers – I've been to a lot of them. I knew some stuff about them but it was interesting to fill in what I didn't know in class. And I like the animals.

Cooper Mallozzi: What makes you think that? What do you like about them?

Student D: There like us in that they have some adaptations and behavioral patterns and stuff. But, they're also very different.

Cooper Mallozzi: So, when you take a walk in any sort of natural area, either here or at home, is there anything you particularly think about?

Student D: I think it kind of really depends on the place. But, as far as rain forest goes, I'd probably be thinking of something different than in a Vermont pine forest. But, I think that when I'm in nature, I often don't start with one thing I'm thinking about, but I end up thinking about the little things that I see on the side of the trail and the bigger things as well.

Cooper Mallozzi: You think that you've changed at all?

Student D: Well, I've done a fair amount of hiking and being in the outdoors before. So, I don't think it changed as much as it probably did for other people. But, I think you experience the outdoors differently when you're with more different people, because you get all those different perspectives.

Cooper Mallozzi: So, when you first go to some of these areas-- You've been to a lot of cool wild areas. What are some of your first thoughts?

Student D: It depends on where. There are various times, when I first got there, that I've thought wilderness areas themselves are so very pristine and preserved. But, I think things are encroaching on them, buildings and civilization and that stuff. That's kind of too bad, but, at the same time, I think it's good to see that lots of people get to enjoy the outdoors.

Cooper Mallozzi: When you're there, do you have friends or family-- or more alone?

Student D: Usually, in the past, it's mostly been family. More recently, at HMI I'm obviously with friends. But, more recently, I've also done some not really extended backpacking trips or anything, but I like going out in the woods in Vermont with friends.

Cooper Mallozzi: Why do you think you like to do that with friends?

Student D: It's relaxing and a nice change of pace from school.

Cooper Mallozzi: So, while at HMI, are there any particular new interests you developed? Status quo?

Student D: I don't think there are any specific new interests, but I have thought before about doing more longer term trips in the wilderness areas. I guess that's an interest going forward, to do more of that, and more with different people than just my family like I've done in the past.

Cooper Mallozzi: Have you and your friends been talking about the natural world? Are there trips you're talking about? What are the things you say?

Student D: That it's [Getting into the natural world is] definitely a good way to get away from the everyday hustle and bustle of society. And, it's a good way to get to know people even better and to get to know yourself even better. In doing that, you get to be in a really nice place.

Cooper Mallozzi: Define nice. What makes it nice for you?

Student D: It's pretty. And, it's really varied. In one area there's lots of different organisms than if you go somewhere else, even if it's right nearby, there will be even more different ones. And, there's always the little things that you can notice and then the big things as well.

Cooper Mallozzi: The science class had a lot of different pieces to it: classes, labs, different activities. [Other people are studying for that. Is anything-- Do you have classes that you enjoy more than others?

Student D: I like interactive [classes] best. I like the labs. My guess is that lots of HMI students like interactive [classes], given that we go out and interact with lots of stuff.

Cooper Mallozzi: Any others besides? You said geology earlier.

Student D: I think it's interesting to learn full processes as opposed to learning just pieces of it. Like when we went to the canyons and learning how the entire canyons were formed. And then learning the entire process-- not just the forming of glaciers, but expanding on what they do to shape the environment.

Cooper Mallozzi: You like glaciers. Last question. What do you think of when you hear the word stewardship?

Student D: I have no idea. That's one of those words where you know you've heard it, and you know you have heard what it means; but I have absolutely no idea what it means.

Cooper Mallozzi: Responsibility in an ethical idea and moral compass in mind.

Student D: I'd say that I think of watching the effect that humans have on the environment as they try to enjoy it and making sure the wilderness isn't changed too much from its original state for future generations to also love to be in.

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**Interview #5****12/17/06**

Cooper Mallozzi: We've just spent a bunch of time this whole semester in the natural world. What are your general thoughts about it?

Student E: I definitely learned a lot about it. It was a unique science class, unlike any science class I've had in New York. And it was definitely very educational, and I learned a lot from it.

Cooper Mallozzi: Expand on that. It doesn't necessarily have to be that science class.

Student E: Most of the science classes that I've taken, like biology, which is more general, and chemistry-- and physics was more like mathematical and logic. But, in the course here, it was really-- you kind of have an intimate relationship and a close connection with nature because you're right there. We spend two hours a week doing the Monday lab, so it was definitely something that I've never had in any other science classes. I actually really did learn-- I always have questions on what kind of tree is that or how to identify species and stuff like that. The class that you taught really taught me a lot of things.

Cooper Mallozzi: So, the connections piece is key? Like spending time learning about species adaptations?

Student E: Of course. You learn about these things. That's the trouble with classroom teaching - you do all of these things in class; but, most of the time, these classes are removed from the things that you're learning about. But, here, you're learning about things, and you see it firsthand. You really make that strong connection.

Cooper Mallozzi: Cool. So, are there any issues that you found to be more pertinent or you're most concerned about or that grabbed your attention?

Student E: I like that Thanksgiving assignment, where we had to research a current environment issue in our neighborhood. It kind of pertained to us. It concerned us, rather than this omnipresent idea of global warming. That's bad, but it's happening to everyone. The environmental issue that you made us look up in our area and do research about - that is affecting me.

Cooper Mallozzi: Do you think you'll do anything about it?

Student E: I think that the-- I kind of knew a little bit about the toxins in the Hudson River, but I think it's something that has been resolved. And it's going to be a long process before it actually physically resolved. But, as of now, GE has agreed to start the process of removing the sludge from the Hudson River. I'll definitely try to participate and partake in the process as much as I can. But, it's kind of a bigger deal. It's kind of over my head.

Cooper Mallozzi: In the class, were any topics the most interesting?

Student E: Yeah. I liked geology a lot. So, when we did that bit about geology, like the formation of features and stuff, I found that really fascinating. And, I'm actually going to take geology the second semester, so it will be a good lead to what I'm going to study next semester.

Cooper Mallozzi: Do you like to do that because you like to know how things were formed when you visit them?

Student E: Yeah. It's nice to know how and why something happened and what it is that you're actually looking at. It's something deeper than when people say, "Wow! This is beautiful." If you know the background information you can say, "Yeah; this is beautiful because of this natural phenomenon."