1. Teaching Philosophy: Students as scientists and partners

As an instructor, I seek to train the next generation of scientists and citizen-scientists to be collaborative, reflective, and empowered to create knowledge and solutions to the grand challenge of biodiversity loss that faces biologists and our society. To train the students I work with in the diverse skills required for impactful careers, **I have partnered with undergraduate and graduate students to design experiential course-based research projects that span lectures, labs and tutorials, field work, and reflective assignments so that *"students are doing what scientists do."***

I instruct six different courses in invertebrate zoology, entomology, evolution, animal behaviour, and field research methods, and mentor undergraduate students in independent research projects and our science internship program. When I began my position at the University of Calgary, available teaching material for five of the six courses that I now teach was limited to the course syllabus and schedule. This allowed me to design all of the course components to align with my teaching philosophy of experiential learning. In each of these teaching contexts, I seek to foster transformative experiential teaching and learning through the following four design principles:

Students as partners. I seek to teach and mentor in a way that is transformative for everyone involved, which requires students to take risks, learn in new ways, and trust the instructional team. The design, development, and implementation of experiential learning in my courses is therefore a collaborative effort among current students, past students in the roles of peer mentors and undergraduate researchers, and graduate students. These collaborations are the source of creativity in my experiential teaching practice and partnering with students is the foundation that supports an inclusive and student-centered learning environment.

Authentic place-based research experiences. I would like students in my courses to be empowered and capable of contributing knowledge and ideas beyond the classroom. I have prioritized developing authentic research experiences for each of my courses that connect students with our community, such as studying urban biodiversity and exploring seafood sustainability in supermarkets. Through these projects, students are collecting new and needed information for our local communities, contributing their course-work to scientific databases, and disseminating their findings to the community.

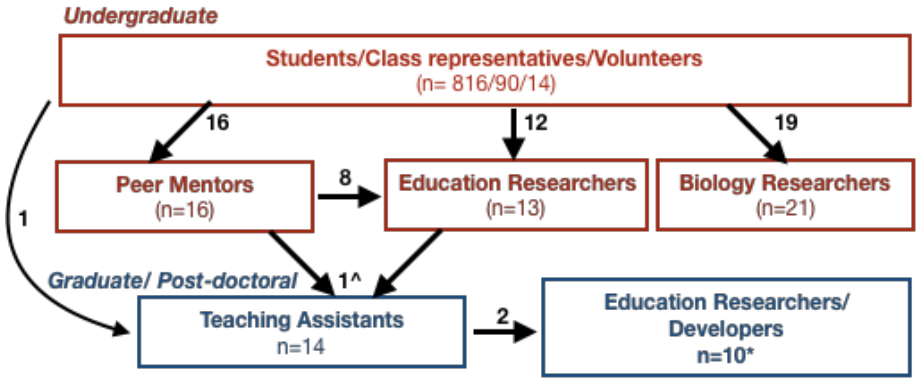
Reflection, formative assessment, and collaboration. My goal is for students to be actively engaged in learning that develops both content knowledge and transferable skills that are aligned with their own values and future goals. To allow students to create meaning from their experiences, students develop their own learning goals and complete a range of reflective exercises, including weekly reflective check-ins, critical reflection exercises, and term learning portfolios. I prioritize providing students with impactful formative feedback, and use specifications-based grading to reduce the risks associated with learning new skills and being creative. Students also work on collaborative teams to further promote reflection and resilience to the challenges faced in experiential learning.

Reflective evidence-based teaching practices. I am committed to continually improving my experiential teaching practice through incorporating and reflecting on student feedback, peer observation, new ideas presented through workshops and conferences, conversations with colleagues, and collecting evidence of student learning and attitudes in my course through education research. Experiential teaching is an iterative endeavour that I enjoy experimenting with, and I attribute my career progress to developing a reflective practice that examines a variety of evidence, incorporates feedback, and is supported by a community of educators.

2. Design Principle: Students as partners

Research-based experiential learning: Collaboration as a source of creativity and support for students. Collaborating with students to co-design learning experiences is a core component of my teaching and how I have grown in my practice. Students, and discussions with students, are the source for many of the creative and innovative experiential teaching practices I use. Likewise, it is through mentorship of independent research-based experiential learning projects that I have been able to integrate research, place-based experiences, and dissemination of student work into my courses – activities that also require a collaborative team approach to implement effectively. Many students find experiential learning settings unfamiliar and at times uncomfortable, for example when their experiment does not work the first time or they need to repeat and practice a skill many times. Engaging in experiential learning requires courage, and a team approach allows students to build relationships and seek different types of support from different members. Working closely with students also allows me to understand the students' experiences and continuously re-align my teaching to ensure that the teaching environment remains inclusive, positive, and student centered.

In the past four years, I have provided opportunities for undergraduate, graduate, and postdoctoral scholars to be involved through the following **collaborative roles in my experiential teaching and research:**



*n = total number of students I have worked with in each role; arrows with numbers = paths that students have taken to different collaborative roles and the number of students who have taken each path; ^ one student has been involved as a student, peer mentor, education researcher, and graduate teaching assistant; *one postdoctoral researcher that I have mentored is now a colleague in the department as a limited term instructor*

Description of student roles and experiential teaching and learning impacts:

Class representatives. Class representatives are current students who volunteer to meet with me once a week to reflect on and discuss students' experiences and how to make improvements in real-time and for future offerings. My class representatives provide an essential communication line with current students during an experiential learning project where many students are taking new risks and learning outside of their comfort zone. Through practicing reflection weekly, class representatives also grow in their own understanding of how they learn and the important skills that they have developed in the course. A subset of my class representatives each year go on to be involved in the peer mentoring.

"This experience allowed me to pass forward the help I had received from my own peer mentor, and through this experience I developed more interpersonal skills than I ever hoped to achieve. Being a peer mentor enabled me to positively contribute to this student's growth in this course, and that is when I truly understood what 'mentoring' was about." –Peer mentor

Peer mentors. Peer mentors in my courses work directly with students in the laboratories and co-facilitate the exercises with the graduate teaching assistants. Students trust and build unique relationships with the peer mentors outside of instructor-student power dynamics. I have found that peer mentors play an essential role in normalizing student's experiences, particularly in helping them

develop a mindset that "failure" produces learning, and not being successful the first time means that they are learning something new. I have also observed that peer mentors are especially effective at sharing advice about time management, studying, their experience in science, and managing stress in experiential learning settings.

Peer mentors are also enrolled in an educational theory course while completing their practicum in my course where they reflect on their experiences weekly. I directly benefit from their reflections by learning from them about how to better align educational theory and practice in my courses. Peer mentors have used this educational training to develop additional support materials for students such as tutorials and videos. Having peer mentors in the laboratory (instead of in lecture) was also the result of one of my peer mentor's research projects where he studied individual peer mentors' facilitation style and engagement with students using the Classroom Observation Protocol (COPUS) and also analyzed peer mentors reflective statements. Through this project, we identified that the peer mentors were limited in their number of interactions with students most likely by the structure of the lecture. Making the change to have peer mentors in the lab allowed unlimited student interaction opportunities, and therefore more time for each student to develop their own mentoring style.

Undergraduate researchers. I mentor students in one and two-term research experiences in biology education and zoology. Weekly meetings include reflective updates and students complete mid- and end-of term reflective summaries on their learning, a mentoring technique that I have incorporated into my curriculum-based research experiences.

"As a research team member, I would say that the biggest thing I have taken away from my learning is that collaboration is a challenging and rewarding way to accomplish a task. I believe that more diversity is better in a research group. I have found that I like to work as a part of a team and I have become better at receiving feedback as well as providing it." – Undergraduate researcher

Undergraduate researchers studying how students learn in my courses have co-designed instructional materials including lab protocols, identification guides, and scaffolded presentation assignments. These students have also assessed the effectiveness of experiential learning practices through analyzing survey data, interviewing students, and coding student work. This work has led to continual refinement of instruction and development of support materials.

Through mentoring undergraduate researchers in biodiversity projects, I have iteratively developed and refined a series of guides to basic research skills (e.g., searching the literature, writing a project proposal, writing a manuscript, preparing poster and oral presentations) that I have been able to use in curriculum-based experiential research. Undergraduate researchers studying biodiversity have also developed research techniques that I now use in my courses. A student and I revised a two-day molecular protocol to occur within a three-hour lab, and students iteratively developed digitization methodology with the librarians at TFDL. Through student projects, I have also been motivated to find ways to disseminate student work through a variety of mediums beyond academic journals (e.g., AskNature, Barcode of Life, blogs, and the new biodiversity website I created).

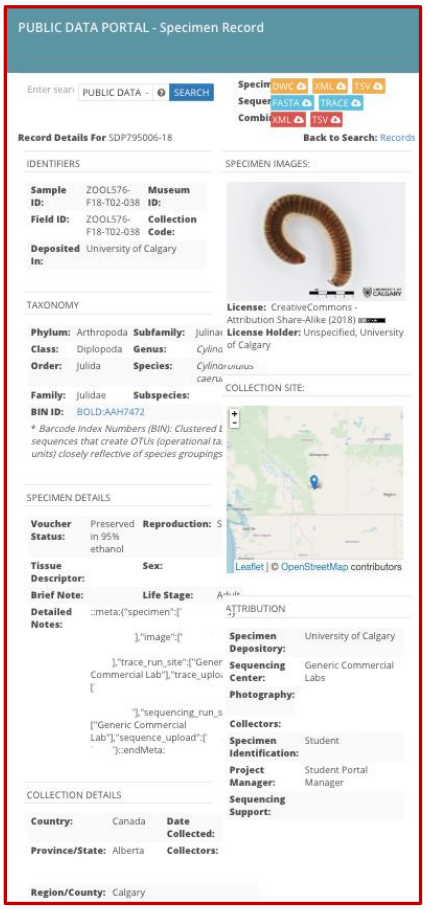
Graduate teaching assistants and researchers. Graduate teaching assistants are a core component of the instructional team – interacting one-on-one with students in laboratories, tutorials, and office hours. This coaching role allows graduate students to both facilitate research and also build mentoring relationships with the students. Many students meet with their GTAs outside of class and after the term is over for advice and feedback on post-graduation plans. Graduate students have also integrated research techniques into my courses, such as jigsaw case-studies from the primary literature, providing students with code to use R in tutorials, refining digitization protocols, and managing student data collection as part of multi-institutional collaborations. These new innovations are all high-impact teaching practices that require significant time to develop, and working with graduate students allows me to provide students with up to date training in skills required for success in graduate school and the current job market.

"Being treated by you as an up and coming teacher rather than as an employee was not only rewarding, but I think really helped me gain confidence in my own ideas… and I think having multiple point of views really helped make this class an enjoyable experience for everyone." – Graduate Teaching Assistant

3. Teaching Practices: Authentic place-based research experiences

Curriculum-integrated and community engaged experiential learning: Students contributing solutions and impacting our community. Grand challenges that our society faces, such as biodiversity loss, require large-scale involvement and I therefore seek to teach in a way that empowers students to apply their learning beyond our classroom. Through these projects, I hope that students can see that they can contribute right now – and that their ideas, research, and voice are valued by the wider community.

Student submission to BOLD database:



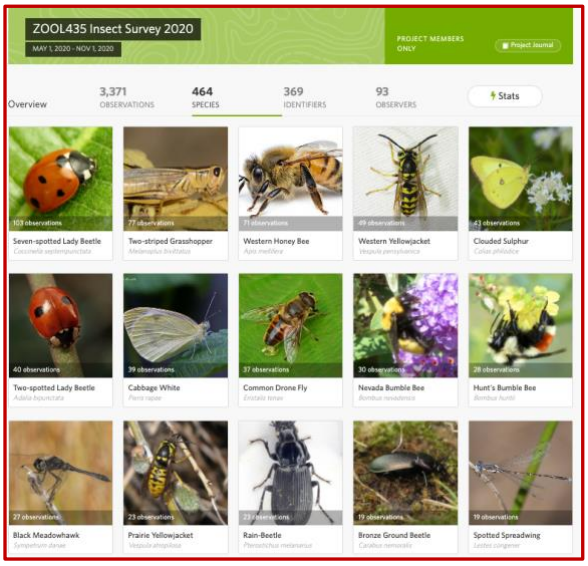
Description of research experiences and teaching and learning impacts:

Alberta invertebrate biodiversity City of Calgary. For the 2017 and 2018 offerings of ***ZOOL475/576*** (enrollment ~32), I developed protocols for students to collect, identify, DNA sequence, and take high-resolution photographs of local invertebrates. Students worked in collaborative teams to develop their own research questions and share their results through submitting DNA records to the Barcode of Life Project (boldsystems.org), uploading images to our biological sciences digital collection (biodiversity.ucalgary.ca), and presenting in a public symposium organized by the *Journal for Undergraduate Research in Alberta (JURA)*. Organizing this project required establishing partnerships with the City of Calgary and the University of Calgary Libraries & Cultural Resources, obtaining funding for equipment purchases, and development of methodologies and protocols for each stage of the research process. Through student efforts, we currently have over 350 invertebrates digitized and over 30 DNA barcode records.

Insect diversity and plant-pollinator relationships in the City of Calgary. In fall 2020, ***Zool435*** was designed to incorporate a course-based research experience where students documented local insect biodiversity and created communication pieces to answer the question "Why should Albertans care about conserving insects?" As part of the biodiversity survey, 90 students learned how to collect and photograph insects, record and manage metadata, pin and curate insects, and identify insects to family. Through collaboration with the City of Calgary, students collected insects in Calgary's parks and natural spaces, as well in their backyards and neighbourhoods. Students also photographed insects and contributed their observations to the iNaturalist platform. Students produced 3396 digital observations and donated 3474 physical specimens for future students to use in research projects. Students identified 19 orders and 127 families of insects, and with the assistance of iNaturalist experts 291 species. Students discovered four species listed as endangered or threatened by the Committee on the Status of Endangered Wildlife in Canada. Information on urban insects is currently lacking, so students provided important data for the City of Calgary to understand and conserve biodiverse communities.

"I had noticed that people in the city did show an interest in what I was doing. They would come up and ask questions about why it is important to document what kinds of insects are in the City of Calgary. I feel like that shows that people do care about insects and it is something that the community wants to learn more about." – Zoology 435 student.

Course public iNaturalist survey:



Students developed skills in science communication and stakeholder engagement through a series of workshops and a final communication project. Student work includes infographics, podcasts, videos, story books, magazines, artwork, and activities for scout troops. Their pieces explore many themes of sustainability including pests and pesticides, entomophagy, invasive insects, pollination services, and insect conservation, and are publicly available online (https://biodiversity.ucalgary.ca/resource/insect-science-communication-gallery/).

"Exploring the city to look for insects allowed me to see the diversity that live around us every day, and gain an appreciation for the insects in my community." – Zoology 435 student.

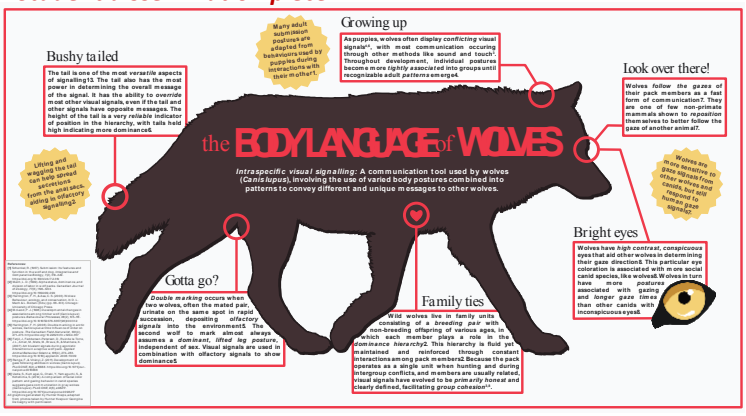
""Every single time I went out on the field to collect, they [my daughters] helped me. I liked so much doing this because I would give them information about insects and they would start to recognize some major orders, the fact that we did not need to over collect and about the importance of not disturbing their ecosystem."." – Zoology 435 student.

Invertebrate seafood DNA barcoding. Starting in winter 2019, I designed an experiential project where students in ***ZOOL401*** (enrollment ~100) work on collaborative teams within the course and internationally with students at other universities to DNA barcode local seafood and contribute their data to the Barcode of Life project. Students learn about fishing and aquaculture practices, DNA barcoding, eco-labels and seafood sustainability, and produce consumer reports on their findings. Incorporating this into my course required establishing international collaborations and supervision of graduate students. Students have collected and sequenced 98 seafood samples from 37 species and produced 18 store inventories. Students share their research experiences with the international partners, and have used these conversations and reflections to produce 69 consumer guides. Instagram: shrimplyseafood.

Independent research projects. In ***MIZ,*** students are trained in field collection and observation during the first two weeks and then given the opportunity to design their own research project, collect the data on their own, analyze their data, and present their work in a manuscript and public seminar. In 2019, students worked individually, in pairs, or groups of threes and studied 12 topics ranging from sea star colouration to anemone bleaching to parasitism. While students conduct their research, we provided daily workshops on the research process (e.g., question formulation, study design, data analysis using R, communicating science) and meet with teams for individual meetings each evening.

For ***ZOOL576,*** I have developed a series of scaffolded assignments for them to practice finding and critically reading the scientific literature, and synthesizing and communicating scientific findings. Students in this course are given the opportunity to conduct a research literature review on a topic of interest (enrollment ~100). Students have the option to disseminate their work as podcasts, videos, blog entries, literature reviews, or a format of their design.

Student dissemination piece:



4. Reflective Practices: Students doing what scientists do

I have designed the experiential learning experiences for my courses so that students are actively practicing as scientists, with the goal of developing **both content knowledge and transferable skills.** My approach to creating an authentic environment where students can take risks, learn through practice, set their own learning goals, and integrate their knowledge involves:

"The interactive and dynamic set up of the class was intimidating at first but I have become quite close with my group mates and we have learned SO WELL together. I genuinely had so much fun with them." – Zoology 401 student.

Collaboration. One of the most important professional skills that I think students can learn is **collaboration**. I therefore have students work in teams in all of my courses and I have incorporated materials to support productive teams and developing skills in collaboration.

Formative goal-oriented assessment. To promote student motivation and interest in professional skill development, I provide opportunities for choice in learning goals. I also recognize that learning new skills, engaging in a project without a known outcome, and being creative involves risk and vulnerability. I have therefore incorporated **specifications-based** assignments and course-designs into my experiential learning initiatives. A specifications framework allows students multiple opportunities to receive feedback and revise their work. Students are also assessed based on meeting a clear set of criteria, and continuously refining marking schemes to identify and clearly describe mastery criteria has allowed me to reconsider what the most essential skills are for students in our program. Assessment based on mastery (rather than points), has also allowed me to better partner with students with the shared goal of their success.

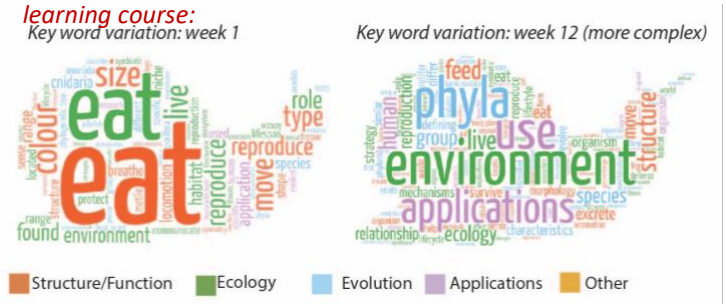
"This experience has definitely highlighted areas where I've struggled with learning and helped me to see solutions. It has also made me incredibly aware of how motivated I am to complete certain learning tasks and where those feelings are coming from. So overall as a learner I would say that I have become more self aware and have gained knowledge about tools I can use." – ZOOL475 Student

Reflection. Reflection is essential for students to integrate their learning, incorporate feedback, and understand their own experience. I have designed and incorporated **reflective exercises** in all of my courses. At the start, mid-point, and end of each course, students are provided reflective prompts where they are asked to set goals and track their progress. At the end of lecture or lab exercises, students complete quick reflections in writing or in words on their experience. I have also developed portfolio assignments for students to select highlighted work, identify important learning moments, and reflect on their own learning.

Highlighted examples of collaboration, feedback, and reflection in experiential skill development:

Asking questions: I use Question Formulation Technique (QFT) to facilitate students' question generation to drive their exploration. The QFT provides a structured way for teams of students to engage in divergent and convergent thinking, followed by prioritization – essential skills for creative and critical thinking in experiential learning settings. After each step in the process, students answer reflective questions to develop metacognition on their own skill development in asking scientific questions. Keyword analysis of student team questions at the beginning and end of term show increasing complexity, and reflections indicate that students feel more confident in their ability to develop and use their own questions for research.

Complexity of team questions asked before and after experiential learning course:

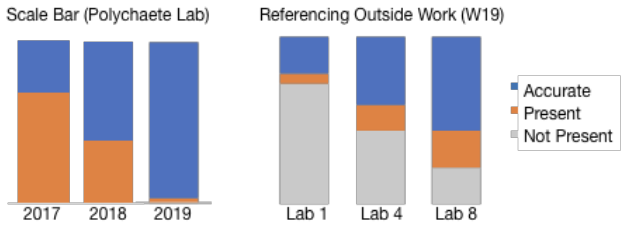


Research and study design: In collaboration with graduate students, we have developed a series of case studies for students to develop skills in reading and discussing scientific literature. Each case study uses a jigsaw approach where each student become an expert on one study and shares their learning, focusing on the methodology, within a small group of four. Individuals in this group synthesize the four studies, and then shares their case with a new group of four. This new group synthesizes what these four cases contribute to scientific knowledge, discusses commonalities and differences in study questions and research design, and reflects on how they might integrate the approaches into their own work.

"What I experienced this morning was an exemplar of social constructivist learning, the idea that learning is best accomplished through social interaction…. This work is impressive, and hits many buttons of thoughtful instructional design. I saw students highly engaged, wrestling with new ideas, developing skill at synthesis and oral communication, confidently communicating with one another, and completing a task that itself was a ladder to the final summative assessment in the course. Mindi's instructional manner is both authoritative and warm, and the welcome reception of this unconventional task attests that students appreciate it." -- Associate Professor

Conducting research and problem-solving: Students record their work in laboratory notebooks to mirror what they will experience in their first jobs or in graduate school. Key record-keeping skills that they need to develop to be successful in their projects include: making observations, asking questions, identifying view and magnification, recording metadata, making scalebar and labels, and databasing. In finding that students were showing little improvement over the course, despite graduate teaching assistants spending many hours each week providing detailed written feedback, I worked with two undergraduate students to code and analyze student work. Through this examination, I re-designed the marking rubric and reduced the amount of required exercises so that students could self-evaluate their work, and then discuss and revise their work with the GTAs and peer mentors in real-time. Through this intervention of replacing a small amount of content with prompted student reflection and real-time feedback, students showed improvement both within a term and compared to previous course offerings.

Effect of incorporating reflection and providing real-time feedback for students in 2018 and 2019 to develop record-keeping (left), and skill development over a term (right).



Communicating results and sharing science: In each of my experiential learning courses, students are given the opportunity to share their work outside of the course. In collaboration with undergraduate researchers, we developed scaffolded assignments for students to practice oral presentations throughout ZOOL401. As a group, students first present two lab presentations in a low-stakes environment, receive feedback, and then prepare a minor phyla presentation at the end of the term. Students in Zoology 435/576 and marine invertebrate zoology also present their research findings in ten-minute talks as part of research symposia. Students in ZOOL401 and MIZ can share their knowledge of invertebrates with engineers, architects, and designers through generating Genius of Place reports and functional morphology pages for the AskNature website (asknature.org/collections/bees). In ZOOL567 and ZOOL435 students have the option to disseminate their work as podcasts, videos, blog entries, literature reviews, or a format of their design. To train students in science communication, we also developed a new series on science communication, which involved guest speakers and collaborative workshops. Through these workshops, students explored multiple perspectives and developed science communication plans to reach a wide audience outside of biology (https://biodiversity.ucalgary.ca/resource/insect-science-communication-gallery/).

"I had noticed that people in the city did show an interest in what I was doing. They would come up and ask questions about why it is important to document what kinds of insects are in the City of Calgary. I feel like that shows that people do care about insects and it is something that the community wants to learn more about." – Zoology 401 student.

5. Evidence: SoTL and teaching reflection

Using evidence and feedback to improve as an educator. The most important practice I have developed as an instructor designing and implementing experiential learning is critical reflection. Using a framework of experimentation, evidence-collection, and reflection has made teaching an iterative and engaging process – allowing me to take risks, change my teaching in real-time during courses, and feel supported by a community of educators.

Descriptions of evidence and feedback used for reflection and improving my instruction:

Weekly student class representative meetings. Each week I invite students to meet with me to discuss the course and bring forward student ideas and concerns. Class representatives also solicit, collect, and summarize **mid-semester feedback from the entire course**. I find these conversations particularly helpful because I am able to ask questions to better understand students' experiences in my courses and their underlying concerns and needs. By having these students as partners in the course implementation, I am also able to make real-time modifications to best suit the students and learning dynamics in experiential learning settings.

Real-time modifications co-designed with class reps
- Pace of lecture
- Detail of instructions in protocols
- Amount of information in notes
- Marking schemes
- More problem-solving in lecture
- Assignment scope
- Assignment due dates
- Support available/feedback
- Skills-training in first two weeks

Teaching observations and feedback. I invite **peers to observe my teaching** and provide recommendations. I have also invited postdoctoral fellows and undergraduate researchers to observe my courses using the **Classroom Observation Protocol for Undergraduate Science** (COPUS) and **Laboratory Observation Protocol for Undergraduate Science** (LOPUS). These observations provide me with an idea of how time is being utilized by both myself and students in my courses, and also creates a starting point to discussions with my observers about what they saw in my courses and how best to support students.

Student end of semester feedback. Following a course offering, I review and incorporate feedback received in **student evaluations** when revising course design and instructional materials. I take a systematic "keep-modify-start" approach that includes identifying: the course components that I should keep; assignments, activities, or practices that I can improve; and new practices that I can incorporate or professional development that I can engage in to improve my effectiveness.

Keep	Modify/Start
- TopHat	- Lab instructions
- Videos	- Peer mentors in laboratories
- Class discussions	- Final presentations
- Lab exercises	- Scope of research project
- In class activities	- Calendar/syllabus description
- Research experience	- Data management tools
- Laboratory techniques	- Research portfolio instead of exams
- Collaboration	- JURA abstract instead of manuscript
- Biodiversity focus	- Public symposia
	- Laboratory notebook feedback
	- Additional readings

Universal Student Ratings of Instruction *(students can provide a score of 1-7; 7=excellent):*

		Term	Duties*	Enrolled	Response	USRI Q1	*Dept. Mean*	*Faculty Mean*	USRI Range
ZOOL567	**Animal Behaviour**	F2019	L	91	93%	**6.72**	*6.33*	*6.09*	**6.33-6.90**
ZOOL 375/401	**Introduction to Invertebrate Zoology**	W2019	L; LC; C	69	93%	**6.51**	*6.14*	*6.00*	**6.39-6.89**
		W2018	L; LC; C	73	89%	**6.24**	*6.01*	*5.95*	**5.39-6.73**
		W2017	L; LC; C	80	64%	**6.40**	*5.59*	*5.79*	**6.09-6.85**
BIOL 401	**Evolutionary Biology**	W2019	AI; T	75	71%	**6.17**	*6.14*	*6.00*	**5.70-6.76**
		W2018	AI; T	76	80%	**6.26**	*6.01*	*5.95*	**5.78-6.90**
ZOOL 475/576	**The Invertebrates**	F2018	L; LC; C	29	93%	**6.48**	*6.22*	*5.97*	**5.83-6.92**
		F2017	L; LC; C	38	91%	**6.00**	*5.79*	*5.79*	**5.03-6.82**
ZOOL435	**Entomology**	F2020	L; LC; C	86	58%	NA	NA	NA	**7.00^**
BMSC	**Marine Invertebrates**	S2019	AI; LC; C	22	95%	4.71 (out of 5)		4.57-4.90 (out of 5)	

*I = Instructor; AI = Alternating Instructor; LC = Lab Coordinator; T = Tutorial Coordinator; CC = Course Coordinator; ^only mode provided.

Scholarship of Teaching & Learning. I began research in discipline-based education research (DBER) during my postdoctoral appointment and have used this training to study student learning and attitudes toward experiential learning. In my research, I use pre/post surveys to provide information on student understanding and attitudes, interview students, and use both quantitative and qualitative approaches to analyze student work. Surveys, interviews, and data analysis provide me with information on student understanding and attitudes, evidence of the impact of my teaching practice, and longitudinal data on the impact of teaching interventions and revisions.

CURE survey: Percent of students identifying large to very large benefit in taking course	ZOOL435	ZOOL567	ZOOL576	MIZ
Understanding of the research process in your field	**82%**	**80%**	**82%**	**81%**
Understanding of how scientists work on real problems	71%	**77%**	**82%**	**76%**
Ability to read and understand primary literature	41%	**94%**	68%	67%
Learning laboratory techniques	65%	20%	**89%**	52%
Skill in science writing	47%	**86%**	65%	72%
Tolerance for obstacles faced in the research process	**75%**	62%	72%	**85%**
Becoming part of a learning community	**75%**	59%	68%	**86%**
Skill in how to give an effective oral presentation	24%	28%	57%	**81%**
Learning ethical conduct in your field	**78%**	**78%**	46%	67%
Readiness for more demanding research	68%	70%	61%	**81%**
Learning to work independently	**83%**	**86%**	57%	66%
Understanding science	**81%**	**75%**	71%	62%

Student pre/post-semester surveys: In each of my courses, I ask students to complete pre and post surveys that asks about their knowledge, attitudes and perceived benefits of the course and experiential learning initiative to their learning. I use seven published validated surveys and have designed two surveys specific to my courses.

Percentage of students that reported "extensive" or "much" gains in research skills after course-based research experience.	ZOOL 435	ZOOL 567	ZOOL 576	MIZ
A project in which students have some input into the research process and/or what is being studied.	**91%**	**85%**	**93%**	**87%**
Work individually.	**87%**	**86%**	68%	67%
Work in small groups.	69%	**80%**	**93%**	**93%**
Become responsible for a part of the project.	**88%**	N/A	**93%**	**100%**
Read primary scientific literature.	N/A	**92%**	**86%**	**100%**
Write a research proposal.	N/A	70%	**89%**	**100%**
Collect data.	**90%**	N/A	**96%**	**93%**
Analyze data.	71%	N/A	**96%**	**93%**
Present results orally.	N/A	N/A	**82%**	**93%**
Present results in written papers or reports	N/A	**80%**	**89%**	**93%**
Maintain lab notebook.	N/A	N/A	**89%**	**93%**

Professional development and conversations with colleagues. To continually expand my experiential teaching practice, as a new instructor I have attended 45 professional development **workshops** and 11 **conferences and courses**, and I also been part of three **communities of practice** and meet weekly with other instructors. Workshops have allowed me to identify new techniques that I can apply in my teaching context and share with colleagues, such as research resources, snowball discussions, and reflective exercises. Based on this experience, I began a Biological Sciences **instructors mentoring group** that now meets weekly and includes sessional instructors, staff, and both new and experienced instructors, and also joined a pilot program on course-based research experiences through the TI. Through conversations with colleagues I have been inspired, and able to align my courses with other offerings and to ensure that students are progressing in their skill development through the program.

Project ownership survey	ZOOL435	ZOOL567
My research project was interesting.	**94%**	**91%**
I faced challenges that I managed to overcome in completing my research project.	**92%**	**84%**
My research project was exciting.	**91%**	**83%**
The findings of my research project gave me a sense of personal achievement.	**94%**	**79%**
I had a personal reason for choosing the research project I worked on.	53%	**75%**
I was responsible for the outcomes of my research.	**91%**	72%
The research question I worked on was important to me.	72%	72%
In conducting my research project, I actively sought advice and assistance.	**92%**	68%
My findings were important to the scientific community.	**91%**	53%
My research will help to solve a problem in the world.	**80%**	38%

	ZOOL 435	ZOOL 475/576	ZOOL 567	MIZ
MS or PhD plans	+3% (30% of students post)	+4% (45% of students post)	+21% (46% of students post)	+7% (78% of students post)

Award Nominations. I am a recipient of the Faculty of Science Teaching Excellence Early Career Award and have been nominated four times for the Student Union Teaching Excellence Award.

6. Reflective Summary: Continuous development and reflection

My identity and values as an educator have been shaped through many impactful experiences with students and colleagues over the past four years, and I look forward to continuing to develop my teaching philosophy and practice.

Students as partners. Students have impacted every aspect of my teaching. As I have learned more about students' experiences, values, and goals, I have been able to design more impactful and transformative experiential learning experiences. Mentorship of undergraduate and graduate students has been particularly meaningful to me, and having a student progress through four roles while working with me (undergraduate student, peer mentor, research assistant, and now graduate teaching assistant) has been especially impactful and a highlight. In the next year, I will be prioritizing having conversations with students to develop a more formalized mentoring philosophy and plan for undergraduate researchers, peer mentors, and graduate students that further encourages career progression.

Authentic place-based research experiences. Developing authentic experiences for my large enrollment courses has required a significant investment in time to establish partnerships, develop new methodology, purchase equipment and retrofit laboratory space, compile and generate student resources, train graduate students for a very different teaching assistant role, and identify ways for students to disseminate their work meaningfully outside of a course. This work has also required that I take risks in my teaching, and many of my first attempts were too large in scope. I am looking forward to using what I learned from these experiences as a co-champion of our department's working group tasked with providing all students in our program with a capstone research experience. I also will be working to expand opportunities for work-integrated experiential learning and international partnerships through serving on the Faculty of Science Internship committee and Internationalization committee. I am also excited to integrate student-directed research into a group studies field course to Belize next spring. I will also be continuing to find and develop new ways to disseminate student work, such as through compiling student work into *BioMimicry Genius of Place* reports, creating a "Buzz about Biology" podcast series, and having students contribute to the Biodiversity Collections website I developed.

Reflection, formative assessment, and collaboration. Watching students develop their confidence in learning from and teaching others, and increase their sense of belonging in science and identity as a scientist is what has driven me to continually seek to incorporate active collaborative learning in my courses. In the past three years, I have focused on how to improve feedback and alignment of assessment with the course learning outcomes and context. I recognize that this is still an area that can be improved, and I will be prioritizing finding new and innovative ways to provide feedback and best facilitate students to learn on their own through reflection. I am also excited to continue developing partnerships to further expand the skills that students are exposed to and can develop in my courses.

Reflective evidence-based practices. I have grown as an instructor most significantly through developing my reflective practice. I have significantly changed my instruction based on evidence I have collected on student learning and attitudes in my courses, and I plan to continue finding and developing appropriate tools specific for my teaching and learning goals. I also have grown as an educator through conversations with supportive colleagues. I look forward to continuing to have regular conversations with my colleagues through peer observation, communities of practice, and collaborative research projects, while also continuing to expand my leadership roles in the department and faculty.