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Teaching Dossier 2014

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1.0 Teaching Philosophy

I have a distinct memory of walking into the lecture hall—Science Theatre 140—for the very first class of my teaching career in 2003 and looking out at 400 faces staring back at me. The sense of responsibility that struck me at that moment was surprising and overwhelming. I realized that I didn't really know what it took to be a good teacher beyond having content knowledge and that I needed to get good at this—fast. I knew I had a responsibility to every one of those students, each an individual and each with their own motivation for being in my class, to provide the best learning experience possible.

My first years of teaching, I focused on honing the obvious: content mastery, lecture notes, classroom management. And apparently this work paid off. My teaching evaluations were good and my department chair was happy with my performance. But in my mind, something was lacking in my teaching. I began to question everything. Was the content I covered of real value to my students? Was it of real value to the discipline? Were my students engaging in surface or deep learning? How could I measure what kind of learning was taking place? I still wrestle with these questions, but now my decisions about teaching are guided by the statements outlined below that describe my teaching philosophy. My teaching philosophy is strongly rooted in student centered teaching: students need to know why it is important to learn the content, students are responsible for their own learning and need to be given the tools to take on that responsibility, assessment is part of the learning process, and the balance of power is shared between myself and my students. My decisions about how and what to teach are informed by the research on learning, my teaching experiences and ideas and feedback from my colleagues and mentors.

In my mind, learning and teaching are intricately linked. Teaching involves designing experiences for students that promote deep learning. Teaching also involves providing students with opportunities to practice using concepts, ideas and skills and continually providing them with feedback on their learning. Learning has occurred when my students have developed new ideas and understandings, have made meaning of the learning experience and have become more aware of themselves as learners.

Teaching is about designing and facilitating optimal learning experiences. Facilitators use their knowledge of how people learn, and their knowledge of the subject they are teaching, to design optimal learning experiences. These experiences are ones that enable and empower students in their learning of the course content, and help students take responsibility for their learning. My approach to teaching is built on a model where student engagement and empowerment is the foundation. For engagement, I use formal and informal active and collaborative learning strategies in all of my courses and provide frequent opportunities for practice and feedback. In large first year courses, students do in-class activities and learning assessments in teams. In smaller senior level courses, students work on term projects in teams, researching areas of the course content that are of interest to them. I also set up frequent opportunities for students to get feedback on their learning – small and large group discussions, in-class case studies, and informal quizzes give students and me feedback on their learning that students can use to adjust their study strategies and I can use to adjust my teaching to help maximize their learning..

Positive environments are imperative for learning. To me the right learning environment is one that empowers students by providing clear expectations, opportunities for practice and feedback, opportunities for dialogue, and opportunities for flexibility. My responsibility is to create and maintain these optimal environments. My objectives as a teacher are to have students understand the fundamental content of the course, develop critical thinking and problem-solving skills that they can apply to the content while reflecting on their own learning as the

course progresses. My expectations of students are explicit and transparent, allowing them to know what it takes to meet the course goals. By making expectations transparent and providing opportunities for practice, feedback and improvement, students can take ownership of their learning. This is accomplished through ensuring alignment of my course learning objectives with assessment strategies and teaching activities. I also make sure students understand what it takes to succeed in my classes. I achieve this by providing rubrics for assignments, examples of high-quality work, practice tests with explicit answer keys and opportunities in class to reflect on their understanding, ask questions, and revise their thinking.

Teachers need diverse strategies. To help facilitate learning, I use different teaching strategies. The strategies I choose depend on the size, focus, and needs of the students in a class. Strategies that I use on a regular basis include small and large group discussions, lecturing, and demonstrations. These strategies must take students' prior knowledge into consideration and provide students with opportunities to challenge their assumptions and create deeper understandings. I embed problem-based activities in my introductory courses where students are presented with open-ended geologic challenges they have to solve, requiring them to critically assess information and provide a rationale for their answer. These activities are also designed to challenge students' prior knowledge and help them identify misconceptions in their thinking. While students work on these challenging problems they have the opportunity to learn from their peers and receive guidance and feedback from the teaching assistants and myself. In a course on mountains for non-majors, they learn the course material through an inquiry-based project where they have to research a current topic and write a magazine article presenting a debate, case study or geologic challenge related to their topic.

Teaching should be informed by evidence. I strive to keep myself current in the fields of education research. My teaching practice has been strongly influenced by the major research findings on how people learn and instructional design. I ask my students for feedback to better understand how instructional activities they experience in my classes affect their learning. I use data collected from my classes to make decisions about future course modifications.

Teaching is a professional practice. Teaching is a practice that is developed through self-reflection and feedback from students, peers, and mentors over the course of one's career. It is also developed through participation in teaching communities and teaching development programs that challenge assumptions and beliefs about learning and practice. Some of my greatest and most challenging professional growth has come from student feedback and peer feedback from classroom observations. I constantly seek opportunities to improve my teaching through administering mid-course and end-of-course surveys, classroom observations, and input from critical friends. I continue to revise and deepen my ideas about teaching and learning by attending conferences, workshops, presentations and courses on teaching and learning.

Teaching is not a private endeavor. Teachers, like students, benefit greatly from sharing their experiences and expertise with each other. Teachers develop and learn when they work with colleagues. Development of an expert teaching practice comes from receiving feedback from others. I continue to seek out mentors and look for opportunities to work with my colleagues so I can continue to learn and grow as an educator

2.0 Courses Taught

Over the past 12 years I have had the opportunity to teach a variety of courses at all levels and class sizes in our undergraduate program. I have also taught in a variety of contexts including in-class and in the field. From 2002-2007 I maintained a common teaching load for instructors in the Department of Geoscience of 4-5 courses per year, along with service and teaching development activities. When I took on the Tamaratt Teaching Professorship position, my teaching load was reduced to half of the regular instructor load (2-3 courses per year), and my teaching assignments were aligned with the teaching and learning projects I undertook as Tamaratt projects. As a result, from 2007-2011 I taught two key courses: GLGY201 and GLGY301 each year and engaged in systematic redesign activities for these courses throughout that period. In 2012, I took on the Associate Dean Teaching and Learning position and my teaching duties shifted from teaching undergraduate geology courses to teaching workshops, and courses on teaching and learning for academic staff and graduate students in the Faculty of Science. In the winter of 2014, I taught a course for the Arts and Science Honours Academy (ASHA421) with Dr. Dave Cramb.

The table below is a summary of the courses I have taught in the past 12 years along with the number of times I've taught the course, and the intended purpose of the course (required for geoscience program majors, option course for program majors, option course for non-science majors).

Course Name and Number		Year Taught	Number of students
ASHA421	Inventions*	2014	19
GLGY201	Principles of Geology and Geophysics*	2011	225
		2009	165
		2008	200
		2008	188
		2006	198
		2005	280
		2004	400
		2003	350
GLGY301	Geology of the Mountain Regions of Western Canada+	2012	245
		2010	244
		2009	220
		2008	300
		2007	300
GLGY337	Introduction to Field Methods I*	2006	18
		2005	20
		2004	16
GLGY439	Advanced Geological Field Methods*	2007	22
		2006	18
		2005	22
GLGY541/641	Advanced Structural Geology^	2005	60
		2006	55
		2005	400

GLGY209	Introduction to Geology+	2004	400
		2003	400
		2003	70
GLGY555	Global Geology and Tectonics*	2003	60
GLGY311	Minerals and Rocks*	2003	70
		2001	70

* Required for program majors ^Option course for program majors +Intended for non-science majors

3.0 Teaching Methods and Course Development

Teaching and Course Design Methods

The teaching strategies I use in my classes are varied and depend on the types of students, class size, course logistics and learning goals. My teaching strategies and course design approaches are consistent with the main research findings in education and cognitive science research on how people learn. I have been informed and influenced by four key publications: How People Learn (Bransford et al. 2000); Understanding by Design (Wiggins and McTighe, 2005); How Learning Works (Ambrose et al. 2010); and What the Best College Students do (Bain, 2012). Research findings on student engagement have also influenced my decisions about my teaching practice (Kuh et al., 2001, Kinzie, 2010). This has been particularly helpful as my class sizes are large (>200 students), making student engagement a challenge.

In the first few years I taught, when designing a new course I would generally look at the course goals (the content I felt I had to cover) and create my lectures. If there was time, perhaps I would be able develop some learning activities. Assessment strategies always came last. As I studied course design models and delved further into education research, I realized my strategies served neither my students well nor me. I recognized that assessment had to become an integral part of any course planning I did, and that assessment should ideally be authentic, providing students opportunities to apply their understanding to real problems. Better assessment strategies would allow me to gauge where my students were in their level of understanding throughout the entire semester instead of just in the middle and at the end of semester when they took their exams. Better assessment would also allow students to get feedback and learn from their experience.

In the past five years, I have come to understand the power of formative assessment activities for the type of learning that I want taking place in my classes. Formative assessment provides students with the opportunity for practice, feedback and reflection and allows me to gauge students' level of understanding. I can then adjust my teaching strategies and activities to address areas where students may be challenged in their learning. Designing my courses is an iterative process that revolves around five key questions.

- 1) What are the understandings I want my students to come away with in this class? (Learning Goals)
- 2) What assessment strategies (formal and informal) will work best with the course content, class and student characteristics? (Logistics)
- 3) What assessment strategies will help students meet the desired understandings? (Assessment of Learning)
- 4) What learning activities will support and engage students in their learning, helping them achieve the course goals? (Learning Activities)

5) What do my students want to achieve / experience taking this course? (Student Interests)

Along with designing experiences for my students that capitalize on what is known about learning, I also work to ensure that my courses incorporate three key elements including: active and collaborative learning, practice and feedback, and authentic learning experiences. Examples of the kinds of strategies I use to design learning experiences are below.

Active and Collaborative Learning

The types of active and collaborative learning activities I incorporate into my classes depend on the nature of the class and the learning goals of the class. Examples include in-class problems and case studies, group projects, small group class discussions, large group discussions, brainstorming activities, minute-papers on a class topic and student peer review of writing assignments. I also work to make sure that students understand why they are being asked to engage in these kinds of learning activities and invite students' feedback on these activities and how they can be improved.

Practice and Feedback

In all classes and courses that I teach I embed opportunities for students to practice and get feedback on their learning. An example of how this was executed in large lecture introductory courses was the learning assessment activities I piloted in my Fall 2009 Introductory Geology class. These activities gave students the opportunity to complete in-class learning activities throughout the semester around the major concepts of the course. These assessments were graded, handed back and discussed in class. These activities provided students with timely feedback and also allowed me to see if my students' understanding of difficult concepts improved after it was taught in class—if it hadn't, then I knew I needed to spend additional time on that concept.

Authentic Learning Experiences

Meaningful understanding of a subject occurs when students are required to do more than recall facts. I want my students to have opportunities to work in the way that authentic geoscientists would work in their professional practice. I achieve this by having students work through case studies in class, read and assess primary research literature, and design assessments that include real-world scientific problems. When possible and appropriate, I design project assignments that require them to read, interpret and synthesize scientific work. And whenever possible, I incorporate real-world topics, events and controversies into class discussion. In large classes, it can be difficult to design learning experiences and assessments that incorporate higher-order thinking skills and require students to make meaning of the concepts. However, I have found even these large classes can be designed to include this kind of authentic academic challenge. A good example of how I have done this is with the research reading assignments that we incorporated into the course GLGY201. Students in the course read current research articles published by members of the Geoscience Department, and completed an article review activity.

Description of Select Courses Developed

All of the courses that I have taught, whether it is a course that is part of my regular teaching assignment or filling in for a colleague on a research and scholarship leave, have undergone modification to fit my teaching philosophy and best practices. In this section I have highlighted four courses that I have redesigned or designed from scratch: GLGY201, GLGY301, ASHA421, GLGY541 and GLGY439. An overview of the key developments for these courses are described in this section. For the courses GLGY201, GLGY301 and ASHA421, course materials can be found in the course portfolios included in the Teaching Section of OADM. I have also included a full

complement of the student comments from these courses in OADM and refer to how student feedback helped inform my course development.

Inventions (ASHA 421)

In Winter 2014 I was fortunate to have the opportunity to team-teach the course “Inventions,” a required course for students in the Arts and Science Honors Academy Program (ASHA) with Dr. Dave Cramb. This course gave me the opportunity to push myself into new teaching contexts as well as experience designing a course from the ground up in collaboration with a colleague. We started the design process by developing the course ‘big ideas.’ This was an iterative process that took place over a few months – and was informed by readings in the areas of inventions, scientific discoveries, innovation and creativity. Once we honed in on the big ideas and the specific understandings (learning objectives) we wanted for our students, we developed the assessment strategies for the course including the assignments and assessment rubrics. Finally, we started planning the learning activities we would use in class to help students achieve the intended understandings. This was a small seminar-style class (19 students) so we also had to plan learning activities that focused on readings, discussions, and the presentations we designed for the course to be given by our students. ASHA421 was a great experience in designing a course from the ground up in a collaborative context.

Geology of the Mountainous Regions of Western Canada (GLGY301)

I took over this course in 2006, which has been previously taught as lecture-intensive with no labs or textbook. My initial modifications included redesigning the lectures both in form and content and developing a course website and course support materials that could be posted online (readings, lecture notes, practice quizzes). In 2007 I closely examined the learning outcomes and realized that they mainly focused on content and were not related to scientific literacy. I decided to modify the course learning objectives to include topics related to science literacy including reading and writing about scientific topics, science in society and the nature of geoscience research. For 2008 I decided to radically modify this class design to improve student engagement and give students the opportunity to meet the evolving learn goals. This modification included reducing the lecture time by half and replacing the lectures in the second half of the semester with a structured team project. I developed class discussions and class activities to implement during lecture portion of the class. A list of the key changes I made to the course are described below.

1. Modification of the course content to include topics on geoscience literacy as they relate to the mountains of western Canada. (2006)
2. Modification of the tests to include questions that emphasize synthesis and application of content and knowledge rather than focus on factual recall. (2006)
3. Development of case studies to use as in class lecture activities. (2007)
4. Modification of the course design to incorporate a half semester-long team project. (2008) Project focused on students learning about a topic related to the mountains of western Canada and writing a magazine article on their topic. General areas of research included resources and the environment, glaciers and climate change, geologic hazards (earthquakes, volcanoes and land slide risk), mountain recreation, geology / plate tectonics and mountain building.
5. Revision of team project rubric and implementation of a peer review process for the team project assignment. (2009 & 2011)

Introduction to the Geosciences (GLGY201)

I took over this course in 2003. Since then I have made significant modifications in content, method of delivery and forms of assessment. These changes were made based on student feedback, consultation with colleagues and implementation of best practices in teaching. Key changes that I implemented to GLGY201 since 2003 are listed below. The changes that were made to the course in 2009, 2010 and 2012 were done in conjunction with graduate students who were part of the Tamaratt Teaching Fellowship Program.

1. Development of clear course learning objectives. (2003)
2. Modifying lecture material to better fit the lab material. (2004 & 2005)
3. Developing laboratory introduction podcasts to ensure that all students received the same background information necessary to complete the assignments. (2007)
4. Implementation of in-class lecture learning assessments before and after each major unit in the class to provide students with better feedback on their learning. (2008)
5. Development of rock and mineral kits available in the library for students to practice and study with in preparation for their laboratory tests and assignments. (2009)
6. Development of case study problems on current geologic topics coinciding with the concepts taught in class. These case study exercises were embedded into the lectures. (2009)
7. Modification of the learning assessment activities to include a follow-up class for students to engage in self-assessment, review and reflection. (2010)
8. Redesign of the learning assessments to embed real world geologic examples. (2011)
9. Development of research literature reading assignments to help students learn to read primary research literature. (2012)

Mapping in Igneous and Metamorphic Terranes (GLGY439)

GLGY439 is an intensive field course where students spend two weeks in an area with igneous and metamorphic rocks and make a geologic map, cross-section and field report. This course is challenging for students both mentally and physically as they travel to areas they have never seen before (e.g. Death Valley, CA, Taos, NM, Bishop, CA, Big Bend, TX) and work in new environments with terrain full of cacti and snakes to study challenging geology they have not experienced in a real world setting. After teaching the course in 2005 and reflecting on my personal experience and the students' feedback, I redesigned two key components of this course to improve how students got feedback and how they prepared ahead of time for the experience.

To improve students' preparedness I designed an assignment where students were required to research the field area we were going to ahead of time and write a technical report that was submitted, graded and handed back before we left. This replaced the written field report that students usually completed as part of the course requirements at the end of the experience. The rationale for redesign was two-fold. First, it addressed comments I'd received the previous year during the 2005 field course in Big Bend, TX from both students and faculty that the students never received feedback on their technical writing, and also that they knew nothing of the field area before they arrived. Having this prior knowledge from their technical report allowed students to delve right into the mapping exercise in 2006 and achieve a greater understanding of the complexities of field mapping than previous sections. The second reason for this pre-field school assignment was to provide students with a more realistic experience of field mapping. In professional practice, geologists embarking on a field-mapping project would prepare themselves with all the background information on an area and I wanted students to experience what that pre-field preparation work is like.

The second change I made to the course was to introduce an oral exam component. The purpose of this exam was to assess students' understanding of the concepts and to provide them with feedback on their map and cross-section before their final copies were handed in. In the exam, students would bring a copy of their field map, which was nearing completion. The questions they were asked were designed to have them explain the interpretations they had made and what evidence they had used to make that decision. The timing of the exam was such that they had the opportunity to visit the field area for one more day, so students would describe where they would go and why they would go there. The oral exam was greatly beneficial to students and an important improvement to the course in the area of feedback.

Advanced Structural Geology (GLGY541)

I had the opportunity to teach this course twice in the same year in 2005. As a teaching assistant for this course in previous years, I was familiar with the content, but in 2005, I was relatively new to teaching as an instructor. In the first iteration of the course, I followed the design of traditional lectures three times a week, weekly lab activities and an intensive term-long project where they applied the skills to a real-world data set. After teaching it that first year and reviewing student feedback, I saw two areas for improvement: more opportunities for students to work on practice problems during class and more opportunities to provide feedback on their project. Their feedback really resonated with me because I remembered as a TA for this course that students struggled with taking the lecture concepts and applying them to the weekly lab activities. The following semester, I redesigned the lectures to include student work on problems (ahead of the labs) as well as demonstrating how the lab content connected with the concepts covered in the lectures. While I didn't teach this course again, the design principle of strongly and intentionally connecting theoretical concepts from lecture to practical applications in labs has remained with me and I ensure that this connection is made in my courses.

4.0 Efforts to Improve Teaching

I am constantly working to improve my teaching practice. I see my teaching as a professional practice that requires continual development through intentional actions on my part. These actions include

- Personal reflection on teaching experiences
- Reflecting and acting on feedback from students
- Seeking feedback from peers
- Attending courses, workshops and seminars
- Attending conferences on teaching and learning
- Utilizing research on teaching and learning
- Engaging in the scholarly teaching and learning projects*
- Presenting teaching ideas and research at conferences*

*Described in section 6.0 of this dossier.

Personal Reflection

At the end of each course I teach I make time to write a reflective memo on how I thought the course went. This allows me to record my impressions and experiences in the course as well as identify aspects of the course or my teaching strategies I want to modify in the future and devise an action plan. In the last few years I have used a modified version of the 'critical incidences' questionnaire of Brookfield (1995) to structure my reflective memos. This questionnaire focuses on the course as a whole and gets me to think of the aspects of the course I thought were particularly effective and engaging, and the aspects that weren't. From this activity I come up with an action plan for the following year, identifying 2-3 key changes I could make to improve

the course. An example of a post-course reflective memo from the ASHA421 course I recently taught can be found in the Course Portfolio.

Student Feedback

Student feedback has played a huge role in my teaching development. I am constantly seeking students feedback throughout the course through informal conversations before/after class, mid-course feedback forms, and questionnaires at the end of class that allow students to report on their experiences. I also utilize the student comments on the Faculty of Science Student Opinion of Teaching questionnaire. I use end-of-course feedback available to me and review their comments and modify or enhance the action plan I have developed from my post-course reflections. If the course had other instructors and teaching assistants (TAs) as part of the instructional team, I will seek input from them based on their experiences with the students. Typically I will do this in a meeting after the course is over. Early in my career, student feedback on the questionnaire was exceptionally helpful. Students in a field course (GLGY439) I taught indicated that they struggled at times because they felt aspects were disorganized and I used that feedback to make improvements to the course design. Students in GLGY541 provided feedback to me about my lectures and how they wanted more than was on the lecture slides. This was really transformative feedback as it got me thinking about the value of face-to-face class time and what we should be spending our time together doing. I began to structure my classes so lecture time included case studies, small and large group discussion, intentional time for questions and feedback.

Over the last five years, I have built in time during the semester to get student feedback and input. I have found this feedback invaluable as it allows me to make adjustments in real time, not just for the next iteration of the course. In large classes, I use mid-course feedback forms to get a sense of what is working and what could change; in small classes I create opportunities in-class for dialogue at periodic intervals through the course. In ASHA421 for example, there were two key moments where student feedback changed the direction of our activities. The first occurred when we were discussing creativity and inventions, and how creative spaces can influence creative practice. The students commented on the space that our class was held in (a small windowless room with 1970's style furniture and décor) and how it wasn't a space that enhanced creative thinking. Dave and I took that feedback and scheduled our next class to take place on the grand staircase in the EEEL building, a space with lots of natural light, interesting art and features, and a sense of openness. We held classes in this space while students worked on their upcoming group presentations. There was a buzz of excitement and students were spread out over the staircase, and occasionally passersby would inquire about what they were doing. In our final class of the year, we did a feedback session and it was that class on the EEEL staircase in response to their comments that they identified as a transformative moment in the course. A second critical moment in the course when we responded to students' feedback was as they were starting to work on their capstone project – a proposal for an invention of their own. One week earlier we had students present a proposal of their invention idea to the class for feedback, however we ended up not having a lot of time for students to give each other feedback at the end of each presentation. While Dave and I provided one-on-one feedback after that class, the following week a student made a comment that she was disappointed that there wasn't more time to get feedback from her class peers. We took this comment and determined that having students give feedback to each other was important for both getting feedback but also in the practice of giving feedback, so we designed a class that allowed them to do so. Students at the end of the course recalled this responsiveness as communicating a strong message of support to their learning and enhanced their motivation at a time in the semester when they were normally feeling tired and low-energy.

Peer Feedback

I solicit peer feedback in two ways—through discussions and through having colleagues observe and provide feedback on my teaching. I've made a point of finding peer mentors who will both support me in my teaching development and challenge me. It is through these challenges I been able to recognize some of my blind spots and overcome biases. An example of how peer feedback helped me occurred in ASHA421. This is the first discussion-based course I have ever taught. At the end of the first three weeks, I found myself feeling anxious during and after class. I shared this with a colleague who helped me identify the source of the anxiety, which was rooted in feeling like I wasn't teaching because I wasn't lecturing, but instead facilitating students' discussions on the readings. Although I had espoused that this was the way in which I wanted to design my courses, the actual implementation challenged my deeply held beliefs about my role in the classroom. Discussing this with my colleague helped me identify my concern that students in the class would think that I wasn't teaching them. Peer feedback has been especially helpful to me when I have undertaken major course redesign initiatives. For example, when redesigning GLGY301 to include a team project component I sought input and feedback from instructors I knew who had experience doing team projects and I also sought feedback from instructional designers at the Teaching and Learning Centre. These conversations helped me plan the team project component more effectively and provided insight into the challenges, helping me avoid common pitfalls.

I also have solicited peer feedback through classroom observations. This began in my first year of teaching. A colleague observed my teaching and provided feedback on my classroom presence and pointed out some unconscious behaviors I had that were distracting (such as favoring one side of the classroom and pacing in a routine pattern). Later, in my teaching career, when I was implementing active learning strategies in GLGY201, I had a peer conduct 15 classroom observations over the semester using a structured observation protocol (RTOP), which helped identify how the learning activities were affecting students' experiences and engagement. This was especially helpful as the class was large (200 students) and it was hard for me to make unbiased observations of the class while I was teaching. The results of these observations can be found in the course portfolio for GLGY201 in the appendix of this dossier.

Courses, Workshops and Seminars

Engaging in formal professional development activities such as courses and workshops is an important part of my continual improvement. I enjoy learning in structured learning environments that courses provide as much as I do in the informal experiences through coffee with colleagues. I make an effort to engage in formal professional development activities every year. Earlier in my career I relied heavily on workshops and seminars to get ideas for my own practice. Over the last five years I have attended fewer teaching and learning workshops but have increased my participation in conferences related to teaching and learning. A complete list of the courses and workshops I've taken to improve my teaching can be found in my CV.

Conferences on Teaching and Learning

Attending conferences has helped me network with teaching and learning experts from across the country and both learn about current trends in teaching and learning as well as present and get feedback on my scholarly projects. Conferences I have attended include: Society for Teaching and Learning in Higher Education (2011, 2012, 2014), University of Calgary Teaching and Learning Conference (2014), Professional and Organizational Development Annual Conference (2013), American Evaluation Association Annual Conference (2009), International Society for the Scholarship of Teaching and Learning (2012), American Education Research Association Annual Conference (2009), Geological Society of America Annual Conference (2007, 2008, 2009, 2010) and the Geological Association of Canada Annual Meeting (2003, 2005, 2006).

Research on Teaching and Learning

I stay current in developments in teaching and learning by regularly reading relevant journals and books. The journals I subscribe to include: Journal of Faculty Development, Science Education, Teaching and Learning Inquiry, Journal of College Science Teaching, Canadian Journal for the Scholarship of Teaching and Learning, Higher Education, and To Improve the Academy. Most recently the books that have influenced my approaches to teaching include: *Mindset* (Dweck, 2007), *Creativity: Flow and the Psychology of Discovery and Innovation* (Csikszentmihalyi, 2012) and *What the Best College Students Do* (Bain, 2012)

5.0 Educational Leadership

I began thinking about leadership in the first year of my teaching career in 2002. I saw leadership skills as something that would enhance my teaching by helping me design better learning experiences and motivate and connect with my students. Teaching very large classes pushed me to think of myself as not only a teacher and subject matter expert, but as a leader of the students in my classes. I never wanted to rely on authority and power to get students to engage in learning, rather I wanted to co-create learning experiences alongside with my students.

Ten years after I first began teaching, Faculty of Science Dean Dr. Ken Barker appointed me to a newly created educational leadership position in the Faculty of Science: Associate Dean – Teaching and Learning. I was excited by the opportunity, believing that it was a natural progression from being the Tamaratt Teaching Professor in Geoscience (2007-2012) and leader of the educational development program Project Engage (2009-2012). I also believed that this role would be challenging and rewarding.

Now two years into this position, I find myself in a leadership role where I am able to help build a vision for teaching and learning in the Faculty of Science. It is a position where I am able to create the community and opportunities necessary to empower my colleagues and empower the people within departments and programs to meet the learning goals they have for their students. This position is challenging, rewarding and exciting. Success in this role will be if we have been able to build educational leadership capacity in the Faculty and shift the teaching and learning culture towards one where student learning is at the heart of all discussions and decisions about teaching.

In my time in the Tamaratt position and now as Associate Dean, I have reflected on the qualities of effective educational leaders and the qualities I aspire to develop. I constantly strive to improve my leadership skills through critical self-reflection, mentors, and taking leadership courses. I use the leadership framework of Kouses and Posner (2007) as a guide to my leadership practice, which is built around five key characteristics of effective leaders: (1) model the way; (2) inspire a shared vision; (3) enable others to act; (4) encourage the heart, and (5) challenge the process. I believe that effective leadership transforms people and organizations to reach their maximum potential. Doing this requires an array of skills and knowledge of leadership, organizational change, and a deep understanding of the function, values and goals of the organization.

Leadership Philosophy

Leaders model the way. I believe that to be an effective and credible leader, I must model in my everyday actions the things that I say are important. I am especially mindful of this when talking to my colleagues about the teaching and learning experiences we want for our students, because I know that to be credible I must also provide our colleagues with the same types of experiences and support that I advocate for our students. An example of where I strive to model this is in our

evaluation and feedback practices of teaching. In teaching skills workshops for faculty members, we encourage people to provide students with frequent opportunities for feedback on their progress, as these practices are imperative for learning. However, faculty members aren't often provided with opportunities for feedback on their teaching. Over the past year I have been working with the Science Department Heads on strategies for changing the ways we evaluate teaching to provide more opportunities for formative feedback for growth.

Leaders meet people where they are. I believe it is critical for leaders to understand people's experience, beliefs, and culture / context within which they work. Everyone's situation is unique; effective educational leadership means finding out what works best for an individual, team, Department or Faculty at that point in time. Effective leaders take the time to listen, determine where people are at, and help them act accordingly. It is equally important for leaders not to assume that strategies that have worked in one context will automatically work in another. I enact this belief each time I do one-on-one coaching with faculty members. Some faculty members are seeking new ideas, lots of feedback, and someone who will push them to the next level. Other faculty members I coach have been asked to work with me by their Department Chair and may be struggling with readiness for change and concerned about the risk involved. While both of these cases are different I approach them from a similar stance of helping them define their goals, recognize their strengths and working with them to develop a plan that suits their aspirations.

Leaders inspire a shared vision. I need to be clear on my leadership vision and work to inspire a shared vision for the future of teaching and learning in the Faculty. I find this challenging as it requires a balance of seeing the future potential and goals as well as allowing that vision to be malleable so it can be informed and enhanced by everyone involved. The Graduate Attributes Framework project is an example of how a vision was developed through an inclusive and participatory process in the Teaching and Learning Committee for the Faculty of Science. While I brought the initial vision to the Committee for us to work on, I explained that we needed to work as a group to enact this vision. Through that process, the wisdom of the group also helped revise and improve the vision. The first part of the process involved helping our colleagues see why a Graduate Attributes Framework would be beneficial to students, faculty members and programs. This was done through discussions at Faculty Council, Department Councils, Science Teaching Forums, focus groups and one-on-one dialogue. As the vision started to build, members of the Teaching and Learning Committee starting writing the first draft together. We used a participatory decision making approach to come to consensus and did not move forward until everyone on the committee was comfortable with the content of the framework. We then sought input from our stakeholders—students, staff and faculty members—over eight months of consultation. Each group we met with was invited to help us build and improve this document and their input became an integral part of the final document, which was approved in January 2014.

Leaders enable others to act. Empowering others is very important to me and I try to enact this in numerous ways. First, by providing resources people ask for—not what I think they need—that allow them to work in ways that are meaningful to them, and second by providing mentorship. In my current position I spend a lot of time supporting people in their teaching. My approach to mentoring is to provide a supportive environment where people I am mentoring can reach the goals they set for themselves. I find out what they are interested in developing, changing, or trying to understand and act as a support person to help them set goals and achieve them. It is through this approach of a mentor working for and with the mentee that I have found people that I have mentored have experienced profound growth. An example of this approach in action is most recently I worked with a colleague who had been consistently receiving low student course ratings and negative student comments. They came to me wanting to improve

these scores but had no idea how. We worked together for 6 months; meeting on average 2 times a month. Through that time we worked together to identify some aspects of their teaching that could be modified within their comfort level, and then devised a plan for implementation. After a successful term teaching with some new strategies, student course evaluations improved dramatically.

Leaders challenge the process. I believe it is the role of educational leaders to envision new ways of seeing and doing with results sometimes being change to the processes and culture of an institution, even if this makes us uncomfortable. In the Faculty of Science we had been using the same Student Opinion Teaching Questionnaire since 1984 (in conjunction with the USRI survey). This questionnaire was developed as a means to collect qualitative student feedback on our faculty member's teaching. Despite many faculty members expressing dissatisfaction with this instrument—one of the major concerns being that the questions were so general, they didn't provide meaningful feedback—changing it made some people very uncomfortable. With a small working group last winter, we set out to develop a new questionnaire with four revised standard questions and a question bank where faculty members could select an additional two that were aimed at the kind of feedback they are interested in receiving. We piloted the new questionnaire in 20 courses and we're gearing up to collect widespread feedback from faculty members and students in Science over the next six months with the intention of implementing this new questionnaire across the Faculty in Fall 2014.

Leaders seek mentors and feedback. It is imperative as a leader that I recognize when a direction should be altered to better suit the needs of the projects, initiatives and people who are impacted by the outcomes. In my current role, I continually seek out and act on the feedback I receive from students, faculty members, project staff, program participants, committee members, and Department Heads. I use that feedback to make decisions and help identify the next course of action. For example, in our 2013 Teaching Skills Workshop program, we collected feedback after every session to find out what participants found valuable and what they would recommend improving. We found that our workshop participants saw value in peer review activities where they received feedback on their teaching from colleagues at their table, but they requested that these activities be better structured. Activities that were less structured with no guiding questions to follow, led to feedback sessions that for some pairs were unproductive. We used this information to develop peer review guidelines for our participants. Mentoring has had a profound and positive affect on my professional life. I am very fortunate to have excellent mentors at the University and in the broader educational community who help me hone my teaching and leadership skills. I meet with my mentors regularly and ask for critical feedback. I also attend courses and workshops on leadership and use the knowledge I gain as a basis to reflect on my leadership skills and practice.

Educational Leadership Initiatives

As the Faculty of Science Associate Dean of Teaching and Learning, I have the opportunity to initiate new projects as well as modify successful programs I led during my tenure as the Tamaratt Teaching Professor and apply them more broadly across the Faculty. My work in the field of educational development has always been based on the current research on STEM teaching in higher education (i.e. Henderson et al., 2011), personal reflections on my pedagogy, and the evaluation of data I have collected from students, teaching assistants, and project participants. My work is also based on a strong belief in building teaching and learning communities; to that end, I recruit experienced academics in the Faculty of Science to help deliver the programs, share their extensive teaching experiences with participants, and provide feedback.

The following describes the programs and initiatives I have developed and led for the Faculty of Science in my position of Associate Dean.

Faculty of Science Teaching and Learning Committee (2013-present)

In January 2013, following the adoption of the new governance model for the Faculty of Science, I initiated the Faculty of Science Teaching and Learning Committee. This committee is made up of academic staff from each science department, student representatives and external appointees. As a new committee to the Faculty of Science, the first task was to create the committee's terms of reference, identify what teaching and learning needs we should be addressing, and develop a work plan that not only addressed those needs but supported the Faculty of Science Strategic Plan and the University's Academic Plan for teaching and learning. A key accomplishment in our first year was the development of the new Graduate Attributes Framework for the Faculty of Science; a comprehensive document that describes, in broad terms, the desired knowledge and skills that students graduating with undergraduate science degrees would develop over the course of their programs. For an overview of the committee work plan and mandate I have included the committee year-end report for 2013 in the Discretionary Materials section of OADM.

Faculty of Science Graduate Attributes Framework (2013-2014)

The Graduate Attributes Framework document outlines and describes the big picture learning objectives for undergraduate programs in our Faculty. The attributes described in this document are those that we want our students to possess by the time they graduate. This document was developed by members of the Teaching and Learning Committee in the Faculty of Science under my leadership as committee chair. In January 2014, it was officially adopted at Faculty Council as a guiding document in a nearly unanimous vote. The intended use of the Graduate Attributes document is as a resource for Departments and Programs to facilitate program planning and evaluation, curriculum mapping, the collection of data on student learning, and program redesign. This kind of document was new for the Faculty of Science and when the concept was first introduced in January 2013 it was met with curiosity and apprehension. Members of the committee developed the Graduate Attributes Framework document over a two-month period (January-February 2013) and then we worked over the next eight months to run focus groups in their Departments with faculty members, undergraduate and graduate students.

Revising the Student Opinion of Teaching Questionnaire (2013-present)

In 1984, the Faculty of Science created a long-answer questionnaire for students to complete at the end of the semester along with the USRI survey. This questionnaire was developed as a means to collect qualitative student feedback on our faculty member's teaching and consisted of the following four questions:

1. Will you please comment on your impression of the instructor's ability to teach this course (for example: the instructor's knowledge of the subject, ability to organize it into a series of logical lectures, lecturing skills, clarity, focus on topic, enthusiasm, etc.)
2. Will you please comment on the student interaction skills shown by your instructor (for example: were exams handed back within a reasonable time, were they realistic in the coverage of the course material, was the marking fair, was the instructor approachable, responsive, considerate, etc.)
3. Will you please comment on your reaction to the content of this course (for example: was there enough, too much or too little material, was the text suitable, was the course material presented at a level suitable for your understanding).
4. What one thing would you suggest could be done to improve this course?

Over the decades, many faculty members have expressed dissatisfaction with this instrument—one of the major concerns having been that the questions are so general and multi-faceted they don't provide meaningful feedback. I led a small working group of six faculty members (one from each Department) during Winter 2013 with the goal of developing a different questionnaire. The new questionnaire consists of four new standard questions (below) with the option for faculty members to include another two available from a question bank. The optional questions could be aimed at specific feedback faculty members were interested in receiving on, for example, a specific teaching strategy the instructor has introduced into the course.

1. What did the instructor do that helped your learning in this course?
2. How could the instructor modify the course to further support your learning?
3. What aspects of the course gave you the most useful feedback on the progress of your learning?
4. A) What did you like about the assessment methods? B) How could the assessment methods be improved?
5. Optional question #1 (selected from a list of optional questions or written by the course instructor)
6. Optional question #2 ((selected from a list of optional questions or written by the course instructor)

The working group members, along with ten additional volunteers piloted this new questionnaire in courses they were teaching in the winter and fall semesters of 2013. From that experience we revised some of the questions and added to the question bank. We are now at the stage of engaging the entire Faculty in the process of re-thinking our questionnaire. From February through July 2014 we collected widespread input and feedback from faculty members and students from each Department. We are in the process of further revising this questionnaire based on the feedback we receive through this process. Our goal is to have the Faculty adopt a new questionnaire for a large-scale pilot in Fall 2014.

C-LAB Educational Development Program (2013-present)

C-LAB (Classroom-Learn-Assess-Build) is a twelve-month program based on Project Engage, which I developed and implemented from 2009 to 2012. Project Engage was an initiative of the Provost's Office and provided selected faculty with the support and resources they needed to improve the learning experiences of students in their first-year arts and sciences courses. The project introduced participants to the "Understanding by Design" teaching model and provided feedback through classroom observations and student surveys. Analysis of data collected during and after Project Engage helped inform the modifications made to the C-LAB program.

In C-LAB, faculty members design, implement, and assess a teaching and learning research project. Through this program, they learn the skills and knowledge needed to conduct a research project including: a review of the education research on science teaching and learning, methods to integrate research on learning into course design and activities, and training for data collection and analysis techniques. Support for implementation and evaluation of each participant's research project is provided throughout this collaborative initiative from the program staff and other participants. Participants choose one of their classes for the design and implementation of their research project, turning the classroom into a lab for a semester. I co-lead this program with Dr. Cindy Graham. A detailed description of the C-LAB program can be found on the web page: http://www.ucalgary.ca/science/teaching_learning/c_lab.

Teaching Skills Workshops (2013-present)

Prior to the development of this workshop initiative, I developed and facilitated numerous teaching skills workshops for University of Calgary faculty and graduate students as the Tamaratt Teaching Professor. I also had the opportunity to deliver talks and workshops at other North American institutions as one of the geoscience education researchers selected for the National Association of Geoscience Teachers Distinguished Speaker Series (2010-2013). A needs assessment on teaching development conducted by Dr. Cindy Graham and the Faculty of Science RAISE group (Research and Instruction in Science Education) in 2008/09 indicated the desire on the part of science faculty for workshops on teaching skills. As Associate Dean, I wanted to address this need and, using my previous workshop experiences, developed the Teaching & Learning Teaching Skills Workshop Series. Topics of the workshops focus on practical teaching skills and issues that arise during a semester (such as creating effective classroom learning environments, grading and assessment, and getting feedback on teaching). Participants spend the majority of each two-hour workshop connecting with colleagues while planning or working on activities that can be applied to their own teaching context. The workshops are scheduled in series, and run in the fall, winter and summer. In the first year of workshop offerings, one third of all science faculty members attended at least one of the workshops. Dr. Cindy Graham, Dr. Heather Addy (Senior Instructor, Biological Sciences), Dr. Nicole Sandblom (Instructor, Chemistry/Natural Science Program) and I share the facilitation of the workshops. Along with creating the workshop program, I also wanted to find someone who could take over running the program once it was established. In 2012, I approached Dr. Heather Addy, who expressed a keen interest in getting involved with educational leadership in the Faculty. In January 2014, Dr. Addy took over the program. I still develop and facilitate workshops in this program, under Dr. Addy's leadership.

Workshops we have offered to date include:

- Getting it right on the first day of class
- Difficult conversations with students
- Teaching students to ask good questions
- Designing and conducting a mid-course evaluation
- Grading efficiently, consistently and effectively
- Getting over the mid-term slump: strategies for re-energizing your class
- Preparing effective exam review materials and sessions
- The post-semester reflective memo: identifying successes, areas for growth and a plan for future course development

An overview of the workshop program can be found at the webpage:

http://www.ucalgary.ca/science/teaching_learning/workshops

Science Teaching Forum (2013-present)

The Science Teaching Forum is based on the Geoscience Brown Bag Teaching Discussion Group (2008-2012), which I created and facilitated during my Tamaratt Professorship. It is also modeled after the RAISE group's Cookies and Learn discussion series lead by Dr. Cindy Graham (2007-2010). The forum is a place to learn about and discuss ideas around teaching and learning in science and are open to everyone in the Faculty of Science including faculty members, graduate students and staff. Speakers are typically from the Faculty of Science and are recruited or (ideally) volunteer to present an issue, activity or idea relevant to teaching and learning, followed by a discussion that allows for a broader exploration of the ideas and issues presented. Our goal is to have a balance between hearing about the experiences of others and participants sharing their own ideas. This exchange is meant to facilitate communication about teaching and

learning and create a sense of community in the Faculty of Science. Two faculty members in Science who expressed an interest in being involved with educational leadership opportunities—Dr. Rob Edwards and Dr. Wendy Benoit—developed and have run the forum since its inception in January 2013. In September 2014, two new organizers will take over: Dr. Alfredo Louro and Dr. Jen Cuthbertson. The forum serves not only as an opportunity for members of the Faculty of Science to discuss topics in teaching and learning, but it also as an opportunity for faculty members to take on leadership roles.

Peer Mentoring (2012-present)

One-on-one coaching is one of my favorite aspects of my current position. I deeply enjoy working closely with colleagues to help them achieve their teaching goals. I began mentoring colleagues in the Tamaratt position on aspects of their teaching practice including class observations, course design, teaching dossiers, classroom management issues, and helping set up scholarly teaching projects. I have shared teaching materials I have developed as part of this process, and have also benefitted from these mentoring relationships as I learn a lot from my colleagues. I follow the Instructional Coaching framework of Knight (2007), which places the coach/mentor in the position of facilitating dialogue with the person they are supporting, working with them to identify their needs, developing a plan and supporting the implementation of the plan. Following this model, some mentoring sessions have consisted of a meeting and one follow up; others have required over 20 face-to-face meetings. In my role as associate dean, I have mentored a number of colleagues who have been encouraged to see me after receiving consistently low student USRI ratings. These are challenging situations as people are often feeling embarrassed about the results; uncertain of what they need to do improve, and unsure if they have the capability to succeed. The results of this mentoring have been positive. In follow-up sessions, colleagues report feeling more confident, implementing new strategies and enjoying their teaching experience. I intend to expand the network of mentors across the Faculty of Science over the next three years and to evaluate the impact of this network. Some insight into the impact that mentorship has had on academic staff in the Faculty is included in the support letters from Dr. Dave Cramb and Dr. Kyla Flanagan.

Academic Leadership Program (2013-present)

Throughout my career, I have taken numerous professional development courses; some of which were designed to help me manage challenging issues such as conflict resolution and leading diverse groups. Having experienced the benefits of such courses myself, I realized that faculty members needed more opportunities to develop different skills as they moved through their academic careers. The Academic Leadership Program is aimed at those who want to more effectively lead established research groups or academic colleagues both within the University and beyond. The three-month program provides practical techniques to ensure that team members are able to maximize both individual and group goals. It helps participants become more effective leaders and better understand the unique challenges faced when leading fellow academics from graduate students through to international research leaders. The course format features small group discussions and peer feedback on leadership styles and problem-solving tactics. The program also includes one-on-one leadership coaching. I co-facilitate this program with Marty Heeg, Senior Consultant, Organizational Development and Change Management at the University of Calgary. An overview of the program can be found at the webpage: http://www.ucalgary.ca/science/teaching_learning/alp.

Developing Leadership Capacity & Building Partnerships (2012-present)

In addition to developing and facilitating new Faculty of Science programs, as Associate Dean, I have also been working with our department heads to identify teaching and learning leaders throughout the faculty in order to involve these individuals in the implementation of our initiatives such as the Teaching Skills Workshop, Science Teaching Forum and the Teaching and

Learning Committee. I believe very strongly that our expertise around teaching and learning should be shared and distributed across the Faculty (and University) and working with these emerging leaders builds educational leadership capacity within the Faculty of Science.

I am also actively involved in building partnerships with my Associate Dean colleagues in three other Faculties—Werklund School of Education, Faculty of Arts, and the Schulich School of Engineering—who are interested in partnering on projects as well as learning from what we are doing in the Faculty of Science. The Schulich School of Engineering has partnered with our Teaching Skills Workshop program and together we have been able to offer workshops that complement teaching in our respective disciplines as well as help people meet and network with colleagues from other faculties. We are currently partnering with the Werklund School of Education on an exciting proposal for a CRC Tier II SSHRC Research Chair in Creativity in STEM education and I hope to continue building strong relationships between our Faculties. I am also providing support to my counterpart in the Faculty of Arts, Dr. Michael Ullyot, in several areas: 1) Teaching one of the required courses for the Arts and Science Honours Academy Program; 2) Sharing my associate dean terms of reference so he has a guide on which to build his portfolio; and 3) Providing support in building the Faculty of Arts' D2L transition plan.

Teaching and Learning Initiatives Program Evaluation

In the Tamaratt position, I developed a keen interest in program evaluation. This interest stemmed from wanting to understand the impact that Project Engage had on the program participants. With no formal training in program evaluation, I sought out experts and invited them to work with me. After meeting Dr. Julie Sexton, a program evaluation and assessment expert at a 2007 conference, I hired her as an external evaluator for Project Engage. I have continued my interest in program evaluation and have taken several courses through the Evaluator's Institute at George Washington University. I am currently working with Dr. Susan Hines from the University of Minnesota, who I met at the Professional and Organizational Development Network Annual Conference in 2014, on developing a program evaluation plan for the teaching and learning initiatives for the Faculty of Science that we can begin implementing in 2015.

Faculty of Science Transition to Desire2Learn (2013-present)

In January 2014 the Faculty of Science transitioned from the learning management system Blackboard to Desire2Learn (D2L), four months ahead of the scheduled university transition to D2L in the spring of 2014. When this was announced to the Faculty of Science was met with concern, frustration and anger. As we started to receive negative feedback, I sought out advice from change management experts in HR as well as colleagues and with my colleague Dr. Cindy Graham, quickly devised a support program that involved workshops (developed and facilitated by educational technology experts in the Taylor Institute and IT) as well as hired, trained and implemented a D2L coaching team of graduate students who provided online and face-to-face support for any user of D2L in the Faculty of Science. I empowered the coaches to make decisions on what they thought was best for our faculty members, and our coaches worked seamlessly with the IT team to bring concerns and issues to their immediate attention. This resulted in a successful rollout of the D2L program in Science, and we have since shared our experiences and model with colleagues in other Faculties who are building similar models of support for the full-scale D2L roll out this fall.

The educational leadership activities I conducted in my role as Tamaratt Teaching Professor are described below.

Project Engage (2009-2012)

This was a faculty development program I co-created and piloted through the Office of the Provost as part of an institutional response to low engagement scores on the National Survey of Student Engagement (NSSE). The focus of the program was to help faculty evaluate and improve student engagement in first-year Arts and Science courses using an evidence-based approach. To accomplish this, a group of faculty was given the opportunity to evaluate and redesign their courses over a 16-month time frame with the support of human and financial resources. There were nine faculty members participating in this project. We also evaluated the program's impact on the institution, participants and students. To date, I have presented the work I did for Project Engage at the Society for Teaching and Learning in Higher Education conference and have just submitted a paper to the Journal of Faculty Development with my co-authors on the impact of the program on participants' teaching knowledge and skills. This manuscript is currently out for review and a copy has been provided in the Scholarship Section of OADM.

Tamaratt Teaching Mentorship Program (2009-2011)

This teaching mentorship program gave senior graduate students an opportunity to be an instructor of record and team-teach with me in the course GLGY201. The teaching mentee was given a section of the course GLGY201 so they could have an authentic teaching experience within a supportive environment. As part of the experience, mentees would develop and implement a new teaching activity or strategy in the course and be involved with the evaluation process to understand the impact on student experience and learning. After the teaching experience, students were provided support in putting together materials for their teaching dossier. A full description of the program and program outcomes can be found in the discretionary materials section of OADM.

Geoscience Brown Bag Teaching Discussion Group (2008-2011)

There are few opportunities for faculty, staff and students to get together to talk about teaching related issues and research in geoscience. These informal discussions were open to anyone in the Geoscience Department with the goal of creating opportunities for dialogue about teaching and learning as well as creating a teaching and learning community. It also provided an opportunity for people to share teaching strategies and learn about current research in science education. Monthly sessions throughout the fall and winter semesters were organized with topics relevant to teaching in the geosciences. Once a year an external speaker was brought in to give a talk on geoscience education research.

6.0 Scholarship of Teaching and Learning

I became curious about the impact that teaching strategies, learning environment, assessment, and student characteristics had on teaching and learning very early in my career. I have sought out opportunities to receive funding to formally address my inquiries and received support from the ITBL (Inquiry Through Blended Learning) to explore virtual field trip experiences as well as funding to explore science literacy and our science service courses for non-majors. When I was appointed the Tamaratt Teaching Professor position I was given funds to conduct scholarly teaching projects, which allowed me to continue to develop and pursue these activities.

Teaching and Learning Projects

Investigating the Impact of Redesigning Courses for Student Engagement on Course Evaluation Scores (2012)

This project involved an analysis of 10 years of Course Evaluation (USRI) data from two courses (GLGY201 and GLGY301), which I have taught over that time period. Each course underwent a massive transformation from traditional modes of instruction to modes of instruction that involved inquiry, formative assessment and feedback and student engagement. The goal of this project was to determine if these course changes had an effect on students' course evaluations. To address this question, data from different years were compared. This work was completed with Dr. Rebecca Orsi (Statistical Solutions), who completed descriptive and inferential statistical analyses. The results of this work were presented at the International Society for the Scholarship of Teaching and Learning Annual Conference in 2012 and a copy of the presentation can be found in the Scholarship Section of OADM.

Evaluating the Impact of Course Design on Learning Outcomes in Undergraduate Introductory Geoscience (2008–2012)

This action research project sought to assess the impact of formative assessment learning activities on the learning outcomes, student experience and student engagement in an introductory geoscience course (GLGY201). Systematic changes were made to the course design and activities over each year and Laboratory exercises were modified to enhance and increase the effectiveness of active and collaborative learning strategies. Lecture activities were also modified to improve assessment and feedback practices and student engagement. Data was collected each year on student learning and engagement to understand the students' perceptions of the learning activities in the course and identification of areas where instruction and course design can be improved to enhance the learning outcomes. Data was also collected on student learning gains over the four years of the project to determine the effectiveness of the course modifications on student learning. The results of this project can be found in the GLGY201 course portfolio document in the Teaching Section of OADM.

Teaching for Transformation in Science Service Classes

This project focused on understanding the types of course activities that promote transformative learning experiences for students. Students were interviewed and asked to describe the results of this project included a course redesign model that includes a group research project, Analysis of student interviews revealed the nature of transformative learning experiences for students in a geoscience classes for non-science majors. Data collected showed that both course activities and instructor disposition played a role in students developing and maintaining interest in the course and promoting transformative learning experiences.

Team Projects in a Large Science-Service Course

This course redesign project involved developing a group project component into a large science service course (GLGY301). The goals of the redesign project were to increase student engagement and faculty-student interaction. The design blended traditional lecturing with a team-based student project was developed and implemented in a large (250 students) science course. The course materials developed have been shared with faculty in Science, Arts and Business at the University of Calgary. Materials have also been shared with faculty at other universities. Ten courses have adopted the course materials. The results of this project have been published in a paper for the Canadian Journal for the Scholarship of Teaching and Learning (available in OADM) and course materials can be found in the course portfolio document in the Teaching section of OADM.

Revitalizing Undergraduate Research in Geoscience

This was a 1-year project to explore barriers and enablers to students' participating in the senior undergraduate research program (GLGY510) in the Geoscience Department at the University of Calgary. Aimed at examining why students do or don't participate in research projects, and what changes can be made to improve the program and encourage student participation.

Outcomes: An internal department report was prepared that compiled survey and interview data from students, alumni and faculty. Report included recommendations for program improvement. Two recommendations—a research methods course for undergraduate research students who participate in this program and a standardized evaluation rubric—are going to be implemented in Fall 2012.

Science for All: The Science Literacy Project

The Faculty of Science offers a variety of option courses to non-science majors; these are often large, lecture-based classes without labs, tutorials or projects. The Science Literacy project addressed two aspects of these courses: 1) Was the content being taught relevant, meaningful, and designed to increase science literacy; and 2) How engaged were the students were in the courses' learning activities. Phase I of this project consisted of a literature review on the definition of science literacy and the analysis of data on science literacy and student engagement collected in eight option courses. Phase II involved assisting volunteer instructors with the redesign of three option courses in terms of increasing science literacy and student engagement. All of the Phase II participants felt that the data collected in their modified course was very useful and would inform / guide their decisions in how they taught the course in the future as there was evidence that there was a positive effect on students becoming more science literate.

Dissemination of Scholarly Work

I have continually pursued opportunities to share my teaching and learning scholarship work with a broader community of scholars so people can learn from my experiences and I can receive feedback from my peers. I believe that teaching should be a public affair and that the results of teaching and learning projects should be shared. A full list of reports and publications can be found in my CV and samples of my scholarly work can be found in the Scholarship section of OADM. I have been invited to speak about my teaching experiences, knowledge and results of teaching projects to a variety of audiences. Below are some key talks that I have given that demonstrate my commitment to sharing teaching and learning knowledge. My full list of invited talks and interviews can be found in my CV.

7.0 Recognition of Teaching, Service and Educational Leadership

Over the years my contributions in teaching, leadership and service have been recognized formally. Below is a list of the awards I have received.

Teaching, Leadership and Service Awards Received

2014 University of Calgary Award for Excellence in Educational Leadership

2011 3M National Teaching Fellowship

2010 National Association of Geoscience Teachers Distinguished Speaker

2009 Award of Excellence in Service, Faculty of Science, University of Calgary

2006 Students' Union Teaching Award for Excellence in Undergraduate Teaching

2004 Faculty of Science Teaching Excellence Award (Undergraduate Teaching)

2004 Students' Union Teaching Award for Excellence in Undergraduate Teaching – Honourable Mention

- 2001 Students' Union Teaching Award for Excellence in Undergraduate Teaching, University of Calgary
- 1998 Faculty of Science Alumni Award for Teaching, University of Calgary
- 1998 Award for Outstanding Teaching Assistant, Department of Geology and Geophysics, University of Calgary
- 1996 Don Taveres Teaching Award, Faculty of Science, University of Calgary
- 1996 Award for Outstanding Teaching Assistant, Department of Geology and Geophysics, University of Calgary

8.0 References

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