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Making Connections through Experiential Education: Teachers and Students in Science 10

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The research was a fascinating process that found us meeting for much longer than we anticipated through e-mail, at our collegiates, Brightwater and various Saskatoon coffee shops.

Beth Campbell, Teacher, Nutana Collegiate Institute,
Susan Campbell, Teacher, Walter Murray Collegiate Institute, and
Marcia Klein, Project Leader, Brightwater Science and Environment Centre.

Saskatoon Public Schools

Executive Summary

Two science teachers from collegiates in Saskatoon Public Schools and the Project Leader of the Brightwater Science and Environmental Centre (Saskatoon Public Schools) formed a team to explore how the *Sustainability of Ecosystems* unit of Saskatchewan's new Science 10 curriculum could be realized in the natural environment. While our original research question was student-centered (how student engagement in science could be enhanced by experiential learning in the outdoors), the project expanded to include consideration of the integration and delivery of this experiential learning.

We concluded that outdoor experiential learning is critical to teaching the Sustainability of Ecosystems unit in Science 10. During the research, we realized that one day outdoors is not sufficient, especially for students with little prior experience in the outdoors. We discovered the value of learning with a Traditional Knowledge Keeper with students in the tipi or the open prairie.

While some student attitudes about sustainability did not demonstrate dramatic value shifts during the semester, we did note that the experience at Brightwater created awareness and connection to a natural place that helped enhance the science unit. We found that many students engaged in experiences that created memories and connections to the theme of *Sustainability of Ecosystems*. As educators, we were able to explore our beliefs about education as a result of engaging in this research project.

Tell me and I will forget.
Show me and I may remember.
Involve me and I will understand.

Chinese Proverb

"Everything changed after the field trip - everything; the way my students treated each other, the way they treated me and even the way they treated education" Page 31 *Teach with your heart: Lessons I learned from the Freedom Writers* by Erin Gruwell New York: The Doubleday Broadway Publishing Group.

Foreword

In 2006, before this research officially began, Beth took a class of grade 10 students out to Brightwater during the grade 10 Science *Sustainability of Ecosystems* unit. The following things came up in her class discussion before going to Brightwater:

- Almost all the students had spent their academic careers within Saskatoon Public Schools. Only about 50 per cent of the regular students recalled being at Brightwater, yet 84 per cent of elementary classes in Saskatoon Public attend Brightwater each year.
- Most students were not familiar with the outdoors, even to a small degree. For instance, it took some time to convince a few that they actually needed to bring a lunch because there were no food courts in the woods (and no canteens, or vending machines, or anything resembling these things ... really). Ditto for the need to take garbage back out with them at the end of the day.

Marcia made some reflection notes about the first day with Beth at Brightwater (journal, Fall 2006).

On the first day, with the regular students, I prepared the tour and facilitated the sessions with the intention of mentoring Beth of the possible resources available and so she could get to know the site a bit better. Also, I had a rookie facilitator who was not confident with programming yet, so she was being mentored in aquatic studies, taking more of a leadership role on the second day.

The second day with the advanced students was a wonderful time. The energy was better, though the day was really cold. The students had been to the site before in middle years and were keen to be back. That set the tone for the program, as did the fact we had a run-through the day before with the regulars and a bit of a sense of where we were going with the program and how the place helps to interpret the curriculum. Beth and I divided the students in half and co-led the hike and plant research. The students did aquatic studies and plant identification and walked the area where we had a recent fire. We had a good day, and the students even wished that they had the chance to sleep over like they did in grade school – one day was not long enough for them. What I felt was lacking were resources for Beth that could help her with this new curriculum. I know we can go further with this [and so the seed was sown for this McDowell Foundation research project].

Creating the Team

In the fall of 2005, I (Susan Campbell)* was newly employed by Saskatoon Public Schools as a science teacher at Walter Murray Collegiate. I had heard of, and was curious about, the Brightwater site. I made an appointment with the Project Leader of Brightwater Science and Environment Centre, Marcia Klein, to spend a day at Brightwater to tour the facilities and learn about how I could use it in my classes through the mentorship program. Independently, my colleague, Beth Campbell, from Bedford Road Collegiate, had been to Brightwater once. Marcia facilitated a meeting with us. By the way, it is just coincidence that Beth and Susan have the same last names (and actually the same first names too as Beth is Susan Elizabeth Campbell – go figure!).

At this meeting (March 2006), we discussed our feelings about the massive disconnect that many students experience between exploring sustainability of ecosystems and their personal actions. We were curious how experiential learning would help students to recognize, and perhaps begin to overcome, this disconnect. Marcia suggested that we apply for a McDowell Foundation grant in order to examine our questions by focusing on the new Science 10 *Sustainability of Ecosystems* unit.

Initially, it seemed that we were “coming from” different places; Marcia as the Brightwater Project Leader, and Beth and Susan as two very different science teachers, albeit with similar backgrounds. It wasn’t until we were almost finished this project and discussing some of our observations and results that we shared our own childhood ecological stories and discovered how similar our own upbringings were. We all grew up with a “place” nearby and had a variety of outdoor experiences with families and friends. These experiences informed our future educational choices. As children we experienced Whitehead’s romance with the natural world, and as young adults were ready to pursue the precision of biological sciences study. Our childhood experiences sum up a few of the factors that Chawla (1999, p.15) cites as being the most influential in shaping adults’ attitudes towards the environment:

Respondents repeatedly attribute their environmental interests or actions to a similar set of sources: extended time spent outdoors in natural areas, often in childhood; parents or other family members; teachers or classes; involvement in environmental organizations; books; and the loss or degradation of a valued place.

A strong desire to provide these kinds of important experiences for students was at the foundation of each of our motivations for participating in this research. For more about our philosophies, refer to Appendix I, which gives the teachers’ personal stories.

* While reading this document, it may be helpful to note that the writing was done as a collective; however, if the content contributed flows from an individual, this writer or speaker is identified.

Research Question

We were interested in exploring how student engagement in science could be enhanced by experiential learning in the outdoors during our grade 10 *Sustainability of Ecosystems* unit. Further, we wondered how we could help to develop in our students an **awareness** of the environment and create an understanding of their **connection** to and **responsibility** for the environment, and finally inspire a **commitment to change** personal or collective behaviours that conflict with their responsibility for the environment. Our research question was two-fold (initially):

How can student engagement in science be enhanced by learning in the outdoors? How will students' awareness, connection, responsibility and commitment to change be influenced by the experiences in the sustainability of ecosystems unit?

We also anticipated that we would help to pilot the Science 10 program at Brightwater, thus providing support to future teachers on how to benefit from the place through pre-visit, on-site and follow-up experiences.

As our research continued into years two and three, we realized that a secondary hypothesis was developing in the minds of all three researchers. We believed that **experiential education facilitates engaged teaching**. As relatively new teachers, both Beth and Susan designed their research to focus initially on student learning but in their personal discussions, it tended to focus more on teaching methodologies. They felt that it would be enormously meaningful to collect data from a large body of teachers engaged in experiential education in order to document the evolution of their ideas on **student engagement, assessment** and **professional growth and development**. It is significant to point out at this time that these three aspects are all part of Collegiate Renewal.

Defining Success

Success for schools of the past was about producing people who were trained to work to keep the economic machine functioning. Success might also have been described as producing a student who was “college bound,” even though this was not a reality for all collegiate students. Success is a concept that also has cultural interpretations, as suggested by Melnechenko and Horsman (1998):

It is the different people involved in the students' education who have different views of success that constitutes its meaning. Aboriginal communities often define success as mastering a curriculum and retaining cultural heritage. A European culture measures success in school by measuring academic achievement. (p. 7)

Learning in which the students develop understanding enriched by cultural perspectives is part of the Science 10 curricular objectives. In our context, success is not solely academic; it also reflects a traditional Aboriginal awareness that we are part of nature. It is based on growing connections with the land through experiences that spark stories which become part of a person. **Beyond knowledge, we look to how learning experiences transform students' attitudes, ways of thinking and actions in the context of the environment.**

Success for us, in this research project, means that our students grasp the concept of *Sustainability of Ecosystems* in a meaningful, relevant way, as evidenced in their comments, assignments and responses to quizzes. It also means that the measurement of our students' eco-footprint would improve over the course of the unit, and there would be more effort by students to make sustainable choices as citizens and consumers. Success for us means that our students would come to value a place for its inherent beauty, appreciate its diversity and actively work to preserve it and other places like it. Success could be viewed through a camera as students who: listen intently, explore a prairie with curiosity, pose questions of facilitators and delve into field guides or the web to find more answers: our students would be engaged. As researchers we were challenged to find ways to gather data that demonstrated this inherent learning by students. Student journal entries and verbal responses to seemingly casual questions posed by the researchers yielded what we found to be the most meaningful data.

Collegiate Renewal

On October 5, 2007, the teaching and administrative staff of every public collegiate met at TCU Place in Saskatoon for a professional development session titled “Collegiate Renewal.” This session featured presentations from groups of students who were drawn from all Saskatoon collegiats, as well as all academic streams, learning styles, ethnicities and personal backgrounds. Some of these students were parents; some had been out of school and then returned over a year later; some were refugees.

These students had been asked by the Galileo Educational Network Association to envision a school for the 21st century. What would the programming look like? How is the role of the teacher viewed? What would the learning spaces look like? The students had two days to work with one another, defining and refining their vision and creating their presentation format. The hearts of the three presentations were astonishingly similar. The students said they felt alienated from their peers and their community, and they needed opportunity to make the connections they longed for. They saw themselves working in small groups led by a knowledgeable, caring adult who could help them focus their attention and energies. They pictured a more casual learning environment, away from the rigid rows of desks and unit tests. The students envisioned collegiate renewal as focusing on **engagement**: engagement with one another, their teacher and their environment. For more information about Collegiate Renewal in Saskatoon Public Schools, please refer to the website <http://schools.spsd.sk.ca/collegiaterenewal/>.

These students have asked for what educational philosopher Alfred North Whitehead termed romance.

Romance is the first moment in the educational experience. All rich educational experiences begin with an immediate emotional involvement on the part of the learner. The primary acquisition of knowledge involves freshness, enthusiasm, and enjoyment of learning. The natural ferment of the living mind leads it to fix on those objects that strike it pre-reflectively as important for the fulfilling of some felt need on the part of the learner. All early learning experiences are of this kind and a curriculum ought to include appeals to the spirit of inquiry with which all children are natively endowed. (Whitehead 1925 Education Encyclopedia, 1971).

What we traditionally provide in collegiats is the second movement in the educational experience, which is precision.

*Precision is discipline in the various languages and grammars of discrete subject matters, particularly science and technical subjects, including logic and spoken languages. It is the scholastic phase with which most students and teachers are familiar in organized schools and curricula. **In isolation from the romantic impetus of education, precision can be barren, cold, and unfulfilling, and useless in the personal development of children.** An educational system excessively dominated by the ideal of precision reverses the myth of Genesis: “In the Garden of Eden Adam saw the animals before he named them: in the traditional system, children named the animals before they saw them.” (Whitehead 1925, p. 285). [Education Encyclopedia, 1971, underlining my own.]*

We were struck by how our inquiry toward student success via experiential education fell within the aims of collegiate renewal, which our school system defines as follows:

All collegiate students will be **engaged** in their learning so they will graduate as active participants in lifelong learning and as responsible and caring citizens in the community, nation, and world. <http://schools.spsd.sk.ca/collegiaterenewal/>

What we want as educators is a re-introduction of romance, an excitation within the student mind for ecology, an interest that will lead to the desire for what Whitehead terms precision. Without romance precision is “barren, cold, and unfulfilling.” Within collegiate renewal, students have called for connection, for engagement, for romance! As researchers we were excited by this call, for it was exactly what we were calling for as well: experiential education to provide the romance.

The Curriculum

The new Science 10 curriculum was piloted over the 2003-04 and 2004-05 school years and became mandatory for all Science 10 teachers in the second semester of 2005-06. Our research focused on the Life Science unit, *Sustainability of Ecosystems* (Saskatchewan Education, 2005). You may access the Saskatchewan Ministry of Education website to view the curriculum: <http://www.sasklearning.gov.sk.ca/docs/xsci/>.

Mr. Dean Elliott, science consultant with the Ministry of Education, summarized the unit as follows:

Students will examine sustainability of ecosystems from a system perspective. Students will document diversity as an indicator of health of ecosystems and investigate the characteristics of population dynamics, within the context of the carrying capacity and limiting factors of ecosystems. This approach provides students opportunities to explore interdependence of species and the relationship between organisms and their physical environment. The study of the physical environment will include consideration of large scale cycling of elements (carbon, nitrogen and oxygen) in biogeochemical cycles and the bioaccumulation of toxins in food chains and webs and the consequent effect on the sustainability of ecosystems. Students are encouraged to develop an action plan that they or members of their community can undertake in order to maintain or enhance the sustainability of our environment at a local, regional, national, or international level. (p. 1, Ministry of Education)

The foundational objectives for Sustainability of Ecosystems include:

- SE1 - Explore cultural perspectives on sustainability
- SE2 - Examine biodiversity within local ecosystems
- SE3 - Analyze population dynamics within an ecosystem
- SE4 - Identify cycles, change and stability in ecosystems
- SE5 - Investigate human impact on ecosystems (Sask. Ed. 2005)

Our focus was primarily on foundational objective SE2, which was addressed through student participation in the field trip to Brightwater to examine the biodiversity of the local ecosystem. We also had the opportunity to explore SE1 through the Indian and Métis Education Development (IMED) grant, which enabled us to invite Joseph Naytowhow to speak with the students.

Brightwater

Brightwater Science and Environment Centre is an outdoor environmental education program and place created by Saskatoon Public Schools in 1990 for middle years and secondary students. The site is located on Brightwater Creek off highway 219, 14 km south of Saskatoon. One property, leased from the Salvation Army by Saskatoon Public Schools, targets middle years students and consists of 100 acres of predominantly native mixed grass prairie with a modern camp village nestled in the valley by the creek.

Each year, over 1,500 grades six and seven students participate in three-day camps in fall, winter and spring that include science studies, arts, First Nations teachings and sustainable living. Teachers receive professional development support to assist in planning and facilitation of their program. Learning sessions for middle years students are lead by teachers, parents, grant- or budget-supported facilitators, volunteers, work education students and the Brightwater project leader. Please check the Brightwater website for more information, resources, maps and a PDF brochure: <http://olc.spsd.sk.ca/DE/Brightwater/>.



Brightwater Science and Environment Centre
Saskatoon Public Schools land with tipi,
schoolhouse and solar composting straw bale
toilet building. Photo credit: Meewasin Valley
Authority, Spring 2003.



Tipi at Brightwater. Photo credit: Henry Wolfe,
Saskatoon Public Schools.

The site that is the main focus of our study (also named Brightwater) is the former Pheasant Farm, a piece of land once owned by the Saskatoon Wildlife Federation and now owned by Saskatoon Public Schools. It is adjacent to the Salvation Army property. Over 500 secondary students and all of the elementary students learn on these 56 acres of prairie, creek and pasture land using rustic facilities that include an old schoolhouse (indoor classroom and electrified booth lab), a solar straw bale composting toilet washroom building built partially by students and a tipi for the First Nations programming. About 5 km of trail systems flow through both properties, providing examples of riparian habitat along the creek valley, former pasture lands, human impact (restored garbage dumps and pheasant pens), pristine prairie and aspen/poplar forest along the valley. Secondary teachers have access to both properties.

Secondary students in Biology 20 currently spend one day at Brightwater studying the landforms that resulted from the most recent glaciation period, the variety of ecosystems present, the species and numbers of plants and biodiversity. Science 10 classes also studied water quality under the previous curriculum. Secondary school teachers have a once-a-year opportunity to participate in a half-day of professional development at Brightwater and experience mentorship with a veteran teacher or the Brightwater Project Leader before leading one-day field trips on their own or with support from facilitators or the project leader.

The program for both lands is staffed by one project leader employed by Saskatoon Public Schools and one to two science and/or art facilitators employed on a casual, seasonal basis through grants and the Brightwater budget. Teachers, volunteer parents and volunteer facilitators also guide students in their programs. The opportunity to integrate First Nations perspectives on ecology and ecosystems was provided from 2001 to the spring of 2007 by an IMED grant through the Saskatchewan Ministry of Education. The grant helped to link the program to the Science 10 curriculum, specifically SE1 (explore cultural perspectives on sustainability), which creates an open invitation to search for stories from many world views.

Brightwater practices a land ethic: “A thing is right when it tends to preserve the integrity, stability and beauty of the biotic community. It is wrong when it tends otherwise” (Leopold, 1966, p. 262). The Science 10 *Sustainability of Ecosystems* unit lent itself well to the Brightwater goals and previous secondary programming.

Challenges

Incorporating experiential learning into a unit plan at the high school level is difficult and often never happens. There are a number of barriers to planning for a day away from school, such as:

- *Extracurricular and Out-of-Classroom Activities.* In any semester, students start with a number of hours of class time that are fewer than the 100 hours of instruction outlined by the Ministry of Education. In the high school where Beth teaches, many students will not, or are not likely to, complete out-of-class assignments or projects. They start off “behind” and then other class hours are distributed between “Just Read,” sporting events, pep rallies, grad activities and administrative functions.
- *The Challenge of Integrating Field Trips into Units of Study.* Field trips can be seen as “standalone” activities. Many opportunities for field trips come up during the semester, and while they are linked to the curriculum, they may not be planned to integrate into the unit of study. Taking advantage of “last-minute” field trip opportunities can add to a class, however, and may well be incorporated into future units.
- *Planning.* Planning the events for a day at Brightwater can be straightforward once a teacher has had access to the site facilitator and become familiar with the site. The learning curve is steep, however, and becoming familiar with the area can take a few trips out to the site either for PD or with classes. This planning can be daunting to teachers unfamiliar with the area who are concerned about students missing a productive day at school. The first “hurdle” teachers have to overcome for a Brightwater field trip is to learn how to brief their classes about expectations for the day, how to dress and what to bring. Teachers also need to know how to get from the parking lot, where the bus drops you off, through the trail to the schoolhouse that they will use as their “base” for the day (and if it’s cold, they also need to know how to work the wood stove). Once on site, teachers generally cover procedures for Brightwater with respect to garbage, compost and the composting toilet. Identification of plants and animal traces takes experience, as does recognition of the geological features of the creek, forest and prairie. There are kits available to guide plant identification and creek dipping, but teachers have to know where these kits are and how to use them with the class. Once it has been done the first time, it is easier the second time.
- *Administration.* From an administrative standpoint, planning the field trip involves filling in the bus request form, absence request form, parent permission form and form for permission from the division for a field trip. The parent permission form has to be distributed and collected, along with any fees that are required, and the money then has to be deposited. Although Brightwater is one of the division’s school programs, so there is no cost for using the centre, the cost of the bus and the substitute teacher still need to be covered. As a result, there is a charge of approximately \$10 per student for a class of 30. Many students in some classes will elect not to attend, seeing it as a day off, which makes the day more expensive for the students who do attend. In Beth’s regular-stream class, only about half the students came on the field trip. In a community school, there are students who will not participate in any activity if there is a fee involved, and although the Community School Coordinator often has funds to

cover their expenses, accessing these funds adds another step to the organization and planning for the trip.

- *Preparing for Substitute Teachers.* Depending on a teacher's classes and how many times the teacher has been pulled out of the classroom for other activities, preparing for a sub can be challenging. Is a day away from your other classes worth it? This is always a question!
- *Assessment.* Designing a tool to assess the understanding that results from experiential education requires thought, especially if it is to be used in the field. Gathering data on student knowledge related to curricular objectives (e.g., plants found in the survey, lists of biotic and abiotic components of the ecosystem) can be carried out as a reflection. However, because experiential education touches the head, heart, body and spirit, assessing it poses more challenges.

Literature Review

OUT-OF-SCHOOL EDUCATION WITH SASKATOON PUBLIC SCHOOLS

Saskatoon Public Schools has an Out-of-School Education Concept Plan, which was authored in 1989 by school principal Max Abraham and revised and expanded in 2002 by grade 11 Outdoor School teacher Kim Archibald and colleagues. Both documents reflect a long tradition of finding the best place to do the best learning beyond the classroom walls. Out-of-School Education is defined in the plan as the “extension of teaching and learning beyond the school classroom” (Archibald, p. 4). Out-of-School Education creates interrelationships through relevant experiences that blur the boundaries of curricula subject areas. While integration of subject matter has been prevalent at the elementary levels, secondary teachers are now exploring the advantages of this holistic instructional method. Historically, Biology 20 and Science 10 teachers have used Brightwater for their field studies, so when the new Science 10 curriculum was introduced, Science teachers asked to be able to continue to use the new curriculum at the site. It is acknowledged that taking the lecture outside is not the intention of Out-of-School Education. Such traditional teaching practices are expected to give way to student-centred, process-oriented approaches through active hands-on engaging programs that are designed to exist outside the classroom walls (Archibald, p. 18). The Brightwater program is intentionally designed to maximize opportunities for engaged learning.

System-sponsored programs exist for students (grades one to seven) so that all students will have at least one out-of-school education experience each year with the intent to expand the program to all grades some day. Saskatoon Public Schools also supports innovative educational classes pioneered in 1999 by the grade 11 Outdoor School teachers, Kim Archibald and Judy McClland. Other innovative programs include EcoQuest (grade eight), ScienceTrek (grade eight), Let’s Lead – Nikanetan (grade eight), and Media School (grade 11), which all have websites attached to the Saskatoon Public Schools site at www.spsd.sk.ca. The practice of Out-of-School Education in Saskatoon Public Schools is an area worthy of further research.

Student views on the environment at the middle years level were explored in 1997 through McDowell Foundation research project #20, *Hearing from Our Kids: An Environmental Study* by teacher Lorraine Stephanson and Louise Jones, the first project leader at Brightwater. Stephanson visited the outdoor learning site with her middle years students for three-day camps in each season (fall, winter and spring), taking the opportunity to explore perceptions about environmental issues and connection to the land. Stephanson noted a discrepancy between what the students knew were the right things to do and what they actually chose to do environmentally after the first camp in the fall (Stephanson, 1997, p. 10). She observed a change in student attitudes over the consecutive winter and spring visits as students connected more often and deeply with their “personal spots” at the environmental site during the camps. Repeat visits to a site, involvement in multi-disciplinary studies and empowerment to help develop the program contributed to powerful learning experiences for the grade eight students and gradual changes in their actions and attitudes. The environmental quiz that Lorraine Stephanson created was used with the grade 10 students for this research project. See website http://www.mcdowellfoundation.ca/main_mcdowell/projects/research_rep/20_hearing_from_kids.htm.

TRADITIONAL KNOWLEDGE KEEPER



“Traditional education for Indigenous peoples has always been an ecological education” (Cajete, 1994, p86). For youth to connect with their homeplace, they need the opportunity to experience ecological education from people indigenous to the homeplace. Teaching through story, song, music and walking with the land refreshes all learners and enriches our multicultural society.

Students at Brightwater Science and Environment Centre have been fortunate to learn with an internationally recognized Traditional Knowledge Keeper. Joseph Naytowhow sets up the large teaching tipi with students each fall and facilitates sessions for middle years and secondary students as part of the Brightwater program, sharing

teachings about ecology, culture and Cree language and consulting with the teachers and project leader. Whether learning through story, remembering their Cree names or listening to drumming or flute songs, students are mesmerized as they sit in the tipi gazing at the fire or gather along the bank of the creek.

Joseph was willing to assist us in this learning project by considering the Science 10 curriculum documents and facilitating learning sessions at Brightwater for each Science 10 class, as well as meeting with the authors a few times and sharing his ideas (printed below). He also worked with Marcia in spring 2007 on a parallel project for Science 10 with Saskatchewan Learning and the Saskatchewan Professional Development Unit (SPDU) that also addressed Sustainability of Ecosystem. *Pimohtewin: Walking with the Earth* supports the facilitation of an outdoor learning program from a First Nations perspective, providing both an on-site program guide to Brightwater and a PowerPoint pre-visit presentation to support hikes at Brightwater.

Joseph’s contribution to the lives of our youth, the Brightwater program, teachers’ professional development and our research enriched our experience immensely. This study would not have been the same without his stories, songs, laughter and teachings.

Joseph’s thoughts about this project are shared, as told to Marcia, Beth and Susan at Brightwater, May 15, 2007. We share his words with permission from Joseph and have honoured protocol by presenting him with tobacco. Nanaskomin (we thank you), Joseph.

Whenever I do something, I sort of pre-plan what I am going to do – what has been presented to me over the years with the oral and visual memory, traditions. What you get at that time is a multi-sensory approach. It is deliberate. If I don't feel at home with what I am trying to share, there is no point to me. So my text is all the accumulated knowledge and is through the natural sharing, part of ritual. That is part of the data of what comes down. It is like repeating a ritual from my point of view. [I am a] being of this land, not necessarily from Saskatchewan, but from the land. I traveled all over in North America and have seen a lot. So the knowledge is coming from the Elders I have been with, both male and female . . . When I am actually there and if there has been proper protocol and I trust that it will be shared the way that is supposed to be shared The protocol is a small offering of tobacco, a concrete giving and taking before anything is actually shared. Like a doorway, opening a door.

I just share who I am. I think part of me is trying to affect their thinking or their feeling. In the tipi, for example, those students, I felt comfortable in sharing. It also depends on where they are at. I felt good with them in there. I didn't want to get too heavy. Sometimes they are ready for heavier information in the way of viewing the earth and Indigenous people. A lot of it is trying to remove stereotypes of . . . Indigenous people. We all live here together in this country, this land.

I was taught on the land so it was appropriate to be at the tipi. It is the place of learning where these students will have some memory. It will affect their future.

It's all about listening. If you have a pad in front of you, it is sometimes an obstacle to hearing more than information. I let them know. If you are going to learn from me, you have to learn through your senses. Put the books aside. Be responsive. Through silence or through participating, you learn. In a lot of ways, I was an active listener. What was being shared by the Elder might not be shared next year. We are only here for a short time. If you have missed a vital piece of information, you have to take another journey to get that information so it all takes time and listening when you have the chance. We have to teach youth to listen from when they are young.

Nanahitamowin - [it means to] listen with your body, mind, emotion.

Sometime it is different with the language, with English. I often wonder about that, how much is missing with the language. I use the language deliberately; throw some words out to add to the learning, like when I give each student a name in Cree. They remember their name.

When we work with an Elder-based system, you take the whole gamut of that [which] is happening. It is part of the teaching. You know your stuff so people respect and honour that. That is how I approach it. How I need to be effective is a two-way street so the youth become my teachers. While I am the teacher, I am the teacher. Teachers sometimes get too involved, but I am still the teacher when I am trying to affect learning. When teachers try to keep the noise down, that bothers me sometimes. You have to find creative ways to work with it. A teacher has to be totally armed with skills, knowledge.

If you want to connect with the young people, it is a model between student and Elder. That is one thing that needs to be strengthened. There is an infusion of Elder-student relationship. Things happen within that. Ultimately, that is where they will learn to respect my culture and the Earth. We are very earth-based people. Because we, you could say, mastered the idea of co-existing with nature without hampering the earth with pesticides. Through that way we can expand it and we need to affect kids' attitudes about how not to disrespect land, nature. It has to change at some point. Are they going to continue what their predecessors have conditioned them [to]? With the Elder woman and young woman that is the way. Sometimes it crosses. Young men need to learn from elder women too. [It] needs to be balanced. Learn about self and the world around you and your fellow animals, standing people. So that's where I come from. Sometimes I am alone. I need a strong earth-based woman to stand beside me. If we plant sweet grass, make it a learning experience. Learn about nature. [We were gifted with some sweet grass to plant at Brightwater.]

We have purpose for all these different plants. It is a very sensitive area of experience. When I see all the destruction along the highway, who knows maybe there was sweet grass along the highway. There [was] a lot of water that is gone now. [Sloughs along the highway to Brightwater were removed for expansion.]

You have to find a way where there is choice. You still cover the objectives; they [the students] select these experiences. It is just how it is done. To me it is more natural in that manner where students learn with their own faculties. They need to think. Learn through selection and how life unfolds. Give more power to decide what they will learn. They find their own energy and spirit. They need to find what they are drawn to. Why not spend a whole day on photography?

I work with what I get back. If one is disruptive, it is an opportunity to affect learning. I see him [a particularly disruptive student] as a troubled individual. I take that opportunity to provide a means to learn to respect and see something. Some might respond with more wrath and harshness, depending on who it is. I learn to remain calm. There are some things you can't make general comments about to minimize them. You can't have the pipe, if you don't know. [Joseph was referring to a student who asked if the students were going to smoke a pipe during the session.]

You don't know that what you say might have an effect on you. A blatant comment based on a stereotype or lack of proper teaching. So basics are not being taught. That was the place for him to learn that, telling him gently, not to shame him or make him feel worse for his actions. He is just responding from a place of confusion. In the end, his friends intuitively understood what he needed. [The student] wants a hug. So I gave him a hug. I saw this little child so you go beyond this big boisterous boy for what it is. You don't know where it comes from. He asked for that. He asked his friend. This kind of teaching works. I like the idea of cross culture. When you bring in Elders, the youth will get more out of it than if it is just separate.

THE DEVELOPMENT OF EXPERIENTIAL EDUCATION

This section addresses the development of the philosophy of experiential education, the umbrella under which are grouped child-centered learning, outdoor education, adventure-based programs, place-based education, service learning, field trips, conservation education, ecological education and environmental education.

The concept of learning outside of the classroom is not a new one. John Amos Comenius (1592-1670), a Czech educational reformer, stated, “We should learn as much as possible, not from books, but from the great book of nature, from heaven and earth, from oaks and beeches” (Knapp, 2005, p. 279). The actual genesis of the term **experiential education**, however, rests with John Dewey (1859-1952), the American philosopher of democracy. In his 1938 publication, *Experience and Education*, Dewey distinguishes between “traditional” and “progressive” approaches to education. Traditional education takes place in a classroom with docile, receptive students who receive knowledge from an experienced teacher. Knowledge is something that is transmitted, given, to students. Knowledge of the past is the end of the education. In contrast, progressive education requires that the students engage with their own learning, that they make their own meanings from their educational experiences. With such an emphasis on the word “experience,” we are led to understand that the student is docile no longer – that the teacher does not simply impart knowledge, but needs to be a facilitator in creating it. Knowledge of the past is no longer the end of the education, but rather it is a means. For educators, the challenge is how to use the experience to educate.

Kurt Lewin (1890-1947), a social psychologist, engaged in research that led him to conclude that learning is maximized when there is a “dialectic tension” between the immediate, concrete experience and analytic detachment (Schugurensky, 2002, quotes my own). Lewin considered this conflict critical to organizational change and improvement. In his view, subjective experience, as well as objective examination, is a vital component of experiential learning.

Lewin’s experiential model begins with concrete experience, from which observations and reflections are made. The concrete experience is not a classroom lecture; instead, it could be a field trip, role play, case study or testimonial that leads to the formation of abstract concepts and generalizations. It is followed by testing of the implications of these concepts in new situations. Each step in experiential learning is linked to the one which follows, forming a continuous circle in which testing leads back to concrete experience (Schugurensky, 2002).

Jean Piaget (1896-1980), a developmental psychologist, studied the nature of intelligence and how it develops. Piaget became interested in the processes children used to reason out the answers to questions on an intelligence test, and this interest led him to study experience and human knowledge. The term “constructivism” is applied to much of Piaget’s work. Piaget theorized that intelligence is shaped by experience, that intelligence is not an innate internal characteristic but rather a product of the interactions between people and their environment (Schugurensky, 2002). Piaget’s theory demands that educators make experiential education the cornerstone of their philosophy of teaching.

David Kolb (1939-), Professor of Organizational Development at Case Western Reserve University, Cleveland, Ohio, published his learning styles model in 1984. He defined learning as “the process whereby knowledge is created through the transformation of experience” (Kolb, 1984, p. 38). Kolb’s learning theory bears great

similarity to Lewin's in that it is based on a four-stage learning cycle: active experimentation leads to a concrete experience that in turn allows reflective observation followed by abstract conceptualization. This abstract conceptualization then feeds back to the beginning of the cycle, promoting active experimentation.

Like Lewin, Kolb provides us with a cycle of experiential learning, but he also defines four distinct learning styles. It is this additional insight into learning behaviour that truly sets Kolb's work apart from his predecessors. Most people have a clear preference for a learning style and will learn more effectively if learning is oriented toward their preferences (Chapman). Briefly, Kolb's four learning styles are:

- *Diverging*. Students prefer to watch rather than do, tending to gather information and use imagination to solve problems.
- *Assimilating*. Students require good clear explanation rather than practical opportunity.
- *Converging*. Students prefer technical tasks and are less concerned with people and interpersonal factors.
- *Accommodating*. Students' learning style is "hands-on" and relies on intuition rather than logic. These people use other people's analyses and prefer to take a practical, experiential approach (Chapman).

For the educator, the lesson is that education must not only involve concrete experience, it also must address the learning preferences of the students. Certainly in any large modern classroom there will be a variety of learning styles among the students. The educator must ensure that during a course, all learning preferences are addressed.

CHARACTERISTICS OF EXPERIENTIAL EDUCATION

In a 2002 publication, Gregory Smith identified five thematic patterns in current experiential educational settings: 1) cultural studies, in which students use local cultural or historical phenomena as the guiding focus; 2) nature investigations, in which students observe wildlife, conduct water quality tests or restore damaged sites; 3) real-world problem-solving, in which students and teacher identify community issues and problems, study them and then propose and possibly implement the needed changes; 4) internship and entrepreneurial opportunities; and 5) complete immersion into community life (Knapp, 2005, pp. 279-280). The second and third themes in experiential education, nature investigation and real-world problem-solving are the foci of our investigation.

Smith recognized that the five different thematic patterns had common elements (2002, p. 593), which Knapp (2005, p. 280) identified as follows:

(a) surrounding phenomena are the foundation for curriculum development, (b) an emphasis on students becoming the creators of knowledge rather than only consumers of knowledge created by others, (c) students' questions and concerns play central roles in determining what is studied, (d) teachers act primarily as co-learners and "brokers" of community resources and learning possibilities, (e) the walls between the community and school buildings are crossed frequently, and (f) student work is assessed based on its contributions to community well-being and sustainability.

These commonalities point to student-centered learning; i.e., constructivism or experiential learning, as the way that students learn. Assessment of students leaves the traditional regurgitation of information and instead focuses on what a student can do with knowledge in order to benefit the community.

The writings of Aldo Leopold (1887-1948) specifically examine the characteristics of experiential ways of understanding nature. Leopold was a philosopher, writer, ecologist and educator in the American midwest. He argued that a “sense of place” is developed by making “meaningful personal connections” to the land (Knapp, 2005, p. 280, quotes my own). An analysis of Leopold’s writings reveals 10 ways of knowing nature, all of which argue for schools allowing students to be in a natural environment for extended periods of time. The following incomplete excerpt from Clifford Knapp’s 2005 examination of Leopold’s writings briefly details his 10 ways of knowing nature:

1. **Wondering and questioning:** questioning what is observed outdoors, and wondering about how that which is observed relates to the surrounding elements, can expand awareness.
2. **Knowing local history:** the evidence of past and current human uses of the land can be examined and clues to local history can be uncovered.
3. **Observing seasonal changes:** by being conscious of the seasons and the accompanying changes that they bring, observers can discover what is happening at the moment.
4. **Listening intently:** by stopping periodically along the trail, one can make more connections to the elements of the ecosystem.
5. **Counting and Measuring:** simple counting and measuring exercises can result in fascinating revelations in the surroundings.
6. **Empathizing with and personifying nature:** one way of relating to living and non-living elements of the environment is to creatively envision them as “persons” worthy of empathy.
7. **Connecting elements in cycles:** when nature and culture are viewed as interconnected circles or cycles, and their makeup and structure are carefully considered, new discoveries often result.
8. **Finding beauty:** in order for beauty to be “in the eye of the beholder,” time must be set aside to look for and find it.
9. **Seeking solitude for reflection:** time alone, away from others in the group, can provide reflection opportunities to absorb the meanings of the place and consider humanity’s role in the process of life.
10. **Improving land health:** action projects can be physically, intellectually, and emotionally satisfying and help the land and local community.” (pp. 282-283)

Interpretation of experience, revealed through the writings of Aldo Leopold, John Muir, Henry Thoreau and Walt Whitman in the 19th and 20th centuries, embraces the affective and spiritual sense of a place through physical experience. This way of being in nature is reached through the field of interpretation. The intent is to elicit wonder, questions and connections that touch not only the head but the heart and quite possibly the spirit. Interpretation provides a means of discovering the many complexities of the world and our role within it. It leaves people moved, their assumptions challenged and their interest in learning stimulated, causing reflections long after the experience. “Good interpretation encourages a greater sensitivity to one’s surroundings, a heightened ecological and cultural awareness and a meaningful link to the past and future” (Beck and

Cable, 1998, p. 3). Interpretation is the strategy used by provincial and national parks in communicating about the environment – a model that deserves more attention in the world of formal educational. A bridging of the domains of education and interpretation would be advantageous to all involved.

Our educational system, even at the university level, needs to continue to walk with the earth and teach on the land as advocated by Aldo Leopold. “One of the requisites for an ecological comprehension of land is an understanding of ecology, and this is by no means co-extensive with ‘education’; in fact, much higher education seems deliberately to avoid ecological concepts” (1966, p. 262). Teachers in Science 10 usually have a background in science and therefore are more comfortable with the stories of ecology.

Learning in the outdoor classroom requires a different way of thinking and teaching. The traditional transmission techniques of worksheets or sage-on-the-stage lectures do not lend themselves well to the outdoor classroom, nor do isolated activities that lack relevance to intended learning outcomes. Careful thought in the preparation, planning and intended use of the resource is advocated by Robert Regnier:

[M]any schools offer a fare of copy sheets, note taking and reading for plot and character in a mode borrowed from industry that offers shades of reality but not in its vivid presence. In these schools, students can learn about trees through characteristics, which they can abstract. They can learn for example that: one tree plus one tree is two trees in math, to calculate the length of a tree's shadow in geometry, the species, genus, phylum, and order of a tree in biology, and the tree's chemical processes in chemistry. None of this learning offers the experience of a tree, of forests, of living with trees, of forest life, of living in forests and of being one with forests. (1995, p. 405)

If trees are solely used as tools or math manipulatives, we miss the essence of the place – we can't see the forest for the trees. Regnier responds to the dire need to develop a more holistic, integrated understanding of the ecosystem through close observation, storytelling and direct experience. Students need to be outside to experience a place, to build their understanding of the cycles, systems, interrelationships and needs of places. We can still use trees to teach about geometry, chemistry or biology, but the lesson needs to be taught through interconnections. How the teacher weaves the experience and creates an interpretive moment is what changes an industrial transmission style into a transformative dynamic learning experience. The facts and figures might not stick with the students but the stories, actions and values will most likely endure.

While it is so important for our society to learn our natural history and the story of our Earth, the pressure of not knowing may be so daunting that it prohibits an Out-of-School Education experience from coming to fruition for some educators. Walt Whitman assures teachers it is all right not to know everything. “You must not know too much, or be too precise or scientific about birds and trees and flowers and watercraft, a certain free margin and even vagueness – perhaps ignorance, credulity – helps your enjoyment of these” (p. 175 in Van Matre). Students and teachers are encouraged to be lifelong learners sharing curiosity, wonder and joy.

EVIDENCE TO SUPPORT EXPERIENTIAL EDUCATION

In a 2003 paper, Holman, Goldenbe, McAvoy and Rynders reported evidence to support positive outcomes for participants in an integrated adventure program (p. 353). The predominant values attributed to the program were transference, self-awareness/improvement/fulfillment, personal goals, warm relationships with others and personal/spiritual values (Holman et al., 2003, p. 353). Dr. Griffin reported an overall positive effect in spiritual growth for adolescent participants of another adventure-based program (Griffin, 2003, p. 351).

In a study similar to ours, Palmberg and Kuru (2000, p. 32-35) determined that the conceptions of nature by 11- and 12-year-old students varied widely and could be seen in the light of their experiences and the importance of nature to them. Nature was important to most of the students, although, in general, they experienced nature as an alternative to their normal constructed environment. About half of the students interviewed expressed anxiety concerning nature, but they had problems distinguishing environmental problems at different levels. The authors recognized that this fragmentary and out-of-context understanding of environmental issues on the part of the students must be considered by educators when planning environmental issue education. The authors also acknowledged that it was important to address students' feelings of being capable of doing something important in order to save nature (in their own neighborhood). They cited Hungerford and Volk (1990) who stated that, "it is essential that pupils are given the opportunity to develop a sense of ownership and empowerment so that they are prompted to become responsible, active citizens who can also affect the attitudes and behaviours of the older generation."

Kenney et al. (2000) reported observations on a program established by the Brandywine Valley Association (BVA) called the Watershed Learning Center (WLC). The goal of the WLC was to ". . . provide outdoor, activity-based environmental lessons to teachers and students on school sites and public or private properties (parks, residences, etc.) within walking distance of the schools Teachers were trained to eventually take over the lessons primarily by observing BVA environmental instructors" (p. 18). By all accounts the program was a great success: students reported that the lessons were fun, they learned a lot of things about nature including an appreciation for it, and liked the chance to see and explore the things they were learning about in class (p. 22). The teachers reported that the lessons considered all typical learning styles and there were positive changes in students' environmental sensitivity as a result of the WLC experience (p. 22, 23). The teachers also noted that the students' awareness of the habitat around their school increased with repeated participation in WLC lessons.

Author Richard Louv, who wrote, *Last Child in the Woods: Saving Our Children from Nature Deficit Disorder*, contends that "place-based education increases students' sense of stewardship and environmental consciousness and adds to their sense of attachment to the place" (Louv, 2005, p. 218). He suggests that people with an attachment to nature might try to protect fragile ecosystems. Louv advocates that youth have the opportunity to play and explore freely in the woods during leisure time as well as throughout their time in the education system. He mentions many examples in his book of the costs of being disenfranchised from our environment. Fortunately, the environment is back in the media, on election platforms and prominent in people's minds, which might help Louv to get his wish of reducing Nature Deficit Disorder in not only our youth, but also the educators who guide them.

The choices we make in our society reflect disconnect from nature in our youth and even adults. What is the benefit of restoring this connection to our society and our citizens? Louv reminds us that, “the great worth of outdoor education programs is their focus on the elements that have always united humankind: driving rain, hard wind, warm sun, forests deep and dark – and the awe and amazement that our Earth inspires, especially during our formative years” (2005, p. 224). For youth who have known only concrete, their own neighbourhood or the mall, those formative years could start at 16.

Youth can be further inspired by the experience of giving back to the land through stewardship, an experience actually written into the Science 10 curriculum as either creating an action plan or going further and actually carrying one out. Students are encouraged to engage in recycling projects, create gardens or take on larger projects that reflect sustainability of ecosystems. “Service-learning and outdoor education both identify reflection processes as primary vehicles in the learning process. Both encourage reflective thought and routinely plan learning experiences incorporating formal debriefing opportunities” (Seaman and Gass, 2004). This project involves some reflections and debriefing opportunities with youth.

CRITIQUE OF OUTDOOR EXPERIENTIAL EDUCATION

In a 2002 article published in the *Journal of Curriculum Studies*, Australian educator Andrew Brookes asks the question, “Is any form of outdoor education essential?” (p. 405). Brookes does not deny that many curriculum benefits may be found amid the “confusion of different outdoor-education programs” (p. 405), but he believes that these benefits may have no curriculum significance (p. 406). Brookes emphasizes that **educators must not expose their students to an outdoor environment in a laissez faire manner: every out-of-school journey must take place with curricular justification in mind.**

Brookes critiques the Australian “. . . neo-colonialist understanding of ‘the bush,’ in which particular locations are seen either as empty sites on which to establish social or psychological projects or merely as examples of more abstract realities such as ‘the environment’” (p. 405). It may be argued that the majority of Canadians experience the “bush” much like the majority of Australians in that they live in urbanized areas, and any immediate knowledge of the woods is scant. This situation may be seen as one that needs rectifying, but Brookes argues that it is not the job of educators to rectify it unless so directed by their curricula.

Brookes argues that there are two very important reasons to treat the urbanization of Australian consciousness (and, by extension, our Canadian consciousness) as educationally problematic and worth addressing in the curricula. First is the imperative to improve relationships between aboriginal and settler Australians (Canadians). Brookes advocates that a comprehension of local knowledge systems is essential in order to develop an adequate basis for understandings between urban Australians and aboriginal Australians, whose knowledge of specific “country” is profound (p. 407). For settlers to learn about the land from aboriginals is not, Brookes says, an appropriation of knowledge, but rather “paying attention to implicit lessons from aboriginal cultures about *how to approach* questions of knowledge and place” (p. 407, emphasis added).

The second reason Brookes gives is the growing importance of understanding environmental issues. Classroom-based knowledge is not equivalent to personal experience of the bush. The abstractions and representations of the bush in the

classroom give an incomplete picture of the environment; personal and local knowledge can make up the shortfall. “The question is not just about knowledge [of environmental issues] but about the experiential and narrative structures in which knowledge is comprehended” (Brookes, 2005, p. 407). Smith and Williams (1999) go on to explain that specific cultures have developed to respond to the specific ecosystem in which they exist. As a result, cultural practices and norms vary – or should vary with respect to the ecosystem in which they have developed. The problem that an industrialized society faces is that “standard” industrial practices don’t recognize that places are different. One of the challenges in ecological education is to re-establish this sense of place and community.

Issues that are worth addressing, such as the two revealed by Brookes, and issues that are currently addressed by the curricula are not always one and the same. Fortunately, Saskatchewan’s high school curricula include both Native Studies 10 and Native Studies 30, as well as courses in Aboriginal Languages (Ministry of Education; Evergreen Curriculum). Muecke (1992) points out that the text upon which aboriginal history and literature is written is the land itself. Surely journeys to sites important to aboriginal culture are a valid way of implementing the aboriginal studies curriculum. Likewise, the Science 10 *Sustainability of Ecosystems* unit may be best taught by making connections with traditional knowledge keepers and the land they so deeply and personally understand. As Brookes states, “It is important for educators to engage in the necessary conversations that determine if, and when, specific local knowledge and the experiences and stories in which it is embedded are important, while avoiding parochialism and mysticism” (2005, p. 407).

Methodology

Prior to conducting our research, we obtained permission from Saskatoon Public Schools by filling in forms related to conducting research with students in our system. Beth and Susan also obtained release forms from the students and parents of the Science 10 classes involved.

The initial student program of 2006-07 was carried out in three “phases” by Susan and Beth: preparation before the visit to Brightwater, implementation of the one-day program at Brightwater, and continuation of the study of the Sustainability of Ecosystems unit after the visit to Brightwater. Through all three phases student journals, on-the-spot questions, student assignments and anecdotal observations provided data for the researchers with data regarding student participation and progress along the continuum of awareness-connection-responsibility-commitment. We were looking in the data for themes such as, “I don’t care, this activity was boring/useless,” “I liked this because”

Writing continued in the 2007-08 and 2008-09 school years in the form of gathering teacher feedback on our second hypothesis that experiential education facilitates engaged teaching. Both Beth and Susan had returned several times to Brightwater with other classes, continuing to develop their teaching techniques both at that site and in their classrooms. Students were not part of the research at this point as we were in the process of wrapping up the writing. Sources of data from Beth, Susan and Marcia included many conversations, emails and journal entries.

BETH

PRIOR TO OUR TRIP

At the beginning of the unit, students were challenged to identify, in writing, what they and their families value about nature, environmental awareness and ecological knowledge. Students were asked to identify actions that they did on a regular basis (their lifestyle), and they were also asked to identify barriers that they faced in living their values. To accomplish this, students filled in a questionnaire that asked about daily environmental choices, as well as science-based ecological concepts to gauge their environmental behaviours and science understandings (see Appendix II for this Introductory Portfolio Assignment). The environmental behaviour questions were taken from a previous McDowell Foundation research project based at Brightwater (Stephanson and Jones, 1997). Additional scientific content questions were also included with respect to ecosystems, food webs, food chains and biodiversity. I made it clear to the class that this assignment was to be assessed on the basis of completion only.

Students also calculated their “ecological footprint” using one of the many available online websites. An ecological footprint is the amount of land required to sustain a person given the person’s current lifestyle choices, and the website we used (www.myfootprint.org) also allowed students to see the impact on their ecological footprint of making lifestyle changes. From this information regarding the students, we were hoping to find where the students initially stood along the continuum of awareness→connection→responsibility→commitment to change. Students handed in a paper copy of their ecological footprint calculations and the effects of any actions they might take as part of their portfolios.

Students then engaged in “regular” classroom activities designed to prepare them for their Brightwater experience, such as covering ecological terminology and demonstrating concepts such as food webs and chains and energy pyramids. No data for the project were gathered directly from these activities.

AT BRIGHTWATER

Having been exposed to the concepts outlined above, the students headed to Brightwater for the day. Two classes attended Brightwater and while the day for each one covered similar material, each one unfolded differently. Overall, we spent a great deal of time on hiking and learning about the plants in the area (see Table 1 for more information on the days) (Learning Objectives from the Science 10 Curriculum: SE2.4, 2.6, 2.7, 2.10, 2.11, 3.4, 5.2.). We had the (un)fortunate opportunity to compare areas of Brightwater that had been affected by the August 28-31, 2006 forest fire to those areas that had not been burned. The first group set out transects in the creek, forest and prairie in both burned and unburned areas. Both groups inventoried plants in the transects (Learning Objectives SE2.1, 2.2, 2.3, 2.8). Both groups also met with Elder Joseph Naytowhow in the tipi. He spoke to them, singing some of his teachings, and translated animal names chosen by the students into Cree. Students had to say their names in order to leave the tipi. While Joseph’s topics were similar, he did cover different material on each day. The second day’s teachings were more light-hearted than the first day’s had been, and he spent more time in song with the second group.* (Learning Objectives SE 1.1, 4.3). We had the opportunity to play games on-site during the second day (Quick Frozen Critters, Oh Deer). These games were played with the first class back at school later in the week.

The weather for these two days (November 6 and 7, 2006) was overcast and hovered around 0oC (see climate.weatheroffice.ec.gc.ca). Overnight between the 6 and 7, there was freezing rain that cleared early enough in the morning to allow us to travel. Susan’s planned trip for November 8 was cancelled due to heavy snowfall.

* While listening to Joseph sing in Cree, most of the students sat fixated on the fire. At one part of his song, he began to sing about “Scooby-Doo,” at which point a number of the students looked up and around at each other and at me. You could almost hear them thinking, “Wow, there’s a Cree word that sounds like Scooby-Doo.” They weren’t sure if they could laugh or not, until Joseph continued his song at the same tempo and tune, in English, about Scooby-Doo attending a pow-wow. After more than six months, many of these students can still sing the “Scooby-Doo” song. (He and Shaggy, dressed so baggy...what a wonderful sight.)

TABLE 1. OUTLINE OF EACH CLASS'S DAY AT BRIGHTWATER

	Class One (November 6, 2006)	Class Two (November 7, 2006)
Morning	We met with Joseph Naytowhow in the tipi. Joseph spoke about ecology and gave each student an animal name in Cree.	Toured the bluff where the forest fire happened with Marcia. Identified plants. Visited hula hoops, confirmed GPS locations, inventoried plants, comparing burn re-growth to unburned areas.
	Toured the bluff where the forest fire had happened. Identified plants. Set out hula hoops in the creek, forest and prairie areas in both burned and unburned sites. Used GPS to identify locations, inventoried plants.	Returned to schoolhouse (to warm up). Liz (science facilitator) helped some with creek dipping. Learned tree and shrub ID and keying. Did some quick keying.
Afternoon	Used the tree key to identify trees without leaves.	Played "Quick Frozen Critters" and "Oh Deer" with class.
		Met with Joseph Naytowhow in the tipi. Joseph spoke about ecology, sang and gave each student an animal name in Cree.
	Chopped wood and wrapped trees with wire to prevent beaver impact.	Garbage cleanup.

AFTER BRIGHTWATER

After returning back to the classroom from Brightwater, we continued our unit on Sustainable Ecosystems. I focused my post-Brightwater work on linking science knowledge with decision-making and action. To this end, we covered a number of areas:

Waste Reduction Projects. In pairs or groups of three, the students carried out a waste audit of the school. We first brainstormed on areas of consumption and waste so that all groups had a broad understanding of consumption that covered electricity, heat, paper, garbage, types of food, etc. After the audit, we met again as a class to discuss the areas we found needing attention. Groups decided on one area in which to carry out a mini-project for waste reduction. We had some class time throughout the unit to work on these mini-projects, write the reports and promote them to the school (should the project proceed that far). Examples of projects included: adding paper recycle bins to all classrooms, increasing the number of pop can recycling bins, starting a vermi-composter in the science

classroom, getting a 5¢ reduction on hot drinks at the servery if you bring your own cup, starting an anti-littering campaign, improving access to technology to reduce paper use, analyzing costs and benefits of having Saskatoon Curbside Recyclers improve recycling in the school², and finding ways to use less paper for posters and ads around the school. Many of the proposed changes were outside of the scope of what a few grade 10s could accomplish in two weeks, so the Waste Reduction Reports were left for students in the following semesters to read when doing their own projects, so that incomplete projects could be picked up and worked on further. (See Appendix III for project handout.)

Water and Carbon Cycles. We studied how the water and carbon cycles work and interact. “Incidental” to these cycles, we touched on the oxygen cycle and, of course, photosynthesis. These concepts were linked back to the energy pyramid work done prior to our visit at Brightwater. The impact of forest fires was also discussed since we had seen first-hand the impact on ecosystems. The water and carbon cycles were linked to current research and understandings of global warming. Students were asked to write a paragraph explaining how scientists understand global warming – and how changes to the carbon cycle have made changes, not to how the water cycle works, but to the way the effects of the water cycle have become more or less pronounced in different areas of the planet (for further information, see: <http://www.epa.gov/climatechange/kids>; click on animations).

Populations. We looked at the exponential growth of the human population, as well as cyclical populations and factors affecting populations. We played a predator-prey simulation game in class and had the “Oh Deer” game experience for comparison.

The Next Industrial Revolution. We watched this video, which gives the message that in a natural cycle, what is waste for one organism must become food for another. That is the nature of a cycle. By breaking the carbon cycle, we have created a problem. This video documents the efforts of a number of industries to close cycles by ensuring that their waste products are environmentally safe. In one example, a textile manufacturer with waste clippings classified as toxic changed the dyes that it was using so that the waste could be used as compost. As a result, the manufacturer also found that its effluent water was cleaner than the water being used in the manufacturing process. The video introduced the idea of environmental sustainability actions falling into one of two categories: less bad than before, or good (see video handout, Appendix IV). I followed up this concept on the final exam project for the students who went to Brightwater on Day 2.

Final Portfolio Assignment. An almost identical version of the “Introductory Portfolio Assignment” was given as the unit test. This “assignment” was marked for both completion of the environmental behaviours section and accuracy of the canonical science section. It allowed us to compare “before” and “after” attitudes and scientific understandings (see Appendix II).

During the unit, students had an opportunity through the visit to Brightwater to participate in activities that made them more aware of the impact that their actions can have on the Sustainability of Ecosystems; they studied our daily habits through the lens of the waste audit, and they began to think of our actions

²Saskatoon Curbside Recyclers is a private local company that, for a fee, will collect a broad range of recyclables (white and coloured paper, boxboard, cardboard, all plastic except Styrofoam, tin, glass and milk cartons).

as being “less bad” or “good” after watching “The Next Industrial Revolution.” Students also had opportunities to link their science knowledge (especially the carbon and water cycles) to their daily behaviours and “our” behaviours as a culture.

SUSAN

Two Science 10 regular-level classes participated in this research in the fall semester of the 2006-07 year; in the spring semester one Science 10 regular-level class and one enriched-level class participated. The two fall classes were not able to take the planned field trip to Brightwater due to a heavy snowfall and high winds on the days of our trip; the spring classes did attend Brightwater. Although it is unfortunate that the fall classes were not able to attend Brightwater, this circumstance allowed for the comparison of attitudes between the group that experienced Brightwater and the one that did not.

PRIOR TO OUR TRIP

Prior to our planned trip, the fall semester students wrote responses to the following quotes taken from their class textbook:

“Progress is the production of more goods.”

“Science and technology will solve our problems.”

“All of nature was placed on Earth for us.”

“Resources are infinite.”

“Humans have the knowledge to manage our planet.”

This activity was undertaken in order to determine where students currently resided on the continuum of awareness → connection → responsibility → commitment to change.

Both fall and spring students wrote responses for an environmental survey, identical to the one Beth used for her classes (see Appendix III).

Both fall and spring students also wrote out value statements, in which the students were required to write three to four paragraphs that defined and described what they really valued about nature (see Appendix V). The students were instructed to think about things they liked to do in nature and say why they liked it. After writing this values statement, the students had to answer questions that examined which of their daily choices and actions agreed with/supported their statements and which ones disagreed. Why was there a discrepancy between what the students said they valued and what they actually did every day? What helped them or hindered them from living their values? What was their personal view of humans’ relationship with the environment?

The fall and spring students next calculated their ecological footprint by completing a survey found at www.myfootprint.org. The survey requires students to enter data about their habits, the size of house they live in, how many people they share it with, their type of transport, the foods they typically eat, etc. The quiz results showed students how many hectares of land it takes to support their lifestyle and compares this to the average ecological footprint in Canada and the number of hectares available for each person on the planet. It showed the

students how many planets it would take to support everyone on the planet if they all shared in the students' lifestyle.

After completing and reflecting on this quiz, students wrote a reflection around the following questions: After seeing the results for the ecological footprint quiz, are you willing to make lifestyle changes? Why or why not? What would you do?

Both fall and spring students studied the following concepts in class prior to attending Brightwater: ecological levels of organization; food chains and food webs; ecological pyramids.

Spring students undertook a restoration project at Walter Murray Collegiate prior to and after traveling to Brightwater; they worked to restore the courtyard at the centre of the school from a weedy wasteland to a biologically diverse, beautiful place where students could eat, study, reflect and learn. This project was incorporated into their *Sustainability of Ecosystems* unit as a way for students to "give back" some of what they had taken from the Earth through their privileged lifestyles. Students framed and graveled a 42 metre-long pathway through the courtyard, framed and graveled an eating area, built and established three raised vegetable beds, moved an enormous amount of soil, established and edged flower beds and generally trimmed, weeded and beautified a formerly neglected area.

AT BRIGHTWATER

The spring classes of grade 10 science students arrived together at Brightwater on May 15, 2007. The students were required to complete a booklet handout during the course of their activities there (see Appendix VI). We were greeted at the bus drop-off point/ball field by Joseph Naytowhow and Marcia Klein. The weather was fantastic – sunny and warm. Marcia invited us to lie down on the prairie grass and close our eyes while she led us in a meditation that invited us to imagine the landscape 12,000 years ago during the last glaciation. Step by step, Marcia guided us through the shaping of the land as the glaciers retreated and the climate warmed, until the Brightwater of today came to be. This activity was connected to understanding the "abiotic" components of the ecosystem.

Next, we sat in circle with Joseph and he invited us to think about an animal we might see at Brightwater and adopt it as our own name. He told us the name of our animals in his language, and those names became our secret names for the day. Periodically throughout the day Joseph would ask us our secret names, reminding us of the pronunciation if we forgot. I was very irritated with many of the students for treating this as a silly game. When Joseph asked them to tell him what animal they were thinking of, they would say things like "Big City" or "Cement." Joseph didn't react to these provocations – he simply translated the word for them. Perhaps in Joseph's mind the joke was on them because for the rest of that day the student was stuck with that name.

Marcia then guided the group on a walk through the prairie ecosystem to begin to survey the ecosystem, pointing out certain species of plants, giving us both the common western name and the common aboriginal name (translated into English) for the plant. She told many interesting stories about the plants and told how to identify them as well as their traditional uses. Joseph pointed out how his people had supported themselves for millennia on this land without farming it – this approach required his people to have a great deal of understanding about the nature of the plants they used if they wished their usage of them to be sustainable. Together Marcia and I pointed out to the students the incursion that

the wooded areas were making upon the prairie, and the differences between the plants on north and south facing slopes. The students were very attentive and often asked questions about the name or usage of certain plants. They were very excited to see a coyote at one point – this led to a discussion of what a “top level consumer” was, and how much land was required to support one.

After leaving the prairie ecosystem, we meandered through the forest ecosystem, again pointing out certain species, both plant and animal. The walk was relaxing, invigorating and interesting all at the same time. Our walk terminated at the schoolhouse where we took a break for lunch. The students were invited to examine the straw-bale solar composting toilet bathroom, a convenience that does not rely on any plumbing or septic system (SunMar composting toilet and one solar composting toilet). Students were interested in this convenience and agreed that it was well suited for the Brightwater ecosystem, but they did not agree that homes in the city should have bathrooms like this.

After lunch we split into two groups. Group one participated in creek dipping and general exploration of the aquatic ecosystem with Linda Dunkley, a Brightwater facilitator, while group two explored the burn site of late August 2006 with Joseph. After approximately 90 minutes, the two groups switched places. It was then time to leave Brightwater, which involved a short hike back through the prairie ecosystem to the point where our bus picked us up to return to Walter Murray Collegiate.

AFTER BRIGHTWATER

Fall students had no “After Brightwater” assignments specific to Brightwater, considering that they never got to go!

Spring students were invited to reflect on their Brightwater field trip in a written assignment (see Appendix VI). They also carried on with their restoration of the courtyard. It is interesting to note that the enriched-level students started showing concern over which species of flowers we were planting in the courtyard, wondering if they were prairie natives or imported species. They also became more interested in the uses of many plants – students would ask if a species was merely ornamental, or if it had some food or medicinal application. Unlike Beth’s students, my students did not repeat the initial Environmental Survey.

In the classroom both fall and spring students continued to study aspects of ecology, such as biogeochemical cycles (carbon, water, phosphorous and nitrogen cycles), population growth and dynamics and Canadian biomes. Fall students watched the film, *The Next Industrial Revolution*, and spring students watched the film, *An Inconvenient Truth*. Fall students wrote a unit test at the conclusion of the unit, while spring students completed their courtyard restoration and wrote their year-end final exam.

Analysis of Data

Bogner (1998) examined the long-term effects of both one- and five-day outdoor ecology programs on students' environmental behaviour, environmental attitudes and basic ecological knowledge. He surveyed 700 students (aged 12.3 +/- 0.8 years) using both pretests and one-month post-tests. Further, a sub-sample was also surveyed six months after the program was delivered. Bogner found that there were differences at pretest between students who were already enrolled in the national park ecology program and those in classes that were invited to participate. The former had higher scores at the outset of the project in areas that Bogner designated as follows: reported environmental behaviour, verbal commitment, human dominance and human-altered nature. Bogner noted that without the results from the pretest, the measure of "improvement" in students' scores after the program was delivered was subject to misinterpretation.

As well, Bogner (1998) cites four main problems associated with data collection and analysis in a project such as this:

1. Measurement instruments remain untested and, because of the absence of rigorous psychometric techniques, they fail to provide any valid and reliable basis for evaluation.
2. Sample sizes are small and are prone to intra-class correlations.
3. Evaluations are potentially biased if the teacher and researcher are administering both the intervention and the evaluation.
4. Failure to collect follow-up data does not allow determination of whether observed effects really persist over time, and posttests administered immediately after the program experience are not conclusive at all.

Haluza-Delay (2001) lamented that the "paucity of research about how individuals interpret experience in the natural world, especially on wilderness trips, is surprising . . ." (p. 1). His study considered a 12-day wilderness experience, while our study only considers a one-day trip. Furthermore, our student participants came from three different academic "streams" – regular, enriched and advanced. The following table indicates the degree of participation in both Beth and Susan's classes throughout the study.

TABLE 2. STUDENT PARTICIPATION BY SCHOOL AND ACADEMIC STREAM

Task	Bedford Road		Walter Murray Collegiate	
	Regular Stream	Advanced Stream	Regular Stream	Enriched Stream
Handed in parental permission form	18/26 69%	29/35 70%	35/60 58%	9/15 60%
Parental permission granted	13/18 72%	29/29 100%	35/35 100%	9/9 100%
Student permission granted	10/13 77%	23/29 79%	35/35 100%	9/9 100%
Attended Brightwater (and enrolled in study)	6/10 60%	22/23 96%	7/8 * 88%	9/9 100%
Complete portfolio received	4/10 40%	16/22 73%	N/A	N/A

* (spring semester students only)

Students failed to return parental permission forms to the classroom teacher for a variety of reasons. Beth was of the opinion that some of the students who failed to return forms were also those who frequently failed to complete and hand in assignments on time. Some were the students who were disconnected from school and rarely participated in extracurricular activities. When asked, Susan's students stated that they had simply forgotten their forms.

With the only exception being the percentage of students who handed in their parental permission forms, there is a noticeable trend of greater degree of participation as we move through the academic streams of regular to enriched to advanced. Beth noted that it was her advanced students who were the most engaged with this study. The only advanced students who could not participate in the field trip telephoned the school to explain their absence prior to departure, and a parent of another advanced student volunteered to accompany the class to Brightwater to lend his expertise in GPS studies. Beth's advanced students also wanted to go to Brightwater overnight like they had done in elementary school. They said that they could go in the afternoon and come back at lunch the next day and still miss only a day of school. Suggestions about implementing a "garbage-less" lunch day for the whole school also spontaneously came from students in the advanced class during their discussion on expectations at Brightwater. It was the same group of advanced students who asked where the compost pail was after lunch at Brightwater.

Susan did not have the field trip participation problems that Beth had, but she did observe a difference between her regular and enriched stream students with respect to the courtyard restoration project. The enriched students were willing to engage in work immediately upon arriving in the courtyard and were capable of executing a task over several days without remedial instruction or reminders between work periods. The enriched students freely shared their ideas about how the courtyard should look and function. In contrast, many of the regular stream

students had to be coaxed into performing the manual labour required in the project, and many had to be reminded from day to day what their task was. They did not volunteer their opinions regarding the form and function of the courtyard. Why were there such differences between the academic streams?

Palmberg and Kuru (2000) compared pupils who were experienced in outdoor activities with pupils who were not. They found that the former seemed to have a strong, clearly definable empathic relationship to nature. In addition, they exhibited better social behaviour and higher moral judgments. Beth's advanced stream students and Susan's enriched stream students certainly exhibited better social behaviour in that they functioned well as a group, and had done so since they arrived in high school in grade nine. This cohesion was most likely because many had been together during their elementary careers in the Academically Talented (AcTal) program. Students who entered the Advanced Program for the first time in grade nine were easily included in the group and, as a whole, this group had been together for a number of classes since grade nine. The advanced students' high level of awareness of environmental issues and their requests for compost bins, garbage-less lunches and an overnight experience indicates that they had previous background experience in the area of outdoor/environmental activities. On the other hand, although the regular stream students did have groups of friends in class, the groups tended to be more isolated from one another, and the regular stream students often didn't know all their classmates. Anecdotal information indicated that students in the regular stream classes often had difficulty distributing marked assignments back to all of their classmates when asked to do so – a "problem" not encountered in advanced classes.

Sibthorp and Arthur-Banning (2004) wrote "if individuals do not perceive value or relevance, they are more likely to apply less effort, and either drop-out or switch to activities having more perceived relevance" (p. 37). Our results suggest that there may be differences between how individuals in the three academic streams perceive the value of their activities with respect to their learning. Making the link between an activity and its relevance is an area where students still require practice.

TABLE 3. STUDENT RESPONSES TO ENVIRONMENTAL SURVEY

Question	Bedford Road Opening Survey		Bedford Road Closing Survey		Walter Murray	
	Regular (n = 4)	Advanced (n = 16)	Regular (n = 4)	Advanced (n = 16)	Regular (n = 29)	Enriched (n = 8)
I use paper instead of plastic	2 50%	7 44%	1 25%	5 31%	9 31%	0 0%
I turn off the lights, TV, radio when I leave a room	2 50%	12 75%	1 25%	15 94%	15 52%	6 75%
I keep the door closed when it's cold outside	4 100%	16 100%	4 100%	16 100%	26 90%	6 75%
I take showers instead of baths to conserve water	2 50%	14 87%	2 50%	12 75%	25 86%	7 88%
I turn off the water when I am brushing my teeth	4 100%	14 87%	2 50%	12 75%	18 62%	7 88%
I avoid pouring harmful chemicals like paint or motor oil down the drain	3 75%	13 81%	3 75%	13 81%	20 69%	6 75%
I carry my lunch in reusable containers	1 25%	8 50%	0 0%	11 69%	13 45%	4 50%
I avoid buying products that harm the environment	1 25%	5 31%	1 25%	8 50%	2 7%	2 25%
I buy products with the least amount of packaging	1 25%	4 25%	1 25%	7 44%	2 7%	0 0%
I buy rechargeable batteries instead of disposable ones	0 0%	8 50%	4 100%	12 75%	9 31%	2 25%
I buy drinks in returnable bottles	2 50%	14 87%	4 100%	12 75%	22 76%	5 62%
I try to walk, bike or take a bus rather than getting a ride in a car	2 50%	8 50%	2 50%	7 44%	15 52%	3 38%

TABLE 4. STUDENT RESPONSES TO ECOLOGICAL FOOTPRINT SURVEY

Question	Bedford Road Opening Survey		Bedford Road Closing Survey		Walter Murray	
	Regular (n = 4)	Advanced (n = 16)	Regular (n = 4)	Advanced (n = 16)	Regular (n = 29)	Enriched (n = 8)
I would be willing to ...						
Share more environmental information with my family	3 75%	11 69%	2 50%	12 75%	7 24%	11 69%
Pay more for environmentally friendly products	1 25%	8 50%	2 50%	10 63%	9 31%	2 25%
Not litter (ever!)	4 100%	12 75%	4 100%	13 81%	16 55%	8 100%
Separate family garbage for recycling	0 0%	8 50%	2 50%	10 63%	12 41%	2 25%
Reuse paper lunch bags	2 50%	5 31%	1 25%	11 69%	14 48%	4 50%
Volunteer one Saturday a month for a clean-up project	2 50%	5 31%	2 50%	4 25%	2 7%	1 12%

Students were surveyed about their environmental behaviours and intentions. The resulting data, however, showed few differences between the opening survey conducted prior to beginning the unit and the closing survey conducted as the end-of-unit test (see Tables 3 and 4 which give the results of the opening and closing surveys). Not all of the questions in the survey were based on actions over which students have direct control. The results from the Ecological Footprint assignment gave the students an opportunity to see which of their actions had the most impact on the environment and to decide what changes to their behaviours would be effective. In Beth's class, students carried out their eco-footprint assignment just prior to visiting Brightwater; in that way any changes they could make to their behaviours could be reflected in their closing survey results.

THE ECOLOGICAL FOOTPRINT: BETH'S RESULTS

In the eco-footprint assignment, the students' final "result" gives the number of planet Earths required to sustain every human if we all shared the same consumption pattern. Of the 14 completed eco-footprint assignments, the average current footprint resulted in a requirement of 3.8 planet Earths (the range was from 1.9 Earths to 6.8 Earths). The footprint is divided into areas: a food footprint, a mobility footprint, and a housing footprint. The website that the students used also has a "Take Action" component that allows them to calculate the impact of making changes to their everyday choices. After taking theoretical action, the students' average ecological footprint dropped to 3.3 planet Earths.

Students were asked about what factors surprised them in calculating an eco-footprint, as well as what actions they could and would take towards being more responsible to the environment.

When students were asked what questions on the survey surprised them the most, by far the most common response was around their “food footprint.” Eight of the 14 students were surprised by the impact their food choices had on the environment:

Because I eat healthy and don't waste food, but most of the food I eat isn't "farm fresh."

The food portion definitely. Half of my "farm" would be for food (from a student who lives on an acreage).

The impact of what I eat has on the earth.

How often you eat animal-based products and if the food you eat is organic.

The factors that contributed to a “mobility footprint” were surprising to another five of the students. One student was surprised that his footprint wasn't higher, but others didn't realize the impact that driving has on the environment. One student pointed out that he will soon be getting a driver's license, as will most of these grade 10 students.

Driving my car. Even in a small city, it's a lot of energy.

Motorcycles (that they even count!)

My time spent in a vehicle, I catch a ride a lot.

One student became more aware of her electricity use, stating:

My use of electricity – how much I abuse having it at my disposal.

When asked to list three things they could do to improve their eco-footprints, the responses (not surprisingly) focused on food and transportation issues. Use of appliances and electricity was also mentioned frequently.

- *Use less electricity (13 responses)*
 - *TV and computer*
 - *More energy efficient appliances*
 - *Less air conditioning*
 - *Turn off the lights*
 - *Use less heating*

- *Make changes to eating patterns (12)*
 - *Buy locally more*
 - *Grow a garden*
 - *Eating more slow foods*
 - *Buy unpackaged food*
 - *Buy organic/farm fresh food*

- *Eat more food that is unprocessed*
- *Eat more vegetarian food*
- *Use more eco-friendly transportation (walk, bike, ride the bus, drive less) (11 responses)*
- *Use less water (5)*
 - *Fewer minutes in shower*
 - *Do less laundry*

Of these ideas, students were asked which they were likely to carry out. Two of the students responded that they were likely to do “none of these.” One student responded that he was likely to do “all of these,” but perhaps had a poor idea of how difficult change can be.

I can easily do all of these, I would just have to break all my habits.

Many students indicated that they were likely to take the bus more and/or drive less (3), turn off the lights (2), and buy un packaged food (2). Other suggestions included spending less time with electronic devices (2) and showering less (2). One student realized that her daily habits had an impact on her use of water:

I can do less laundry because I usually don't put them (her clothes) away and they become wrinkly and I have to wash them again.

Two students indicated that they were unlikely to take any changes, with one stating that there were no barriers to change; he just wasn't going to make any. By far the most responses regarding actions that were unlikely to be taken had to do with riding the bus more (6). A variety of reasons were given for this lack of action:

As much as I'd like to I have strict time-lines and often don't have the time or will power to refuse convenience.

I live too far from school. I would have to walk so early and wake up so early! It's just easier to get a ride and less hassle.

I live on an acreage on the other side of the city and I need to drive lots everyday.

For now, I don't really need the bus for more than school. But, I'll be learning to drive soon, and I'll “magically” discover places to be, so I should probably remember to use the bus.

The route to school is ineffective and inefficient, and I really have nowhere else to take the bus.

Lack of time was also cited for the use of prepared food:

(I am unlikely to) eat more food that is unprocessed because we don't have the time to make all of our meals from scratch.

Students also indicated that they don't always have control over some of the actions that they could take.

I don't control the heating.

I don't buy the groceries in our house (2 responses)

Another response indicated a lack of awareness of definitions – an issue that could have had an impact on much of our data³.

I don't like organic food (I like food from my grandma's garden).

THE ECOLOGICAL FOOTPRINT: SUSAN'S RESULTS

Overall, Susan's fall and spring students were shocked when they read that the amount of biologically productive hectares available to each person on the planet is 1.8 ha, yet Canadians use an average of 8.8 ha. The number of hectares used per student in the class ranged from a low of 4.0 ha to a high of 8.3 ha. The fall students realized that their lifestyle was not sustainable, but they largely viewed this revelation in the light of the number of people on the planet. Surely, they argued, their lifestyle would be sustainable if there were fewer people. As one student bluntly put it, she liked her cottage that was bigger than her house, and liked all of her electronic toys and conveniences, and the people in Africa could just starve to death because they didn't make any contribution to the planet anyway. Not one student in the class verbally challenged her assertion.

In their written reflections to the eco-footprint quiz, most fall students indicated that in response to their results, they would be willing to make some lifestyle changes, but not a lot. Some quotes excerpted from student responses indicate the majority view:

I could lie and say I'd totally change my life to help save the world, but I really wouldn't. I'd make small changes though. Small changes are better than no changes.

Yes [I'd make lifestyle changes], but only to an extent. I personally am not willing to fully participate in these lifestyle changes because I know that there is nothing to do about this problem.

I believe I am willing to make a change in my lifestyle to better the environment . . . But how? I was wondering about that. I mean, my lifestyle is pretty decent.

I would be willing to make some lifestyle [changes], but I would not go out of the way to make changes.

When the students were challenged by Susan to defend why they wouldn't go out of their way to make changes, the three major responses were "we're lazy," "we don't know what we could do," and "there is nothing we can do about it – our changes will make no difference." **Students perceived change to be difficult, inconvenient and time consuming.** They also perceived the greatest challenges

³Unless Grandma uses a lot of pesticide!

to the environment as coming from big business, not from individuals. One particular student did not perceive any environmental problems at all, as his response to the eco-footprint quiz reveals:

I feel that my lifestyle is perfectly fine and that I don't need to make any lifestyle changes . . . My dad says it's all a conspiracy about global warming and I believe he is right . . . Naturally occurring world disasters affect the environment more than all the greenhouse gases have ever done. Mt. Saint Helen's, Mt. Krakatau created more changes to weather patterns than man has ever dreamed of.

Susan's spring semester students had the opportunity to travel to Brightwater, and they also had the courtyard restoration project. Despite these opportunities they also perceived change to be difficult and inconvenient, and they argued for the protection of their lifestyle, albeit in different ways from the fall students. One spring student pointed out that Americans use more biologically productive land than Canadians, and so we weren't doing so badly, considering that we HAD to heat our houses just to survive here. Much more so than the fall students, spring students cited time as their largest limitation; they did not have time to take the action they knew would be necessary to change their lifestyles.

Reflections, Making Meanings

We must now ask deeper questions about the institutions of schooling than have so far been raised in the school reform movement, with its short-term panaceas of more accountability, site-based management, standardized tests, prescribed curriculums, and longer hours for teachers and students. We have to accept that we are dealing with a deep systemic crisis. Constructivism collides head-on with so many of our institutional arrangements for learning. (Abbott & Ryan, 1999)

BRIGHTWATER REFLECTIONS: BETH'S CLASSES

Once we have been to the creek for a day and we are all comfy, then we can go out and do the nitrate tests. (Beth)

We took only one day to go to Brightwater, and we now know that one day is not enough for the students to become familiar enough with the novelty and wonder of the site to allow us a more in-depth science experience. It can't be. It wasn't enough for me as an adult teacher; I couldn't go out to Brightwater and learn everything I needed to know in one day. I also had the benefits that many of my Advanced Program students had while I was growing up, namely, experience with the outdoors, a family that valued education and learning in its broadest sense and parents that might just show up on such a field trip to offer their expertise.

My students were asked what they learned or remembered the most from their Brightwater experience. The responses were meaningful and showed that the students were thinking about some science content, but were feeling more connected to the land. Note that some responses talked about instructional methods – students appreciated this way of learning.

I actually enjoyed my trip to Brightwater. I was expecting it to be cold, dirty and boring. But I actually learned something. I learned enough about the environment that I've started doing things to help it, that I've never done before.

The day was great! We learned a lot on the different species of plants/animals. We learned in a fun, interactive way by taking pictures and using the GPS units. After lunch, we got to help the environment by doing some chores like putting up fencing around the trees [to limit beaver damage]. The best part was sitting in the tipi and hearing great stories.

The highlight at Brightwater was the neat toilet [solar composting toilet in the straw bale washroom]. I wasn't expecting a whole lot from Brightwater. I didn't think that spending a day out in nowhere would be fun or educational. After going, I realized that Brightwater has very educational things. The porta-pottie definitely was a highlight. I never knew something like a toilet could cause such a big problem. I also enjoyed the storytelling part. Very educational, learning about how things were once done with no electricity or video games. I learned how to tell which tree is what. I found that Brightwater wasn't that bad after all. Next time, I would hope there would be more hands-on activities and also a different location; Brightwater is very over used!

I'm not sure if Joseph appreciates the reference, but one student summarized the day's events – expressing that the learning wasn't just about science content, but also about discovering nature, and stewardship.

Basically, we went around cataloguing plants with paper, pencil, camera, GPS and our trusty guide (Marcia). Then we went and picked up wasted junk in the forest for recycling. We listened to an Aboriginal dude in a tipi. I had expected a longer nature walk but the trip was good. I learned how a GPS works and what beaver eaten wood feels like.

BETH'S COMMENTS

The Saskatchewan science curriculum has objectives that encompass not only canonical scientific content, but the Common Essential Learnings, which include ethics and empathy. In Science, we hope to teach students to make informed ethical decisions that include, but are not necessarily limited to, scientific thinking. This requires both a connection to the environment as well as an understanding of ecological processes. This is a lot to learn on a one-day field trip. If we hope to teach our students to use science as a tool to help us honour our stewardship responsibilities, we need first to foster that connection with the environment. We know that not all students have experiences that have provided them with that connection. We also know that not all teachers have experiences that have provided them with that connection. The connection takes time – time that teachers would say they don't have – because they don't. For me, the gap between what I knew needed to happen outdoors and the often overwhelming expectations of a frenetic school were stressful.

Time at Brightwater allows students to reintegrate curricular objectives from many courses of study. While we might be studying Sustainability, we also have the opportunity to photograph what we're seeing, or to journal or draw. Students carry out "giving back" activities like chopping wood for the tipi fire [a student taught by his uncle and one student from an outdoor program were permitted to chop wood], wrapping trees with wire to protect from beavers, or clearing old junk from a stand of trees. Learning becomes integrated, not disjointed into hours labeled "Math" and "English." The facilities at Brightwater support this way of learning. Using the schoolhouse as a base, students can venture off to a riparian habitat, a prairie or wooded area. All of these areas are close at hand, and the equipment and supplies in the schoolhouse allow students to return to a classroom in which they can discuss their various findings with each other.

The day at Brightwater was more than worthwhile. It gave the students a chance to begin to link the scientific concepts they've covered in class to the practices they encountered at Brightwater. **Student reluctance to make lifestyle changes, however, emphasizes that one day is not enough. The day will need to be reinforced continually once we are back in the classroom and it would be excellent if we could follow this up with another trip out.** After Beth's last trip, she printed up certificates for all of the students who came on the field trip* and they debriefed the trip the following day in class. Many who hadn't attended the day expressed regret that they hadn't come, so a follow-up trip would most likely have included more students. This would be a plus in her regular-stream class since fewer than half were in attendance this time.

* Awards were based on events that had happened during the day and included such awards as First to Spot the Tadpoles.

It was great to see the students in a different environment and have more time to talk with them. Molnar (1996) quoted a teacher involved in a “school within a school” grade nine program who commented on the importance of getting to know students “in a different light. It made our year a little better because we finally felt we made contact with some of our students.” The following is an excerpt from Beth’s journal, written after her second day at Brightwater (November 7, 2006).

I am glad of the opportunity to get to know students “in a different light,” but worry about the effect on the rest of the students.

I especially appreciate the opportunity to spend a day outside of the school because I often find myself overwhelmed during the day with the number of students and the chaotic schedule of the school. There are more students on my attendance roll this semester than last. I have large classes including 26 in a modified class and 34 in an advanced class. The classes where I have the fewest “problems” are those where I know the kids . . . I find myself ready to leave the profession because I’m burned out. I need fewer students and more time with students. These two needs are met, at least for a day, by taking a crew away from the institution. Those left behind, though, suffer. Today is my first day back in the classroom since last Wednesday. I’ve been out for 4 days – 2 sick and then two at Brightwater. My modified grade 9 class has had 3 substitute teachers over the last 4 days. This is the downside of experiential education within the current system. The students who aren’t “experiencing” can be left for days at a time with inconsistency. What are the effects on students like those in the modified program?

For Beth, student success in science, and in making meaning from activities, requires experiential opportunities. Despite structuring the in-class planning around the opportunity to go to Brightwater, the results from our research indicated that students still had difficulty connecting their science learning to their everyday choices. This finding didn’t suggest to us that we should leave out the experiential component, but that we should give students the opportunity for **more** experiences. Students must have not just concrete experiences, but opportunities for metacognition – learning to learn. In Beth’s view, the traditional classroom setting, with its one-hour time increments and large numbers of students, is the biggest barrier to student development.

BRIGHTWATER REFLECTIONS: SUSAN’S CLASSES

In their reflections on the Brightwater trip, 100 per cent of the students said that it was very worthwhile and should remain as part of the *Sustainability of Ecosystems* unit. They all said that one day does make a difference, and they really appreciated having a first-hand view of a natural, unspoiled environment. All students said that they really enjoyed listening to Joseph. One student wrote, “When he spoke you could really concentrate and listen to what he was saying.” Given below are some other excerpts from student reflections.

I loved it all, I wouldn’t change it but more grade 10 students should have the opportunity to learn and one day did make me feel so much better and more respect for the Earth.

I did appreciate his [Joseph’s] point of view because it made me realize god created fire and the land but how we pay him back, well we don’t.

But the first nation people lay tobacco down and really connect with his spirit.

I think Brightwater would be a great thing for others to experience. All of the different aspects of environmentally friendly living and the biodiversity is well worth seeing.

Through this trip, I could more value nature and become more familiarized with it!

I think it [the field trip] should stay in the unit, but next time it should be a Friday, and we stay the night.

SUSAN'S COMMENTS

June 2007: As the classroom teacher, I had my own reflections about the Brightwater experience. I am gratified that my students enjoyed and appreciated the day as much as they did, but I wonder if their reflections would have been as positive if the weather had been less than ideal. I would have liked to have done more empirical science. Rather than walking around and simply experiencing the place, I felt it was important to get quantifiable data because that is science, and that is the curriculum. I admit, however, that simply walking into a new place and beginning an inventory of what is present will not suit the student need to experience and appreciate a place. We need to experience Brightwater more than once: once to experience, once to quantify and once to reflect. (Refer to assignment Susan provided to students who visited Brightwater - Appendix VI.)

November 2007: What a difference a few months of reflection makes. I now firmly believe that “simply walking around” is about the most important thing my students can do at Brightwater. I have reassessed what my goal really is as an educator in this *Sustainability of Ecosystems* unit, and it is to forge an appreciation, a romance, for nature. How can I expect students to change their unsustainable lifestyle to protect an environment they do not feel connected to? **All** of our environmental problems were/are being caused by a lack of care/lack of connection to place. Any empirical study we do must come **after** a connection is forged; only then is the science worthwhile. Joseph Naylor's words resonate for me:

“It's all about listening. If you have a pad in front of you, it is sometimes an obstacle to hearing more than information. I let them know. If you are going to learn from me, you have to learn through your senses. Put the books aside. Be responsive. Through silence or through participating, you learn.” (Naylor, personal communication, 2007)

I have come to believe that my insistence on quantitative data from my students came from a lack of trust in them. I needed proof that they had done work at Brightwater in order to justify the trip. I was obsessed with Whitehead's precision without having experienced romance. Having experienced Brightwater now with two groups of students (I traveled there again with my fall 2007 Science 10 Enriched class) and having post-conferenced with both groups, I trust now that they will better forge connection and appreciation without the disciplined collection of data. This collection can come later, in different places and circumstances, when the students are ready to move from romance to precision. The joy of Brightwater is simply experiencing the diverse landscape through all of the senses and generating questions about what is experienced. These

questions lead to the empirical science in future classes. I now trust my students to generate the questions that the curriculum is designed answer.

MARCIA'S COMMENTS

My role in this project was as guide, resource provider and to assist with the report. I have observed that every Science 10 teacher who arrives at Brightwater takes a different angle in their interpretation on how to best engage in the curriculum with their students, which is to be expected (see glimpses of other teachers' experiences in Appendix IX). I see the importance of providing rich pre/post-visit experiences for students, using diverse instructional strategies and engaging in hands-on learning, so I see the need to provide support through PD (to learn more plants, geography and land stories), websites, kits and resource people. It is important to collect data that demonstrates the impact this program provides to our students in their learning process. I also observe the ripple effects that mentorship creates in teachers in the form of professional development and empowerment, the value of repeat visits and the importance of walking the talk – truly showing positive examples of sustainability and demonstrating proactive responses when there are problems (such as inviting the shepherd and his sheep to graze the invasive plant species at Brightwater).

This unit is terrific for connecting youth with the land – most students will be here as return visits and if we missed them in elementary school, we can catch them when they are older. A significant highlight was the opportunity of walking with Joseph, who has such a deep respect for people and land. He loves being at Brightwater and has respect for our program. Youth and teachers are truly touched by his presence. I am concerned about willingness of youth (and adults too) to embrace more sustainable actions and will find ways to encourage and model positive life styles at Brightwater.

There are so many more projects and questions to ponder. This research is not done; like Picasso said about his painting, it just ends in a beautiful place.

During a recent camp, we had the opportunity to follow up on what resonated for one of Beth's students two years after the experience. Her comments, which we reproduce here with gratitude, are provided with permission from her mother and her. So, the last words of reflections are from our youth:

STEPHANIE J.

Beth wanted to do more projects with us instead of only book-based learning. I learn better hands-on. I remember better if I can do it, see it and make a connection. Just reading and studying for a test does not really help me remember anything afterward. We did the eco-footprint challenge on the computer. After that I got a sense of how I impacted the environment. You realize that one person does make a difference and huge contribution to the footprint. You can make a difference by being conscious of actions and being aware.

We each had a special action project in our class. Our group did a recycling initiative in our school to get teachers and classes involved. We already had five recycling bins in the school but they did not get used. We made decorative recycling boxes that would stand out so that people would think of using them. Every classroom had one and they were used. We collected all that paper and were amazed that they

would always be full. People started putting the bottles in there too. These boxes are still being used even two years later.

At Brightwater, I remember sitting in the tipi and having the talk and the scoobie doo song with Joseph. Then we got to look at trees and use a key to identify different plants and that was neat. I looked at trees and to me they all looked the same. Then I realized there are so many different species. You never learn about that in the school in the same way. We were looking at pond water under the microscope and discovered that it was full of life. I love learning outside. You see much more and take in so much more rather than only using a textbook. It helps me remember. I really enjoyed the way Ms Campbell teaches because she was passionate about it. She wanted to share it with us and learn too. Sometimes we study and do our schoolwork because we have to know it and we're just doing it because we have a test at the end of the week. She brought us out and let us experience it for ourselves and everyone had so much fun. We all remember that day. We all learned so much and got to do different things. It was a great opportunity to be out in the environment. (Dictated to Marcia while Stephanie attended a senior leadership camp, December 12, 2008).

Recommendations

BRIGHTWATER PROGRAM

1. **Mentorship.** Mentoring is the preferred model of professional development for educators at Brightwater. Teachers new to Brightwater have the opportunity to be mentored by veteran teachers, to shadow them in their best practices while their substitute teachers are covered through the PD line in the Brightwater budget. Since 1990, when Brightwater was created, both elementary and secondary teachers have embraced this way of sharing. Supported by educational research, mentorship keeps educators on the cutting edge of educational best practice. Combined with professional development opportunities with a specialist (e.g., botanist or water studies scientist), teachers are empowered during half-day meetings to incorporate their learning into teaching practice. It takes time for teachers to get to know a place and learn the stories of the land. That is why it is fortunate that the secondary field studies program is a solid facet of Brightwater.
2. **First Nations World View.** First Nations teachings complement the other teachings shared in the science class. This honours multiple ways of knowing and learning about nature. Being with a person who provides a different perspective on a topic such as sustainability of ecosystems enriches learning. The students can tell if a person is deeply connected with the Earth and believes in sustainability. Joseph Naytowhow shared a global view and a deep respectful earth ethic with the students in this project. Other traditional knowledge keepers, mentored by Joseph in the Brightwater program, assisted other classes so that their teaching included multiple world views. This part of the program was well received by both teachers and students and provided an integral balance. Its continuation is critical. In the past we have supported this component of the program through grants, Brightwater budget and support from the Indian and Métis Education Development Fund through the Saskatchewan Education Ministry (IMED) program. Because this funding has shifted, we continue to search for ways to sustain the First Nations component of the Brightwater program as a valued and successful means of meeting an important need for our teachers and students.
3. **Out-of-School Education Assessment.** Teachers typically use a wide variety of methods to communicate learning and assessment of curricula outcomes, including field notes, tests, portfolios, conversations and checklists. How we measure what happens in the outdoor classroom requires us to find “compelling evidence of success” that can communicate the need for this experiential strategy to persist in a world where the pressures of standardized tests might usurp “real” experiential learning. This area requires immediate attention and consultation with similar programs in the United States and neighbouring provinces as well as leaders in our province.
4. **Finding Wild Places.** Brightwater is close to its carrying capacity and is experiencing some environmental impact because it is the only facility of its kind in the school division. To alleviate this environmental pressure, each school needs to identify learning places that are nearby. Indeed, this has happened formally at Saskatoon Natural Grasslands, which is also experiencing high use impact. The identification and creative use of places along the Meewasin Valley – South Saskatchewan riverbank, however, requires

a higher level of teacher support and mentoring than a visit to Brightwater, where facilitators and programs are already developed and available. Teachers at each school need support in order to facilitate lessons at their own pace, as well as to overcome barriers (e.g., liability and who owns the land).

RESOURCE KITS

We chose to create resource support kits with music, field guides, read aloud books, maps, etc., for use by teachers before and after the outdoor experience. (See Appendix VII for a content list for this kit). Susan made some suggestions for creating the resource kit for future teachers. She suggested that the kit clearly indicate where to find material at the teacher inservice and ensure there is a walkabout of the site to demonstrate teaching stops, providing a demonstration of possible activities at each stop. A map would be really valuable, as well as a list of clothes to wear, site rules and regulations and instructions on how to use the facility (wood stove, straw bale toilet, etc.). These ideas have been incorporated into the teacher guide for the kit.

ACTION RESEARCH

On the basis of our research experience, we would recommend the following to others who would like to engage in this kind of research:

1. Attend the McDowell Foundation Learning from Practice conference as a research team in the fall to get a sense of the caliber of research being conducted, the methods being used and the opportunities and challenges faced by teacher-researchers.
2. Visit the Stewart Resources Centre at the Saskatchewan Teachers' Federation building, which has a rich set of resources and helpful librarians.

Further Research

If we were to continue this research, we would:

- Compare students who have one day at Brightwater with students who have no days or three or more days with respect to the development of their sense of place. How much would change with less or more time?
- Explore more consciously what was happening to us as educators and researchers during this process, paying attention to factors such as instructional perspective, professional development, professional survival, personalities of teachers, importance of personal stories, etc. How can we best support teachers through PD, resource development and mentorship? How do we acknowledge the importance of the Brightwater Project Leader and experiential education coordination?
- Examine more fully the differences in engagement that was observed between the academic streams. What makes an engaged learner? How would providing meaningful, subject integrated, outdoor experiential learning experiences help engage learners?
- Network with Science 10 teachers to share experiences and collaborate on planning. How could we build on Saskatoon Public Schools' Collegiate Renewal and Assessment for Learning initiatives to provide more meaningful experiential learning experiences?

Conclusions

Formal schooling, therefore, must start a dynamic process through which pupils are progressively weaned from their dependence on teachers and institutions and given the confidence to manage their own learning. Surely it should be the child who is tired at the end of the term, and not the teacher . . . As children grow older, they start to become their own teachers . . . Learning need not be confined to an institution – it must become a total community responsibility. It is not merely teachers who can teach, not just pupils who need to learn and certainly not just the classroom that can be the major access point to knowledge, information and skills. (Abbott, 1997)

When both Susan and Beth began to teach the *Sustainability of Ecosystems* unit, they knew that they would be taking classes of students to Brightwater. This research project changed their teaching practice right off the top. The amount of reflection they engaged in during this process was considerably greater than it would otherwise have been. As the unit progressed, they reflected on how the videos, experiences and projects were affecting students' abilities to link canonical science content to everyday environmental issues and behaviours. While students seemed to be able to assess their own environmental behaviours, at the end of the day, very little change took place. This result does not negate experiential learning, but indicates that experiential learning must become more a part of students' learning. We recognize that change in habits, attitude and values takes time, commitment and motivation. Perhaps these changes will occur years later, influenced by their experience at Brightwater or the ways that their teachers taught sustainability of ecosystems.

Like fine shale, this kind of understanding is laid down one layer at a time. Students need to encounter example after example of how systems thinking provides insight into dynamics that would otherwise remain invisible. (Krapfel, in Smith & Williams, p. 63)

We practice to excel in basketball, dance, music or theatre. One performance on a stage does not make a music idol. Similarly, we need to make time and space to practice being in nature, to do stewardship or community projects, to actively reduce eco-footprints and to explore more cultural stories of our homeplace – to make these actions a part of ourselves. There are many ways to interpret a curriculum by exploring diverse experiences that honour many ways of knowing (consider Multiple Intelligences, Indigenous World Views, Western Science). Youth who do not have the experience of Out-of-School Education and diverse instructional strategies will be living in more vicarious abstract worlds with fewer layers of experience and thinner stories.

We believed that experiential education in the form of a day-long field trip to Brightwater could help students move along the continuum from an **awareness** of the environment, through an understanding of their **connection** to and **responsibility** for the environment, and finally inspire a **commitment to change** any personal or collective behaviours that conflict with responsibility for the environment. While our research data suggest that students were not all ready to commit to change, there was also evidence that students felt a connection to and responsibility for the environment. As teachers, we need to meet students where they are and guide them along the environmental continuum. We also need to

continue to take risks to create quality educational programs that engage learners in powerful instructional practices through Out-of-School Education so youth may continue to create meaningful and relevant connections with their learning in our environment.

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RESOURCES

WEBSITES

- Brightwater Science and Environment Centre <http://olc.spsd.sk.ca/DE/Brightwater/>
- Carbon Cycle, Water Cycle, Climate Change: www.epa.gov/climatechange/kids
- Collegiate Renewal-Saskatoon Public Schools <http://schools.spsd.sk.ca/collegiaterenewal/>
- Eco-footprint: www.myfootprint.org. Also see Saskatchewan Natural History Museum site: http://www.royalsaskmuseum.ca/gallery/life_sciences/footprint_mx_2005.swf
- Saskatchewan Ministry of Education grade 10 Science curriculum <http://www.sasklearning.gov.sk.ca/docs/xsci/>

VIDEOS

- An inconvenient truth [videorecording]: a global warning. Produced by Paramount Classics and Participant Productions. c2006. Available through the Stewart Resources Centre (STF), Call No.: 363.73874 I37.

The climate change show [videorecording]: Une présentation sur les changements climatiques. Produced by Sudbury, ON Science North, c2004. Available through the Stewart Resources Centre (STF), Call No.: 551.6 C639.

The next industrial revolution [videorecording]: William McDonough, Michael Braungart & the birth of the sustainable economy / written [and] directed by Shelley Morhaim, Chris Bedford; produced by Shelley Morhaim. Publisher: Stevenson, Md. E Earthome, c2001. Available through Saskatoon Public Schools Curriculum Materials Centre, Call No.: V3845 745.2 Nex.

After the warming: Part 1. The fatal flower.

After the warming: Part 2. Secrets of the deep.

Appendix I: Personal Stories

BETH

I grew up on the edge of a suburb in Peterborough, Ontario. After the houses ended, there was “the Farmer’s Field” where the vicious steers roamed. Our subdivision was also bordered on another side by an abandoned railroad bed, complete with scrub that was excellent fort-building territory and a wooded area with a tiny creek. Spring provided the opportunity to pick fiddle-heads and to (try to) sell them to people in the neighbourhood (not a huge money-maker). The zoo was within a kilometer down “the back road” – well within biking distance (it was there I learned that llamas can and will spit bubblegum at high velocity).

My family owned a canoe, and we did a fair amount of camping as well. I was also a Brownie, Guide and Ranger and I took canoeing lessons during the summers at the Boy Scouts’ “Brownsea Base” facility conveniently located on “Little Lake” in the centre of town.

When I was older, my summers were spent as a counsellor at Camp Maple Leaf – a camp run for underprivileged kids from the Peterborough-Hamilton-Toronto area. As a child and teenager, my parents also took us out of school for an extra week each year at Easter. We often travelled with family friends (the same ones with whom we canoed and who participated in Guides), visiting most points along the Eastern seaboard of the US. My brother and I often complained that there is not a museum we haven’t been in – from the Astrodome to southern plantations to the Baseball Hall of Fame to the Smithsonian.

I studied Biology at the University of Guelph and worked for a number of years as a research technician looking at the plant growth-promoting capacity of soil microbes. I was transferred to Saskatoon in 1990, as the lab in which I worked was sold. The work was initially exciting because we were using natural soil microorganisms to help plant growth, but I became disillusioned as the companies I worked for became “successful” and the marketing of agricultural inputs began to direct the work done in the labs. It was also during the 10 years working in a lab that I lost contact with the outdoors.

As an educator, I believe more in a philosophy of learning rather than a philosophy of teaching. To be successful, students must actively construct their own knowledge. Children and youth, however, require the “pieces” before they can begin successfully constructing knowledge. Abstract reasoning can only be successful when there are enough concrete experiences on which to “hang” the reasoning. The job of the teacher is to provide these experiences (especially when some students may not have had the same advantages outside of the school setting as others) and to have enough of a relationship with the students to know when to explicitly help make connections. This requires that the teacher has time with the students and is teaching in an integrated way (i.e., covering more than one subject area). One of the best phrases you can hear from a student is, “Hey, that’s just like when . . .”

Experiential learning provides students with the concrete experiences they need to move ahead in their learning. It provides “robust” experiences that often involve more than one “subject area.” As a result, experiential learning also provides students with many more opportunities to experience success, rather

than putting them into a situation where they (probably once again) find themselves falling short. The traditional school system rewards only the very few who are already skilled in verbal, logical and interpersonal intelligences. The structure of the traditional school system supports this, because teachers are often teaching one curricular subject area to students in a short daily time period. Within this structure, authentic experiential learning is difficult to achieve.

As a teacher, I was hoping to bring students to Brightwater to be outdoors. I know that although some of my students have some familiarity with the outdoors through camping or “going to the lake,” many do not. Experiential education allows those students with knowledge to share it with those who don’t yet have it, helping to move their understanding of where learning comes from away from the model of a teacher-authority. It allows all of the students to acquire new knowledge from the outdoors about whatever we’re looking at – whether creek dipping for plants, animals or protists or keying trees. All of these experiences can be referred to later in class. “Do you remember when we . . . that’s why we look at **all** of the kingdoms of living things in an ecosystem.”

Going to Brightwater also gives all of us (especially me!) a much-needed break from the four walls and fluorescent lights of the school and from the thought-killing bells that ring on the hour . . . and from the 125 kids who cycle through my classes during the day. Out in the woods you have time to breathe and connect with the students who have come with you. You have a rich environment in which to teach and learn about not just the curriculum objective, but also about the context in which things exist. It’s not just about monocots and dicots; opposite or alternate leaves . . . it’s about seeing how you can use this information and how plants fit into the “whole big picture.” It’s about having time to step back, breathe and see that “whole big picture” and, hopefully, come to see that the big picture is important enough to take care of. The problem is in keeping the memory of the experience alive once we’re sucked back into the vortex of daily lives that move at too fast a pace to allow us to make the changes we know we need to make.

When I started this project, I was concerned with students’ lack of experience in making the connections between the canonical science information they learn in school and the choices, actions and attitudes towards the world they take in their everyday lives. It seemed to me that the disconnect stemmed not only from a lack of experience in actively making the connections, but also in a belief that their individual actions were meaningless . . . so why bother? The hope was that by adding to the students’ outdoor experiences, they could make more meaning of the curriculum content.

Since working on this project, Beth has volunteered for the outdoors club at the high school where she teaches and has completed certification in Lakewater Paddling and Canoe Tripping I. In September 2007, Beth began a new team-teaching position in a grade nine program that focused on integrating the curriculum around an experiential focus in a high school that has rich links into the community.

I am now in the process of integrating my work more fully into my life, as well as making my connection to the outdoors more solid. My husband and I are moving to rural(ish) British Columbia where we will work for ourselves, plant our ½ acre to permaculture and work to get “off grid.” Teaching and learning will always be part of my life, but the process will be less dictated by an overly zealous curriculum. (And you don’t need to shovel snow!)

SUSAN

I was raised in south-western Ontario, in a subdivision on the very outskirts of the city of Brantford. My street dead-ended a few houses away from mine, and I remember there being an enormous swamp there, surrounded by huge trees dripping with moss. I remember being very little, with lots of other little children, poking at that swamp with sticks and marveling over the tadpoles and frogs. I don't know when that swamp was developed over – my memory leaps from that scene to one a few years later, when the road was extended and the swamp was gone. The creek that fed the swamp was still there, though, even though it now ran into a concrete pipe that disappeared under the street. Upstream, though, was still natural wilderness – huge deciduous trees, grassy glades filled with buttercups and skunk cabbage in the spring, trilliums that we knew we weren't allowed to pick because they were the provincial flower of Ontario. This seemed a very big forest to me – it was surrounded on three sides by farmers' fields and on the fourth side by my subdivision, but it was big enough to lose myself in. This forest supported squirrels, skunks, porcupines and maybe the occasional deer. There was a multitude of bird life: I remember most vividly the red-headed woodpecker for its beautiful scarlet head. Whenever life got me down it was to this forest I inevitably would go – I would climb a tree, book in hand, and read for hours. It really was a different time then – my parents had absolutely no idea where I was from dawn until dusk, and to my knowledge never investigated this wood for themselves. Any dangers there, as well as the pleasures there, were mine to discover.

As a child, my family vacations were inevitably spent camping – my favourite spots were deeply wooded ones with water access. I was also fortunate to attend a youth summer camp for one week every summer. I learned how to canoe at summer camp. My best memories of my adolescence come from this beautiful, peaceful place. Time seemed to move much slower there. Like my forest, this camp was a place for **me**. I wasn't anyone's sister, daughter, cousin, etc. I was just me.

I was 15 when my family moved to a small community outside of Halifax, Nova Scotia. Once again I was blessed to be by a street that dead-ended in a forest – this time a coniferous forest with a very large lake. The smell of pine and blueberries permeates the air in Nova Scotia, and I would ramble for hours in these woods. I remember coming across some pink lady slipper orchids once, and thinking it was as if someone had a pocketful of gems that they had just scattered over the woods floor. I spent two summers working at a wilderness campground and canoe outfitter. I was very proud the day the owner of this business granted me the privilege of using his wood and canvas canoe, rather than the aluminum canoe I had been formerly restricted to.

After high school I entered Dalhousie University in Halifax and completed a Bachelor of Science degree in Biology. I was particularly interested in my ecology and botany courses. As a young adult I moved to Saskatoon, Saskatchewan, in order to pursue a Master's degree in Horticultural Science. Much of my research took place just south of La Ronge, Saskatchewan. This environment was very similar to my Nova Scotia environment in both geology and ecology. When in Saskatoon I would spend a great deal of time exploring the river basin. When my fiancé and I purchased our first home, it was in the neighborhood of City Park, a very heavily treed neighborhood full of character homes and close to river.

I spent 10 years after earning my M.Sc. working as a research technician, largely in biochemistry and molecular biology. I would have been happier working in

ecology, but at that time there was very little funding for ecological research. Genetic modification was all the rage! Although I found the science behind my various projects very interesting, I must admit I found the majority of the actual work to be quite boring. Too, I developed many misgivings about the genetic engineering of crop plants that I participated in. I don't have a problem with the science of genetic engineering, but I really disagree with the argument crop scientists make that GM crops are kept isolated from the environment, even when planted in a field setting. The fact that organic canola can no longer be grown in Saskatchewan due to the prevalence of GM canola with which it can cross-pollinate stands in sharp contrast to this argument.

At the age of 34, I left research science and went back to school to earn my Bachelor of Education degree, hoping to re-educate to become a science teacher. I graduated in 2003 and have taught science classes ever since. I completed the accreditation seminar offered by the STF in spring 2007, and was accredited by my Board in Biology and Chemistry for the fall semester.

Now I teach high school science. I approach my work with no particular philosophy of teaching in mind, unless practicality is a philosophy. The methodology I use is determined largely by the reality of the curricula, the number of students I have, their skill and motivational level, classroom dynamics, the amount of time I have to prepare for my work and the structure of the school day. My job, what I am required and paid to do, is to help students to become scientifically literate; i.e., to use the scientific method as a tool to examine and analyze not only the physical world around them, but also to examine the claims of media or other aspects of society. My job is also to help students gain mastery of specific knowledge and skills fundamental to science.

To accomplish my work within the realities of it require me to focus largely on mastery lecture, classroom laboratory exercises, independent research and a great deal of drill and practice. Through these traditional methods, the curricula are covered. It must be remembered that failing to cover the curricula is a dismissible offense for a teacher. Although I can rest easy in the knowledge that I have covered the curricula with my classes, I often feel that my students fail to incorporate the curricula into their daily lives; they do not associate their classroom experience with anything that they could (or should) apply in the "real" world. To discuss ecological sustainability in a classroom is not the same as practicing the values of sustainability; to write about the importance of reducing our greenhouse gas emissions is not the same as designing and implementing an action plan that actually accomplishes this goal. How can a student appreciate the importance of protecting an ecosystem if their only experience of nature is scenery through a car window?

Experiential education may help to facilitate student success in incorporating the values of their education. In particular, the grade 10 science unit *Sustainability of Ecosystems* lends itself to experiential education. Specifically, incorporating a day-long field trip to the Brightwater Science and Environmental Centre (owned and operated by Saskatoon Public Schools) directly addresses the second foundational objective of this unit, which is to examine biodiversity within a local ecosystem. Brightwater is conveniently located just south of Saskatoon, and all programming there is provided free of charge to Saskatoon Public School students. Brightwater contains within its boundaries many distinct ecosystems: prairie, mixed forest and aquatic. By spending a day there, students have the opportunity to study first hand the organisms and population dynamics of ecosystems, learn about how this land supported the First Nations people for millennia and to simply connect with a beautiful, undeveloped place. It is hoped

that this hands-on experience in a wilderness setting will help students to overcome their disconnect between school and “the real” world; that they will understand and appreciate that their actions have consequences, and that they personally can make a contribution toward sustainability.

Susan continues with the Walter Murray courtyard restoration project, formulating designs for her future Science 10 students to implement and planning lessons for a variety of classes that will use the courtyard as the central focus. She plans on increasing the experiential educational opportunities for her grade 10 students through designing lesson plans around the exploration of a slough near to the school and by naturalizing the landscape of Walter Murray’s current grass frontage. Susan has a permanent contract with SPS and will be continuing teaching chemistry, biology and science.

MARCIA

When I was a child, my family lived in a new neighbourhood on the edge of Saskatoon where deer, jack rabbits, skunks and other animals would visit regularly. In vacant fields the other kids and I built forts, explored sloughs and played outdoors. My family camped all over Canada so we spent a lot of time in provincial and national parks. Camping was also a possibility through Girl Guides and while I was a high school student with the outdoor education club canoe trip to the Churchill River system (an annual voyage I still continue as an adult).

My mother always took us on “gneiss” hikes in natural areas sharing her interests as a geologist. When visiting Grandma, we heard stories about the land and the plants and saw how she used them in making dyes for weaving. Grandma taught us about pest control when we had to rescue the box of 1,000 ladybird beetles tipped over in the back of her car that were destined for her aphid infested raspberry bushes. Learning about plants was a value instilled by my mom; in order to graduate from high school, mom joked we had to identify the native trees and shrubs she planted in the backyard (about 10 species).

I worked as a park naturalist with the provincial parks system as well as a naturalist at Beaver Creek Conservation Area (Meewasin Valley Authority) for three years after completing my B.Ed. This fortunate experience set the foundation of knowledge and interpretive education techniques for being an outdoor educator. Ironically, when I entered the classroom for my first year of teaching in 1989, I slipped into survival mode while learning the ways of the elementary French immersion world. I still did a lot of outdoor teaching, but it wasn’t until a year later when I was a participant in a research project by a doctoral student that I was enlightened to return to the “best place.” He asked me why I was drawing a plant when we could just head outside and pick a weed (dandelion) to review the parts of a plant. Of course – that is what I would have done as in interpreter, but somehow I fell into the abstract mode of educating. The outdoor classroom has been my way of educating ever since. My elementary students used to take about 20 field trips (off school property) each year. Outdoor classroom was a highlight each week (where we would study in the adjacent aspen bluff or playground).

I completed my Master’s at the University of Saskatchewan in Environmental Education by studying primary teachers’ experiences in the outdoor classroom. While teaching I also volunteered at Brightwater, contributing to committee work, program development, ethnobotany studies and leading night hikes. Brightwater was an excellent PD site.

As a project leader at Brightwater Science and Environment Centre with Saskatoon Public Schools since 2002, my role is mentor for teachers, parents and post-secondary students as well as program coordinator, grant writer to secure funds for innovative projects and facilitators, land steward, facilitator mentor/supervisor and teacher. I am totally biased about this place and program. I love that our youth get to learn close to the creek, in the prairie and in community with facilitators, teachers and parents in a residential setting. Every pathway shares amazing stories. The students are always at the heart of Brightwater, where they belong, helping to remind us why this place exists. I have deep gratitude for the people who dreamed Brightwater into reality and created sound foundations of philosophy, land ethic and learning practice (thank you Jake Ens, Rene Baxter, Max Abraham, Louise Jones, the SPS previous and current trustees/admin council and hundreds of other people). Reflecting these beliefs, Rachel Carson (1965-1998) inspires me: "If a child is to keep alive his [her] inborn sense of wonder, he needs the companionship of at least one adult who can share the joy, excitement and mystery of the world we live in."

I am pursuing a pause for a year from the role of Project Leader at Brightwater through a deferred salary leave (2009-10). I will spend more time with my boyfriend and the sled dogs near Waskesiu in his off-grid (solar energy) home, garden (organically of course), and paddle wild northern rivers. Perhaps travel will take me to visit other eco-centres like Brightwater. I'll be back at Brightwater (fall 2010) as project leader in time for the 20th anniversary of Brightwater.

Appendix II:

Pre- and Post-Portfolios Assignment

Note: Questions on current actions and attitudes were provided to the students in the form of an environmental survey from Stirling McDowell research report #20, entitled Hearing from Our Kids: An Environmental Study by Stephanson and Jones. Please refer to this project for those questions.

SCIENCE 10 – SUSTAINABLE ECOSYSTEMS

- Please complete the entire worksheet to the best of your ability.
 - Consider the questions thoughtfully. This is due at the end of class.
 - Your mark will be based on the completeness of the answers, NOT on whether the answers are “right” or “wrong.”
1. Predict what will be the most important thing you will learn from going to the Brightwater Centre this year. Afterward, you will have a chance to write a reflection of what you learned, expected, wish we would have learned.
 2. What does “Sustainable” mean? Give a definition.
 3. What is an “Ecosystem”? List all of the components of an ecosystem that you can think of. Draw a diagram of an ecosystem that includes all of these components. Use colour!
 4. Use the ecosystem diagram from Question 9, and redraw the organisms to show a food chain or web.
 5. Look at your drawing from Question 9. List a minimum of 5 things that could cause a disruption in this ecosystem.
 6. Classify these disruptive factors as either “natural” or “man-made.”
 7. Choose one natural thing that could disrupt this ecosystem. What are the effects on the components of the ecosystem? List or draw the effects.
 8. Choose one man-made thing that could disrupt this ecosystem. List or draw the effects on the components of an ecosystem.
 9. How does the number of species in an ecosystem indicate its health? How important is it that ecosystems exist in as healthy a state as possible? Who is affected when biodiversity is lessened? Who is affected by unhealthy ecosystems? Answer in a complete mini-essay, paragraph answer. (Biodiversity. The number and variety of organisms within one region.)
 10. How can humans in general improve the sustainability of the Earth’s ecosystems?
 11. What can small groups of people and individuals do to help improve the sustainability of the Earth’s ecosystems?
 12. Which of these actions do you currently do? Which of these actions are you willing to do? Of the actions that you are not currently doing, and are not prepared to do, list reasons why.

Appendix III: Waste Reduction Project

WRITTEN BY BETH CAMPBELL

Note: This project began with an environmental audit of the school, where students were dispatched around the school to assess areas of resource use that could be improved upon. After collecting initial observations, we exchanged ideas and each group decided on a mini-project. Groups had to assess the situation take action assess the results of their actions leave a status report for future groups.

This project had two “handouts” – the initial audit sheet and a report structure/marking guide.

SCIENCE 10 – ENVIRONMENTAL AUDIT

Today’s task is to choose an area of the school to audit. The purpose of the audit is to identify the activities that take place in this area, to assess the types of waste that are produced and to suggest ways to reduce or eliminate the waste.

Be creative! Think of alternate ways to do the tasks we’re currently doing!

Use the table below to help you focus your thoughts. Use the information from the table to produce a proposal for an action that would result in a positive change.

Main Activity Chosen:

Type of Waste	Amount	Ideas for Reduction

Proposal: Write a few sentences outlining your ideas for reducing or eliminating this type of waste. How could this be done? How much of an impact would there be? Be prepared to share your ideas with the class in the last 20 minutes of class.

WASTE AUDIT WRITE UP

Your waste reduction or recycling project write-up should look something like a science lab report. Each group will produce a report that looks something like the report below. Each report should have:

- Title
- Names of ALL group members
- Appropriate sections as outlined below (Preliminary Waste Audit, Description of Project, Assessment of Effectiveness of Project, Work Left to Do)

PRELIMINARY WASTE AUDIT

This section should include the information you collected when you went around the school looking at garbage and recycling. Include all data – including numbers – especially for the problem you ended up choosing. If there were no Styrofoam cups in the garbage, why implement a plan to reduce them? For example:

“In our preliminary audit, we noticed a number of areas that could be addressed. For instance, there is a lot of garbage on the floors. We could implement a poster campaign to get people to put garbage in the garbage cans. The garbage we found in the cans consisted of . . . ”

You might have recommended ways to reduce garbage from lunches, Styrofoam plates, etc.

DESCRIPTION OF PROJECT

Here you outline the area you chose and why. Why is the area a problem? You’ll talk about what you plan to do about it. Who did you talk to? What extra equipment or permission do you need to do the project? For example:

“We found that there are XX number of Styrofoam cups used at Georgio’s every day. Even if we start to separate the garbage to recycle, we can’t recycle Styrofoam. The way to handle it is not to use it to start with. In talking to the staff at Georgio’s, we found that they were willing to give a \$XX discount to each student who brought their own travel mug or coffee cup when buying hot chocolate or coffee. We plan to advertise this by . . . ”

ASSESSMENT OF EFFECTIVENESS OF PROJECT

After you carry out your project, you need to go out and collect data again to make sure that it’s working. Write a paragraph about how it’s working.

WORK LEFT TO DO

This section will outline any changes that need to be made if another group picks up this project in the future. Maybe your program was a big success and you have suggestions for the future about carrying on or expanding on it. That goes here!

Appendix IV: “The Next Industrial Revolution”

VIDEO HANDOUT BY **BETH CAMPBELL**

Note: This handout was originally in four-page booklet format and has been re-formatted.

- What is the definition of a sustainable economy?
- List some “harmful acts,” either large or small.
- Who, according to the video, is the most important person to a ship that is crossing the ocean? Why?
- What is the ONE source of energy that is added to our environment?
- How did they design a building that is sustainable at Oberlin College?
- What is the difference between being “less bad” and being “good”?
- Describe the Herman Miller building (the Greenhouse).
- How does the building make the people who work there feel?
- How much more did it take to build the Greenhouse compared to a “regular” building?
- How much do they save on energy costs?
- How has attendance changed?
- Why are people attracted to the Greenhouse?
- What percentage of chemicals in our clothing and surroundings have been tested for safety?
- What industries are shown in the video that are considered to be polluters of the environment?
- Why is a regulation a sign of design failure?

NEW YORK MERCANTILE EXCHANGE

“The significant problems we face cannot be solved at the same level of thinking we were at when we created them.” Albert Einstein.

- In Nature, growth is good because nothing is wasted. In nature, waste is food.
- How does the biological cycle work?
- How does the technical cycle work? Outline the example of a computer.

WASTE = FOOD

- What were the major problems Rohmer Textile faced?
- How did Rohmer Textile come to change waste into food? Who had to be convinced and what changes had to be made?
- How is the “waste” at Rohmer Textile now used?

TAKING THE NEXT STEP

- How did Nike formerly process used shoes?
- What were the problems that weren't addressed?
- What is Nike doing now to make rubber safer for children and the Earth?
- What is the future of "shoeing" children?

FORD

- Describe the issues and changes being made by Ford.

Appendix V: Values Statement

BY SUSAN CAMPBELL

SUSTAINABILITY OF ECOSYSTEMS: VALUES STATEMENT

On a separate piece of paper, write a brief statement (3-4 paragraphs) that defines and describes what you really value about nature. Think about things you like to do in nature (example: maybe you like to go to the lake in the summer, or you like to hunt/fish/boat, or go for long walks, etc.) Make sure you say WHY you like it, even if you have a hard time explaining.

EXAMPLE:

I value time spent camping with my family. I like being outdoors (ok, sleeping in a tent, but that's still kind of outdoors – I get the fresh air and can hear the wind in the trees!). I really like being able to just go swimming in the lake whenever I feel like it, or go canoeing with my sister. I like being with my family around the campfire when we toast marshmallows.

I value all of the different animals I see when we're camping. I most like seeing and hearing loons on the lake – they're really amazing swimmers, and their cry is very haunting. I like seeing beavers too, and once I saw a moose. I've never seen a bear, but I'd like to (as long as it wasn't too close!)

I most like camping up north, in the woods. I value all of the different trees there, and the different kinds of birds I see. I think what I really like about it is that there are no houses around, and not a lot of people crowded together. It's very peaceful.

After you have written this statement, answer the following questions. Make sure to use full sentences.

1. What daily choices and actions of yours agree with/support your value statement? Which disagree? [Example: the person who wrote the above statement recycles paper as a way to help preserve the forests, but doesn't do much else to help preserve the northern forests and ecosystems there.]
2. Why is there a discrepancy between what you say you value and what you actually do everyday?
3. What helps you or hinders you from living your values?
4. What is your personal view of man's relationship with the environment?

Appendix VI: Brightwater Field Trip Notes and Reflections

BY SUSAN CAMPBELL

Note: This booklet was used in the first excursion by Susan in fall 2007. It was originally a 10-page booklet. It has been reduced in size for this appendix.

BRIGHTWATER FIELD TRIP NOTES

You may not see everything listed on this sheet, and they may not be in the order listed. READ OVER THIS ENTIRE SHEET so that you'll know if you need to take any notes for any particular activity that we do.

Theme of our trip: "Without Variety, There is no Spice of Life!"

BURN SITE

- In late summer 2006 there was a wildfire at Brightwater. Wildfires are a natural and important part of prairie ecology. Why?
- Describe your first impression of the burn site.
- Now take a closer look at the burn site. Is there anything alive in this area? Identify what you can.
- What do you think this site will look like in the spring? Why?
- What do you think this site will look like in five years? Why?
- List and briefly describe the equipment we use to document the biodiversity at this site.
- Define the term "succession." Distinguish between primary succession and secondary succession.
- Make a sketch of a portion of the site. (Do the best you can – some people are wonderful sketch artists, others of us aren't. Just do your best. You may insert a photo here in **addition** to your sketch if you like.)

FIRST NATIONS SPEAKER

We are privileged to have a First Nations Elder speak to us about a First Nations approach to ecology.

- What is the name of the Elder who spoke to us?
- Write down (jot notes) what you felt were the major points of the Elder's presentation to us.

HIKE AROUND BRIGHTWATER

- Name and briefly describe the two very different ecosystems that exist at Brightwater.
- Are there any other types of ecosystems you could identify at Brightwater? Name and briefly describe them.

PLANT SAMPLING AND IDENTIFICATION

- Describe how a population is counted in a natural ecosystem.
- Briefly define the terms destructive and non-destructive sampling. State the benefits and the drawbacks of each type of sampling.
- List the names of at least five plant species here (common or Latin names). Sketch two of them.

COMPOSTING TOILET

- Write down (jot notes) your impressions (positive and negative) of the composting toilet.
- How does this type of toilet benefit the environment?
- Should every household have a toilet like this? Why or why not?

ACTION PROJECT

- Briefly describe the action project we undertook to benefit the environment of Brightwater.

Note: We did not do this. Rather, we undertook the action project at WMCI.

- Why did we decide this project was necessary/beneficial?

Imagine that someone liked Brightwater so much that they wanted to live there. This person, however, wants all of the comforts of the big city, and so they have an underground natural gas line installed, overhead power and phone lines installed, a well dug and a septic field developed. They fence in the land so that no one can trespass.

- How would these actions change the environment of Brightwater?
- Would these actions be sustainable (i.e., would a future generation be able to do the exact same thing on the same piece of land and enjoy the same benefits)?
- What does the phrase “sense of entitlement” mean to you?
- Do you think that Canadians have a sense of entitlement? Why or why not?
- How does a sense of entitlement lead to non-sustainability?
- How can we overcome a sense of entitlement?

REFLECTIONS ON BRIGHTWATER FIELD TRIP

1. Did you enjoy yourself? Try to say **WHY**:
2. Was this trip **worth** the trouble of missing your other classes (and therefore having to catch up on the material)?
3. Did you appreciate Joseph’s point of view? If so, try to express how what he said affected you. If not, try to say why.
4. Do you think this trip should remain as part of the Sustainability of Ecosystems unit? How would you improve/change it? DOES ONE DAY MAKE A DIFFERENCE?

Appendix VII: Science 10 Resource Kit

BY **MARCIA KLEIN**

For more information on this kit, consult the Brightwater website or Stewart Resources Centre, Saskatchewan Teachers' Federation.

POSTERS

- Atlas of Saskatchewan 1999 Hydrography Map
- Saskatchewan Wildlife Federation Posters:
 - Wild Animals: Rabbits & Hare Big Rodents & Bear
 - Wild Weasels of Saskatchewan
 - Grouse, Partridge & Pheasants
 - Wild Cats & Dogs
 - Wild Hoofed Animals
- Ducks Unlimited Duck poster

BOOKS OR PAMPHLETS

- Aboriginal Plant Use in Canada's Northwest Boreal Forest ISBN 0-7748-0738-5
- Wildflowers Across the Prairies by F. R. Vance et al. ISBN 1-55054-703-8
- Plants of the Western Boreal Forest & Aspen Parkland by Johnson et al. ISBN 1-55105-058-7
- Animal Tracks of Saskatchewan by Sheldon & Eder ISBN 1-55105-314-4
- Saskatchewan Birds by Alan Smith ISBN 1-55105-304-7
- Natural Neighbours: Selected Mammals of Saskatchewan ISBN 0-88977-123-5
- Prairie: A Natural History by Candace Savage ISBN 1-55054-985-5
- Last Chance to See by Douglas Adams & Mark Carwardine ISBN 0-330-32002-5
- A Guide to Nature Viewing Sites in and around Saskatoon edited by Peter Jonker & Bernie Gollop ISBN 0-8880-416-4
- Change the World for Ten Bucks: 50 ways to make a difference ISBN 1-55092-300-5
- The Ecoregions of Saskatchewan, Canadian Plains Research Centre ISBN 0-88977-097-2
- Keeping a Nature Journal: Discover a Whole New Way of Seeing the World Around You by Clare Walker Leslie & Charles E. Roth ISBN 1-58017-493-0

READ ALOUD BOOKS

- The Elders are Watching by David Bouchard & Roy Henry Vickers ISBN 1-55192-614-5
- The Bullrush helps the Pond by Ken Carriere ISBN 0-920915-65-5
- There's a Hair in my Dirt by Gary Larsen ISBN

GOVERNMENT, NGO AND BRIGHTWATER PUBLICATIONS

- Native Plants, Water and Us by Garth Wruck, Native Plant Society of Saskatchewan
- Species at Risk: A guide to Canada's species at risk in the prairie province Environment Canada ISBN 978-0-662-45235-5
- Riparian Plant Guide by Marcia Klein and Sharon Pulbermacher

Appendix VIII: One-Day Program Schedule

BY MARCIA

SUSTAINABILITY OF ECOSYSTEMS

ONE DAY PROGRAM SCHEDULE

School:

9:00 a.m.	Group up at School
9:15	Leave for site on bus
9:45	Arrive; Orientation
10:00	First Nations Walk
11:45	Zero Garbage Lunch
12:15	Survey of Site
1:15	Environmental Work Project
2:15	Talking Circle to close excursion
2:30	Load bus; Head back to school

FIRST NATIONS WALK – What does this place teach us?

Take a walk with an invited Elder or First Nations presenter at the site with the large group. The content will be determined by the person leading the hike. Record notes in field book (after, not during, the talk).

SURVEY OF SITE – Document biodiversity of the site by recording further information about the place (with cameras, field books, sketching notebooks).

Terrestrial Study - quadrat survey/GPS unit and record sheets in field book.

Aquatic Study - Creek dipping, water quality monitoring, microorganism study. Use GPS unit, chemical test kits and record sheets in field book.

ENVIRONMENTAL WORK PROJECT – Garbage collection, tree seedling planting or other project as arranged with project leader.

TALKING CIRCLE – What did this place teach you about biodiversity in the local ecosystem? Share learnings in field book and as a large group.

Appendix IX: Colleagues' Stories

We share the following stories of teaching colleagues who, inspired by this research project, took their own Science 10 students to Brightwater (shared with permission from each of the teachers.):

John Wright – ‘Oh no. I’ll not go to Brightwater. Not unless you can lead the session, Marcia.’ John chose to engage in a writing project with Saskatchewan Professional Development Unit and Saskatchewan Learning to provide First Nations, Métis and Inuit perspective in Science 10. His involvement in the project with Joseph and Marcia (and many other teachers and Elders) created a relationship and willingness to take the risk to engage in a spring excursion with his Science 10 class at Brightwater in spring 2007. He continues to bring students to Brightwater and has since mentored other new teachers demonstrating a deep commitment and passion for the program, land and especially the First Nations component where students will sit with Joseph in the tipi or walk the prairies listening to stories of the land and the people. For more information about the SPDU writing project and the units created to support Science 10, check the SPDU website.

Jon Schwanke – ‘Hey do you want to see the GPS unit I just got so I can do a special project?’ Jon visited us while we (Beth, Susan and Marcia) were working on our Stirling McDowell writing at Walter Murray. Of course talk lead to an invitation to come out to Brightwater with his Science 10 class in fall 2007. A phone call confirmed that a day camp would not work as there was not enough time to get everything done. The grade 10s would sleep over, make 100 mile diet meals, go on a night hike, learn with an ethnobotanist - Brightwater facilitator Sandra Walker, study botany with Jeff Thorpe, learn about land management with shepherd Gerad Epp (his sheep and his border collie, Kate), hike the trails with Marcia to start an inventory of the site and focus on other coursework with Jon. This program lead to interest by teacher colleague Vince Mamer (Native Studies 30) and a totally integrated rich program in spring 2008. Vince has since mentored another teacher. So the story will continue . . .

Cody Dill – ‘I don’t know about a Science 10 field trip as I am an English teacher.’ Yet the students arrived from Nutana Collegiate and walked about the prairie and creek area for their studies with Marcia and Cody. They took many photos of the site. Sitting on the bank of the creek with a backdrop of white birch reflecting on the water, students gathered around Joseph Naytowhow, immersed in ideas about sustainability, responsibility and commitment. Students still remember this experience two years later – a powerful experience to rest on the creek bank with a traditional knowledge keeper.

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