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Master's Project: Watershed Education Practicum: A Pathway to Catalyzing Change in Watershed Science Education

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**WATERSHED EDUCATION PRACTICUM: A PATHWAY TO CATALYZING
CHANGE IN WATERSHED SCIENCE EDUCATION**

A Masters Project Presented

by

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ABSTRACT

This project explored and piloted a watershed education practicum for pre-service educators and scientists that combined high impact educational practices with topics and skill development aimed at creating inclusive watershed education. Issues of water quality and quantity are complex and require a deep understanding of not only ecology but also of the people and systems with which water interacts. This project explored how watershed education can address power and privilege dynamics that are interlaced in issues of water quality and quantity by illuminating systems and structures of oppression and challenging current untenable water resource practices. The findings from this project suggest that in order to prepare our students for the water quality challenges of tomorrow, we need to expose them to sustainable and innovative alternatives while also fostering critical thinking and a fundamental understanding of the importance of ecology of place.

Keywords: Watershed Education; Power and Privilege; Reflection; Awareness; Water

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Introduction

"Water *is* life. Water is the thread that interconnects life itself- the forests, the soil, the

atmosphere, plants, animals, and human beings" (Shiva, 2002, p XVI).

Despite the fact that the global population can be sustained by only 1% of the Earth's

freshwater supply, natural disparities and economic inequity in water distribution have led to

water scarcity and contamination globally (McDonald & Jehl, 2003). People's lives are put at

risk every day due to contaminated drinking water. Recent water contamination issues in Flint,

Michigan and Pownal, Vermont point to stressed water systems, systemic inequity, and some

suggest they foreshadow the end of "golden age of water" (Goleman et al 2012). Understanding

and solving water quality issues requires a deep understanding of not only ecology but also of the

people and systems with which water interacts. The way educational programs teach about water

should be reflective of these complex social-ecological systems.

In addressing issues of water quality, it is imperative that the process and solutions

acknowledge the power and privilege dynamics that underlie many water quality challenges.

Cases of water quality contamination often affect marginalized groups first (McDonald & Jehl,

2003). An example of this pattern can be seen in the dynamics associated with the North Dakota

Access Oil pipeline, a project that not only threatens the water supply of the Standing Rock

Sioux Reservation but will also destroy sacred tribal burial grounds and cultural lands (Healy,

2016). As a watershed educator, I've designed this project to actively address issues of equity

and power and privilege dynamics that often perpetuate systems and structures of oppression in

issues of water quality, quantity and access.

To prepare our students for the water quality challenges of tomorrow, we must expose them to sustainable and innovative alternatives that challenge the current untenable water resource practices. Students need opportunities to engage in emerging research, while fostering critical thinking and a fundamental understanding of the ecologies of place that include systems of power and privilege. In developing this project, I focused my attention on two essential questions:

1. What tools and skills are critical to the development of inclusive and equitable watershed education programming?

2. What capacities do watershed educators need to design and implement curricula that are inclusive and effectively address social equity?

The strategies and methods below reflect these questions as I worked to develop a watershed education professional development program with Lake Champlain Sea Grants education program UVM Watershed Alliance.

Water is an inspiration – it transcends political boundaries, has the power to unite, and illuminates deeply rooted systems of power and oppression (Goleman et al., 2012). Aaron Wolf (2012) challenges the current water scarcity orthodox offering that water quality issues pose a greater opportunity for collaboration and cooperation than conflict. While "two out of five people in the world live in places where rivers and lakes cross national boundaries – it easy to imagine nations going to war over water" (Wolf, 2012, p.70). Wolf spent years studying conflicts between nations where water was the key factor. During this time, he examined nearly 2,000 conflicts between 1946 and 1999. He found that of these conflicts, 67% resulted in peaceful resolutions while 23% involved verbal hostilities and only 5% led to physical hostilities (Wolf, 2012).

Strategies and Methods

As an educational practitioner and watershed science outreach professional, I am immersed in both the qualitative and quantitative worlds. I oversee curriculum development, research projects, undergraduate internships and K-12 professional development programs. The focus of my project involved developing an undergraduate course for aspiring watershed educators that explored and expanded students understanding of educational theories, watershed science, and the systems of power and privilege that inform these topics. This course and professional development opportunity sought to bridge scientific understanding with the human dimensions of water quality challenges, inviting students to develop and construct their own understanding through the process of reflective practice throughout a 15-week course that combines a seminar with a field-based teaching placement with a watershed organization in the Lake Champlain Basin.

This watershed practicum specifically targets undergraduate students seeking careers in formal and informal K-12 education and environmental science. I chose this audience as a high leverage point: these individuals will take their learnings and implement them throughout their years of service in the environmental education and environmental science field. Additionally, the practicum design was informed by transformational educational theory, drawing upon the work of O'Sullivan, Morrell and O'Connor (2002). The framework I used was adopted from Teaching for Change (2017), an organization committed to transformative education which focuses on teaching and learning that includes:

- o *"A deep structural shift in the basic premises of thought, feelings and actions*
- o *A shift of consciousness that alters our way of being in the world*
- o *Understanding ourselves, our self-locations, and our relationships with others in the world*
- o *Envisioning alternative approaches and possibilities for social justice. In other words, transformative education is teaching and learning which effects*

a change in perspective and frame reference (Mezirow & Taylor, 2009, p. xvii).

  o *Understanding relations of power in interlocking structures of race, class and gender"* (Change, 2017)

This framework has the potential to significantly influence the way that watershed education is practiced by focusing on leverage points (Meadows, 2008) that transform underlying mindsets that give rise to water quality solutions and strategies.

This project builds on the current work happening at the University of Vermont Rubenstein School of Environment and Natural Resources regarding diversity, equity and inclusion. The Rubenstein School mission includes a commitment to creating a culturally diverse learning environment. Currently the Rubenstein School is undergoing a yearlong equity assessment, M. Vea-Fagnant shared that this initiative will "support and foster organizational learning and change in service to equity-centered practices and culture" (personal communication, September 13, 2017). Additionally, topics of power, privilege, equity and social justice are woven into the fabric of core curriculum including Race and Culture in Natural Resources (NR 006), Environmental Problem Solving and Impact Assessment (NR 206) and Power, Privilege and Environment (NR207). This new practicum course complements the existing curriculum while addressing a school-wide priority to offer diversity, power and privilege content and curriculum within the programmatic disciplines. As such, the course places issues of power and privilege at the center, and will go through the process to be listed as a General Education Diversity requirement course.

The practicum course also addresses the strategic initiatives of the University in many ways. It would fulfill a General Education Sustainability requirement (necessary for all undergraduate students). The design of this practicum course utilizes an internship approach and

a service-learning component where the students are engaged in developing their own teaching philosophy while they are building skills in the classroom. These approaches are shown to have high impact on the retention of and engagement in learning (Kuh, 2012).

In addition, this course provides an opportunity to expand the training program for student interns in the Watershed Alliance. These student interns work as facilitators of watershed science programs and activities. This project transforms this training into a credit-bearing practicum course that could accommodate more students and further deepen capacity within our Watershed Educator student body. To do this, my project included four phases: surveying student needs, piloting coursework, conducting a focus group to gather feedback, and syllabus development.

Surveying Student's Needs: Following the framework for catalyzing change provided by Donella Meadows (Meadows & Wright, 2008), I began by "dancing with the system" – learning the history of watershed education and the current Watershed Alliance internship model. I began by reviewing 4 years of watershed educator evaluations that addressed the current strengths and weaknesses of the internship program. Overwhelmingly the feedback called for more technical training and support developing teaching abilities. These identified needs and areas for improvement provided a platform to begin exploring what a more reflective and intensive experience for our undergraduate students might look like. Additionally, I administered a "pre" survey to the current group of watershed educators to assess their perceived understanding and abilities surrounding topics of watershed science, teaching, power and privilege dynamics (see Appendix A). I also conducted informal interviews with individuals around the UVM campus to learn about programs that were already working to address issues of power and privilege.

Developing and Piloting Coursework: Building on the assessment described above, I began to develop educational activities and opportunities for Watershed Educators that expanded the curriculum in ways that address critical reflection of power and privilege dynamics. I combined high-impact educational practices such as service-learning with diversity and global learning into smaller activities with supporting content that I could pilot with the current cohort of watershed educators (Kuh, 2012). The trainings and activities are outlined in Appendix C. Throughout this project I was able to work with teachers around Vermont and learn some of the innovative ways they have been addressing the current political climate in the classroom.

Feedback: While experimenting with these new activities, I facilitated a series of meetings and check-ins with students throughout the semester to elicit feedback on the students' experiences. I conducted bi-weekly student cohort meetings where students were provided the space and opportunity to reflect on their teaching experience, progress on their personally designed teaching goals, and dive deeper into conversations of power and privilege. I maintained an online discussion board in which students were asked to critically reflect on these issues. At the end of the semester, I administered a follow-up survey to assess students' perceived ability and knowledge gains (see Appendix B). Lastly, I conducted a focus group (see Appendix D for the focus group facilitation guide) to gather qualitative data on the students experiences. I was able to then code and analyze the transcripts to identify major themes and patterns. I had two peers independently code the transcriptions, and compared our results to validate the analyses. The codes are listed in Appendix E.

Syllabus Development: Integrating all of the learning from the methods above, I developed a syllabus for a credit-bearing practicum course that builds on the piloted work from this project, accounting for both evidence-based teaching practices and student feedback from the project data.

Results

Figure 1: Spring 2017 Watershed Educator Cohort

The results and deliverables from this project fall into two categories: 1) insight/learnings from undergraduate watershed educators experience, and 2) the development of the practicum syllabus that takes the current internship model and transforms it into a reflective practicum and credit-bearing course. The syllabus can be found in Appendix F.

The student feedback (including surveys, meetings, and focus groups) provided an array of notable findings. The post-practicum survey revealed that 100% of students either strongly agreed or agreed that they can facilitate difficult conversations on water quality in the Lake Champlain Basin. On the pre-practicum initial survey, only 33% of students agreed they had this

skill. Also in the post survey, 100% of students said they were familiar with reflective practices that can help improve their teaching abilities.

Additionally, students were asked to reflect on how the course readings and activities helped them develop a deeper understanding of water resources and intersectional issues of power and privilege. The two responses below reflect the overall sense that many students were able to make these explicit connections:

Figure 2: Watershed Educator Responses Q17

[The readings and coursework] have helped me think about the fact that there are many different approaches to water resources to be considered. For example, the approach the Abenaki have versus euro American settlers. It's important to be aware what type of framework of assessment of a stream we are teaching the kids. Currently, it's focused on science based processes and parameters. I think it could include more about the way that Abenaki view our water resources.

I learned from the readings that water is life. With life comes issues of power and privilege. I learned that water issues are so much more than clean/dirty.

To add to these comments, 100% of survey respondents said they would be interested in learning more about the power and privilege dynamics of water quality and quantity issues, and all were also interested in learning more about the local and Indigenous knowledge of the Lake Champlain Basin.

Additional feedback on the piloted coursework and activities was provided through an externally facilitated focus group. Through coding the results, I was able to identify the main themes and patterns. Overwhelmingly, students discussed increases in their teaching abilities and increased understandings of power and privilege dynamics. Other prevalent themes included inclusion, the development of students' personal teaching philosophies, and identifying leverage points for catalyzing change. These results also offered a sense that the students' learning was

aligned with the essential questions and course learning objectives noted in the Watershed Education Practicum in Appendix F. Additionally, the focus group data suggested that that students were engaged and found the content meaningful.

Watershed Education Practicum Core Principles

Building on the learnings from the practicum and my inquiry into transformative learning (and project essential questions), I have identified the following key principles that inform and underlie this approach to education. These principles below are also influenced by the learning and development goals from the North American Association of Environmental Education (2017) and the United Nations Sustainable Development goals (2017):

- **Diversity, Equity and Inclusion:** Learning environment is inclusive of all students, acknowledging multiple ways of knowing, differentiated skills, and students' strengths.

- **Thinking in Systems:** Systems are inherently complex. To better engage in this complexity, students require a deep understanding of the individual parts and the relationships between them.

- **Fostering Relationships:** The development of relationships with self, peers, students, and place is essential to creating a learning environment where there is trust and vulnerability. At the heart of this core principle is the practice of reciprocity which allows for deeper connections and the development of relational trust.

- **Awareness and Reflection:** Awareness is a key practice for educators, including awareness of self, their students, and the environment (both natural and learning). Through reflection, individuals can deepen their understanding and teaching practices.

- **Cultivating Openness:** In an effort to invite vulnerability and authentic feedback that fosters transformative learning, I seek to create a space that is open and allows for individuals to engage across difference and partake in difficult conversations.

- **Integration and Infusion:** A fundamental understanding of natural and social sciences is essential to effectively engage with water quality challenges. This learning environment creates space for cross-pollination among disciplines. Additionally, the goal of the practicum is to be an applied learning experience, which enables students to take their academic learnings and employ them in their work throughout the community.

These core principles are important drivers for making watershed education transformative. I have included components for each within my proposed watershed education practicum syllabus that build skillsets around these principles (as seen in Appendix F). The syllabus essential questions and learning objectives repeatedly highlight the essential focus on relationships, awareness, and openness, while providing content to develop teachers their teaching practices, skillsets, and pedagogies.

Personal Learnings, Evaluation, and Assessment

In addition to exploring Watershed education practices and developing course content a key element of this project was personal critical reflection and evaluation. One of the aspects I enjoy most about teaching is the reciprocity between the students and the instructor. During this project, I was privileged to engage with and learn from the current watershed educator cohort, including conversation and seminar about their experiences, aspirations, and exploration of their unique individual potential. Engaging in their learning process cultivated in my own self

immense personal growth and altered my personal teaching philosophy, further solidifying the MSLS leadership practices I have been engaged in over the last two years. Specifically, my continued practice of gratitude and awareness has helped me be more open and responsive as a teacher. In addition, this has helped ground my understanding of water quality to include all life.

Additionally, an external avenue in which I received feedback was through my project committee. I selected my committee based on their strengths and areas where I felt I would need extra support throughout the project development and implantation process. Over the course of the project I met with my committee twice for formative assessments. During these assessments, my committee offered a variety of feedback focusing on my learning edges of qualitative research and synergistic connections to current research. This qualitative expertise increased the rigor of my work and reflection on my project at a much deeper level.

One of the challenges and future aspirations I discussed at my formative assessments was the ability to develop more differentiated structure of support for students. As a teacher, I understand the importance of meeting students where they are at and providing the adequate amount of support throughout their own personal learning journey.

While I received much feedback from the entire MSLS cohort, my peer support group was a grounding source throughout the project. From the inception to the implementation and evaluation my peer group met virtually and in person to discuss our projects, address challenges we were facing, and offer guidance. This informal support provided valuable feedback from colleagues which ultimately helped shape the work I have done over the last two years.

Recommendations and Next Steps

While I have finished the project, the work has just begun. I am grateful to have been provided the opportunity through my Masters work to dive deeper and lay some of the foundation that will allow this work to continue and grow. A few of the key next steps I see taking shape include: proposing the practicum to the Rubenstein School of Environment and Natural Resources, completing a semester of the program, integrating more work from experts in the field, and increasing alignment with RSENR and university initiatives and requirements.

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Appendix A: Theory of Change

Desired Social Change		
Watershed science education and outreach is inclusive and encourages participant engagement		

Change in Environment	Change in those Most Affected	
Education practices reflect a broader understanding of water as a natural resource and the power and privilege dynamics associated with current education pedagogies and practices	Marginalized groups are participating (or engaged) in WA programming or citizen science projects that is inclusive and address relevant needs	

Necessary Conditions for Change	Necessary Capacity for Change	Necessary Opportunity for Change
Watershed Educators, teachers and students are ready to lean into tension surrounding water quality power and privilege dynamics and are open to inclusive watershed curricula	Educators and marginalized groups transcend the status quo of watershed education	Opportunities for all to develop a stronger sense of stewardship for their watershed.

Watershed Alliance's Role	Project Partners
- We provide a space for meaningful reflective watershed science education experiences. - We engage our students (interns and K-12 students) in an inclusive learning environment. - We create the conditions for rich meaningful conversations about power and privilege dynamics within the water resource sector.	- UVM Extension - College of Education and Social Services - Rubenstein School of Environment and Natural Resources - UVM Watershed Alliance - Lake Champlain Sea Grant - NOAA - Watershed Education Groups - NAAEE - VT SWEEP

Appendix A: Watershed Educator Practicum Survey (Pre)

Q1 How did you discover this internship opportunity?

_____

Q2 Is this your first semester interning with UVM WA?

○ Yes (1)

○ No (2)

Q3 Which of the following statements best describe your professional aspirations?

○ Working as an extension agent directly with communities to solve local environmental problems (1)

○ Working as an environmental educator with K-12 youth and communities to extend scientific research and knowledge (2)

○ Working as the science communicator and outreach specialist for an environmental organization (3)

○ Program Director for an environmental nonprofit, academic, or governmental organization (4)

○ Working as a quantitative or qualitative researcher in a field based position (5)

○ Working in a field not listed - please describe (6)

_____

Q4 Please rank the following skills on how important you think they are in relation to success in the workplace (click and drag to move items)

_____ Ability to facilitate difficult conversations (1)
_____ Ability to give and receive feedback (2)
_____ Ability to reflect on you own work (3)
_____ Ability to develop meaningful relationships (4)
_____ Ability to extend your knowledge and understanding of a given topic (5)

Q5 Please rank the following skills and knowledge you hope to glean from this internship (click and drag to move items)

_____ Water Resource Knowledge (1)
_____ Experience Teaching (2)
_____ Teaching Skills (3)
_____ Outreach Skills (4)
_____ Knowledge about local water quality issues (5)
_____ Experience working with a NOAA funded program (6)

Q6 Please indicate your level of knowledge with the following topics

	Extremely knowledgeable (1)	Very knowledgeable (2)	Moderately knowledgeable (3)	Slightly knowledgeable (4)	Not knowledgeable at all (5)
Water quality testing (pH, DO, PO43) (1)	○	○	○	○	○
Biological sampling of benthic macroinvertebrates (2)	○	○	○	○	○
Stream geomorphology (3)	○	○	○	○	○
Water quality issues in the Lake Champlain Basin (4)	○	○	○	○	○
What is your knowledge of the different organizations working on improving water quality in the Lake Champlain Basin (5)	○	○	○	○	○
What is your knowledge of the work being preformed by various organizations working on water quality issues in the Lake Champlain Basin (6)	○	○	○	○	○
Best management practices for improving water quality (7)	○	○	○	○	○

The major tributaries and sub basins of the Lake Champlain Basin (8)	○	○	○	○	○

Q7 How much feedback would you like to get on your teaching throughout the semester?

○ A great deal (1)

○ A lot (2)

○ A moderate amount (3)

○ A little (4)

○ None at all (5)

Q8 How do you prefer to receive feedback?

☐ Through a reflective discussion directly following the lesson or activity (1)

☐ Through a reflective discussion a day or so after the lesson or activity (2)

☐ Through specific examples of actionable improvements (discussion) (3)

☐ Through specific examples of actionable improvements (written) (4)

☐ Through one-on-one coaching or meetings (5)

Q9 Do you feel comfortable receiving feedback from your peers? (Please explain your response in the text box next to your selection)

○ Yes (1) _____

○ Maybe (2) _____

○ No (3) _____

Q10 Please select your level of agreement/disagreement with the following statements

	Strongly agree (1)	Agree (2)	Somewhat agree (3)	Neither agree nor disagree (4)	Somewhat disagree (5)	Disagree (6)	Strongly disagree (7)
I have participated in formal multicultural competency training (1)	○	○	○	○	○	○	○
I have received training on how to differentiate lesson plans for different student ability levels (2)	○	○	○	○	○	○	○
I am familiar with the traditional ecological knowledge and indigenous knowledge of the Lake Champlain Basin (3)	○	○	○	○	○	○	○
I can integrate local and indigenous knowledge into my lesson plans (4)	○	○	○	○	○	○	○

| I can facilitate difficult conversations about water quality in the Lake Champlain Basin (5) | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| I am familiar with reflective practices that can help me improve my teaching (6) | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

Q11 Would you be interested in taking an experiential education course that dives deeper into watershed science education?

○ Yes (1)

○ Maybe (2)

○ No (3)

Q12 Are you interested in learning more about the power and privilege dynamics of issues of water quality and quantity?

○ Yes (1)

○ Maybe (2)

○ No (3)

Q13 Are you interested in learning more about the local and indigenous knowledge of the Lake Champlain Basin?

○ Yes (1)

○ Maybe (2)

○ No (3)

Q15 How do you think UVM Watershed Alliance is working towards creating an inclusive environment?

_____

_____

_____

_____

_____

Q16 What has been the most rewarding aspect of this internship?

_____

Q17 How have the course readings and activities helped you develop a deeper understanding of water resources and intersectional issues of power and privilege?

_____

Q18 Is there anything else you would like to share?

_____

_____

Appendix B: Watershed Educator Practicum Survey (Post)

Q2 Was this your first semester interning with UVM WA?

○ Yes (1)

○ No (2)

Q3 Which of the following statements best describe your professional aspirations?

○ Working as an extension agent directly with communities to solve local environmental problems (1)

○ Working as an environmental educator with K-12 youth and communities to extend scientific research and knowledge (2)

○ Working as the science communicator and outreach specialist for an environmental organization (3)

○ Program Director for an environmental nonprofit, academic, or governmental organization (4)

○ Working as a quantitative or qualitative researcher in a field based position (5)

○ Working in a field not listed - please describe (6)

_____

Q4 Please rank the following skills on how important you think they are in relation to success in the workplace (click and drag to move items)

_____ Ability to facilitate difficult conversations (1)

_____ Ability to give and receive feedback (2)

_____ Ability to reflect on you own work (3)

_____ Ability to develop meaningful relationships (4)

_____ Ability to extend your knowledge and understanding of a given topic (5)

Q5 Please rank the following skills based on how much experience and knowledge you gleaned in each of these topic areas this semester (click and drag to move items)

_____ Water Resource Knowledge (1)

_____ Experience Teaching (2)

_____ Teaching Skills (3)

_____ Outreach Skills (4)

_____ Knowledge about local water quality issues (5)

_____ Experience working with a NOAA funded program (6)

Q6 Please indicate the increase in your level of knowledge with the following topics - as a result of your internship experience, suggested readings and resources, and group discussions.

	Extreme increase in my knowledge (1)	Significant increase in my knowledge (2)	Moderate increase in my knowledge (3)	Slight increase in my knowledge (4)	No increase in my knowledge (5)
Water quality testing (pH, DO, PO43) (1)	○	○	○	○	○
Biological sampling of benthic macroinvertebrates (2)	○	○	○	○	○
Stream geomorphology (3)	○	○	○	○	○
Water quality issues in the Lake Champlain Basin (4)	○	○	○	○	○
What is your knowledge of the different organizations working on improving water quality in the Lake Champlain Basin (5)	○	○	○	○	○
What is your knowledge of the work being preformed by various organizations working on water quality issues in the Lake Champlain Basin (6)	○	○	○	○	○
Best management practices for improving water quality (7)	○	○	○	○	○

| The major tributaries and sub basins of the Lake Champlain Basin (8) | ○ | ○ | ○ | ○ | ○ |

Q23 How much feedback do you feel you received throughout the semester?

○ A great deal (1)

○ A lot (2)

○ A moderate amount (3)

○ A little (4)

○ None at all (5)

Q24 Would you have preferred more feedback? If so, please explain what would be helpful in the future.

_____

_____

_____

_____

_____

Q8 Having a semester of experience what do you see as the most effective way to give and receive feedback as a Watershed Educator?

☐ Through a reflective discussion directly following the lesson or activity (1)

☐ Through a reflective discussion a day or so after the lesson or activity (2)

☐ Through specific examples of actionable improvements (discussion) (3)

☐ Through specific examples of actionable improvements (written) (4)

☐ Through one-on-one coaching or meetings (5)

☐ Other (Please Explain) (6) _____

Q9 Would you like more opportunities for peer feedback? (Please explain your response in the text box next to your selection)

○ Yes (1) _____

○ Maybe (2) _____

○ No (3) _____

Q10 Please select your level of agreement/disagreement with the following statements

	Strongly agree (1)	Agree (2)	Somewhat agree (3)	Neither agree nor disagree (4)	Somewhat disagree (5)	Disagree (6)	Strongly disagree (7)
I have participated in formal multicultural competency training (1)	○	○	○	○	○	○	○
I have received training on how to differentiate lesson plans for different student ability levels (2)	○	○	○	○	○	○	○
I am familiar with the traditional ecological knowledge and indigenous knowledge of the Lake Champlain Basin (3)	○	○	○	○	○	○	○
I can integrate local and indigenous knowledge into my lesson plans (4)	○	○	○	○	○	○	○
I can facilitate difficult conversations about water quality in the Lake Champlain Basin (5)	○	○	○	○	○	○	○

| I am familiar with reflective practices that can help me improve my teaching (6) | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

Q11 Would you be interested in taking an experiential education course that dives deeper into watershed science education?

○ Yes (1)

○ Maybe (2)

○ No (3)

Q25 Would you be interested in receiving more training as a part of your Watershed Educator experience?

○ Yes (1)

○ Maybe (2)

○ No (3)

Q12 Are you interested in learning more about the power and privilege dynamics of issues of water quality and quantity?

○ Yes (1)

○ Maybe (2)

○ No (3)

Q13 Are you interested in learning more about the local and indigenous knowledge of the Lake Champlain Basin?

○ Yes (1)

○ Maybe (2)

○ No (3)

_____

Q15 How do you think UVM Watershed Alliance is working towards creating an inclusive environment?

_____

_____

_____

_____

_____

_____

Q16 What has been the most rewarding aspect of this internship?

_____

_____

Q17 How have the course readings and activities helped you develop a deeper understanding of water resources and intersectional issues of power and privilege?

_____

_____

Q18 Is there anything else you would like to share?

_____

_____

_____

_____

_____

Appendix C: Watershed Educator Training Agenda

Day 1: Saturday, March 25th 2017
Location: Rubenstein Lab - Teaching Classroom
Time: 12:00 - 4:00 PM

Assignments due on **Saturday, March 25th:**
*Please bring your schedule for the semester and computer
- Complete the following pre-season survey
  - Sent in Email
- Read Preface from *Water Wars* by Vandana Shiva
  - PDF of chapter attached to email
- Read Ch. 1 from *Streams: their ecology and life* by Cushing and Allan
  - PDF of chapter attached to email
- **Listen to these 2 NPR segments (~4mins each)**
  - http://www.npr.org/sections/ed/2016/09/28/495488716/bias-isnt-just-a-police-problem-its-a-preschool-problem
  - http://www.npr.org/sections/ed/2016/08/12/485839561/want-to-address-teachers-biases-first-talk-about-race

- **Watch ONE of these Ted Talks (~10 minutes each)**
  - https://www.ted.com/talks/dena_simmons_how_students_of_color_confront_impostor_syndrome
  - https://www.ted.com/talks/kandice_sumner_how_america_s_public_schools_keep_kids_in_poverty

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Session 1: (12 - 12:30) Introductions, training overview, spring schedule, paperwork, and resource introduction (~1.5 hours)

Objectives: Get to know one another; understand WA program goals and objectives as well as WE's roles and responsibilities; discuss spring schedule; complete paperwork; learn how to use online resources.

Activities:
- Lake Champlain Sea Grant and Watershed Alliance Overview, LCSG staff (AE)
- Introductions - "Ice-breaker" (AE)
- Intro to Semester: Educators and Scientists as systems thinkers - using reflection and practice to build skillsets
- Training overview, program components, and WE responsibilities (AE)
  - Threads we will be exploring this semester: Water, Power and Privilege, Teaching
  - Ask questions anytime!
- Google account access, Gmail, calendar, documents, and website access (AT)
- Review spring schedule and WE availability (AT)
- Peoplesoft (AT)
- Mileage (AT)
  - (AE) New Policy - 1 car per trip unless student gets prior approval
- SMSP Pre-Assessment
- Overview of feedback Structure for semester (AE)
- Schedule 3 Check in Meetings between now and end of May

- Photo Contest (AE)
- Lab Tour (AT)
  - Bus from UVM Campus

Section 2: (1:30 - 2:00) An Introduction to Educational Theory, Professionalism and Group Management Skills (30 mins) (AE)

Objectives: Understand the meaning of professionalism and characteristics of a professional; discuss student-teacher dynamics. Know the qualities of an engaging teacher; go over educating tips, understand differences in learning styles and how you learn best; go over challenges of teaching in the field and how to address them; learn some tools you can use to focus a group.

Essential Questions:
- Language - What do we mean when we say water as a "Natural Resource"
- How do we teach without perpetuating euro-american ideologies and extractive water practices?
- Practice

Activities:
1. Discussion and reflection on what makes a teacher "great"
2. Teaching Scenarios

Session 3: (2:00 - 3:00) Watershed Introduction and Watershed model demonstration (1 hour)

Objectives: Define watershed, polluted stormwater runoff vs. point source pollution, best management practices; describe impacts of pollutants (sediment, feces, pesticides, fertilizers, salt, motor oil and other organics) on an aquatic ecosystem; explain the process of eutrophication and the relationship between nutrient loading and cultural eutrophication; demonstrate the watershed model activity and discuss tips for using with school groups; model set-up, cleaning, and storage; explain impacts of development on stormwater volume.

Activities:
1. Introduction to watershed science, Lake Champlain watershed, lake ecosystem (15)
2. (AE + AT) will teach watershed model with time for questions (45)

Session 4: (3:00-3:35) Power, Privilege, and Water

Objectives: Reflect on pre-training materials. Share your Water Story. Explore authentic ways to connect with students.

Activities:
1. What's your water story?
2. Ecology of Place - Basin Edition
3. Exploring where we teach: what are the local stories of water - Don Stevens Podcast
4. Dynamics present in Vermont classrooms
   - Demographics of VT: semi-urban vs rural, farming communities, there is often a lot of pressure of people of color in the room, refugee resettlement program (what does place mean)?

Section 5: (3:35-3:55) Edmunds Overview (AT)

Session 6: (3:55-4:00) Co-Teaching Activity for Next Training Assignment Overview (AE)
- Each group of 2-3 will co-teach 1 of the three stream monitoring stations in preparation for next week's training.

- o Benthic Macro Station
- o Chemical
- o Physical
- Pairings:
  - o Anna R-B - Olivia (Benthics)
  - o Caroline - Lily - Maya (Chemistry)
  - o Sam - Lila (Physical)

Watershed Educator Training Agenda Spring 2017

Day 2: Saturday, April 1 2017
Location: Rubenstein Lab and Potash Brook
Time: 12:00 - 4:30 PM

Assignments due on **Saturday, April 1st**
- Be prepared to get into the stream! Wear waterproof footwear, layers of warm clothes, and bring a lunch.
- Be prepared to give a ~15 minute lesson on one of the following stream monitoring stations:
  - o Anna R-B - Olivia - Tara (Benthics)
  - o Caroline - Lily - Maya (Chemistry)
  - o Sam - Lila (Physical)
- Please jot down some ideas about a personal goal you would like to set for the semester
- Please listening to the ***Streams of Thought*** Podcast (~15 mins) with Don Stevens: https://drive.google.com/file/d/0B1Qc6yPnNH2XR29oNlZEUElGSEk/view?usp=sharing
- Read:
  - o Privilege as Practice: A Framework for Engaging with Sustainability, Diversity, Privilege, and Power - Kolan and TwoTrees (PDF attached)
  - o From Healthy Water, Healthy People: (PDF's attached)
    - ▪ Dissolved Oxygen
    - ▪ Phosphorus
    - ▪ pH
  - o The Reflective Teacher: Taking a Long Look from edutopia (PDF attached)

OPTIONAL: Watch Videos on Chemical Testing:
- ▪ DO - https://www.youtube.com/watch?v=7efaMU5wsY4
- ▪ PO4 -Go to minute 3 - we have HACH colorimters but the process is relatively the same. https://www.youtube.com/watch?v=9oaHjMrnYX0
  With our kits you have to do the math and multiply by .326. I then found this video, which is most similar to our process - https://www.youtube.com/watch?v=08x1eSWznPA

Session 1: Goal Setting (20 mins)
    Objectives: explore how you would like to grow as an educator and professional.

Session 2: Presentations (45 mins)*

Objectives: Discover your style of teaching, how to improve your teaching skills/methods, and learn about some of the major topics that we cover.

Activities:
1. Give 10 min presentations. Be prepared to give/receive feedback regarding your presentation style, content, and delivery.

Session 3: Exploration Stations (30 mins)
Objectives: Better understand the chemical, physical, and biological stations that will be taught during SMSP and learn how to facilitate this introductory lesson to stream monitoring.

Session 4: Stream Monitoring at local stream (2 hours)
Objective: Learn how to use all monitoring equipment as well as how to teach and manage the three stream monitoring stations included in SMSP.

Activities:
1. Gather and load equipment, travel to site (20)
2. How to collect water sample (10)
3. Chemical testing (30)
4. Benthic Macroinvertebrate sampling (30)
5. Habitat assessment/physical survey (30)
6. Group Management and safety role-play (15)
7. Travel to lab, clean and put away equipment (20)
8. Discussion about outreach and stewardship of SMSP (10)
9. Debrief/Questions, SMSP Post Assessment (15)

Appendix D: Educator Post Season Facilitation Guide

September 5th, 2017 from 8:30-9:30
Aiken 301 – *Rock of Ages Room*

Hi Corey,

Thank you so much for taking the time to conduct the focus group for me. Below I have outlined a few key items such as the purpose, participant names, ground rules and the primary questions. I will be recording the session (if granted consent of the participants), this way you can simply stay engaged in the conversation. My goal is to have the session flow as a conversation, ideally as students begin to reflect it will spark others to share. This should create an easy dialogue that pulls out their key reflections. I have provided a set of primary questions, however if you find there is an opportunity to "dive deeper" please create the space for this.

Purpose

To reflect on the practices, activities and readings piloted last spring focused around power and privilege in issues of water quality and quantity and the role educators can play in affecting change with the group of undergraduate interns who worked for Lake Champlain Sea Grant as Watershed Educators. This session is to provide insight into the experience the educators had and allow space for feedback.

Focus Group Participants

- Caroline Drayton
- Lily Myers
- Maya Dizack
- Sam Koufman
- Lila Satterfield
- Olivia Coon

Ground Rules

- Ask permission to record focus group
- Confidentiality – what is said in the focus group will not be made anonymous
- Step up step down – allows all voiced to be heard

Questions

Question	Category of Question	Time Required
1. What knowledge was improved or deepened during your spring semester as Watershed Educators?	Assess Knowledge	Brief – 5 minutes
2. How did the spring coursework influence your perceptions about power and privilege dynamics within issues of water quality and quantity?	Change Perceptions	Long ~10 minutes
3. How have the readings, activities, and applied practice last spring impact your teaching philosophy? *Teaching Philosophy:* a set of your beliefs about **teaching** and learning. It should also discuss how you put your beliefs into practice by including concrete examples of what you do or anticipate doing in the classroom. (UMN)	Reflection, Sharing	Very Long - ~15 minutes
4. What motivates you as future educators/scientists/etc. to engage in work that addresses power and privilege dynamics in water quality (or more largely in the arena of sustainability)?	Discussion	Long 10 minutes
5. What enduring understandings, knowledge, or practices will you take forward and implement in the future?	Reflection	Long 10 minutes
6. In future years, what should be included (content, activities, etc.) in the practicum coursework?	Reflection	Range 0-10 minutes
7. Is there anything else you want to share that we didn't talk about?	Closing	Range 5 – 10 minutes

Notes:

Things to avoid when conducting a focus group – from CAHC Evaluation Resource Guide

Asking too many questions—stick to the time frame you have set. Participants will be less open if the group takes too long.

Asking inappropriate questions—make sure the questions relate to the reason the group is being done and that all follow up questions stay on the desired topic.

Talking over or under the participants' comprehension level—the moderator of the group must be able to talk at the participants' level.

Using jargon—make sure to not use acronyms, medical or other terminology that the participants may not understand, and to explain any ambiguous terms.

Letting one or two people dominate the discussion—encourage everyone to participate by asking to hear from anyone who hasn't shared their thoughts yet, without putting any person directly on the spot or forcing anyone to share.

THANK YOU!!

Theme	Code	Qualifier
Teaching Ability	TA	Participant identifies a change in their teaching abilities
Power and Privilege	PP+	Participant comments reflect a theme of increased understanding of power and privilege dynamics
	PP-	Participant comments reflect no change in understanding of power and privilege
Critical Reflection	RE	During the focus group, participant critically reflects on their experience engaging in the coursework and/or practices
	RF	Participant references critical reflection that occurred during the pilot practicum
Professorial support	PS+	Participant notes different levels and types of support offered by their professors and instructors
	PS-	Participant notes insufficient support by their professors and instructors
Teaching Philosophy	TP	Participant comments on practices they developed that changed how they teach
Catalyzing Change	CC	Participant identifies leverage points that deconstruct systems of power and oppression that led to change
Inclusion	IN	Participant identifies ways in which their teaching practices increased inclusion and engagement
Content	C	Participant identifies increased scientific content knowledge

Appendix F: Draft Syllabus

NR XXX: Watershed Education Practicum
University of Vermont

Instructor:	Ashley Eaton, MS	**Credit hours:**	3
Office:	Rubenstein Ecosystem Sciences Laboratory RM 114	**Meeting time:**	TBD
Phone:	802-859-3086 ext. 340	**Office hours:**	TBD
Email:	akeaton@uvm.edu	**Classroom/Lab:**	AIKEN XXX

Overview:
The Watershed Education Practicum is an applied practice course that combines a seminar and field based teaching placement. The course will engage students in topics and practices pertaining to environmental education and water resources. Acknowledging the power and privilege dynamics that are often interlaced in issues of water quality and quantity is part of how watershed education can be used as a leverage point to address the disproportionate challenges marginalized groups face, illuminate systems and structures of oppression, and challenge current untenable water resource practices. This is an elective course for undergraduate students and will be offered each fall and spring semester (see below for list of topics).

Required Texts:
Cushing, C. E., & Allan, J. D. (2001). *Streams : their ecology and life*. San Diego, Calif.: Academic Press. **ISBN-10: 0120503409**
Shiva, V. (2002). *Water wars : privatization, pollution and profit*. Cambridge, MA: South End Press. **ISBN-13: 978-1623170721**
Orr, D. W. (1992). *Ecological literacy : education and the transition to a postmodern world*. Albany: State University of New York Press. **ISBN-10: 1578051533**

Recommended Texts:
Hoekstra, A. Y., & Chapagain, A. K. (2008). *Globalization of water : sharing the planet's freshwater resources*. Malden, MA: Blackwell Pub. ISBN-13: 978-1405163354 **ISBN-10: 1405163356**
Lampert, W., & Sommer, U. (2007). *Limnoecology* (2nd ed.). Oxford ; New York: Oxford University Press Inc. **ISBN-13: 978-0199213931**

There will also be articles, websites, and other online resources provided throughout the course via Blackboard.

Required Materials:
- Write in the rain notebook for field and teaching observations

Practicum Description:
The course content explores the intersection of education, water, humans, power and privilege and supports the hands-on practicum experience. Throughout the 15-week semester, the course

will cover a range of themes organized in 8 modules. The course will use an applied learning structure that pairs students with a watershed organization where they will gain experience as watershed educators in the Lake Champlain Basin. Students will record field notes of their teaching experiences and attend a concurrent seminar in which they reflect on their field experience. This creates the space for students to reflect, build their capacity and literacy in watershed science, education, and to be agents of change. This approach engages students in developing and constructing their own understanding through the process of reflective practice.

Each of the modules will include the following aspects:
1. **Context and Content**
   a. Through weekly seminars students will engage and explore content and practices pertaining to the specific module topic(s)
2. **Exploration**
   a. Through weekly field teaching experiences students will apply practices and content knowledge as watershed educators
3. **Reflection**
   a. Weekly dialogue prompts will invite students to explore and reflect on module content and experiences and create a dialogue in which students can reflect on one another's posts
   b. Students will keep a teaching journal that will be used throughout the semester to record field notes, observations and critical reflections from their teaching experience
4. **Integration – Teaching Portfolios (throughout the entire course)**
   a. Teaching portfolio assignments are opportunities for students to share and reflect on the module content. Prompting students to reflect on their specific teaching practices and what they will carry forward

Course Structure for 2-Week Modules:

Timeline	Assignment	Approx. Time (hours)
Midnight on Sunday	Module content released via blackboard	4
Monday	Seminar	1
Monday through Saturday	Field teaching practicum	4
Monday through Saturday	Discussion board posts	1
Last Saturday by Midnight	Module reflection and ongoing teaching portfolio work	1

Essential Questions:

Issues of water quality and quantity are complex and require a deep understanding of not only ecology but also of the people and systems with which water interacts. The way we educate others about water should be reflective of these complex systems.

- How can we best prepare educators and scientists to teach about water quality and access to clean waterways that address issues of inequity, power and oppression?
- How can our teaching practices reflect and interrupt systems of power and oppression?
- What can we learn from historical and current issues of water quality and quantity?

Course Learning Objectives: KNOW — DO — UNDERSTAND

Students participating in the Watershed Education Practicum will:

- *Develop the skills and practices to work across difference and facilitate difficult conversations about water quality and access to clean water in the classroom*
- *Develop critical reflection and inquiry skills*
- *Engage with new teaching practices that will provide the opportunity to expand and develop their individual teaching philosophy and teaching capacity*
- *Develop and demonstrate an understanding and respect for diversity within watershed science and environmental education*
- *Expand their knowledge and perspective of water and place*
- *Expand their knowledge of watershed science and water quality issues of the Lake Champlain Basin*

COURSE & UNIVERSITY POLICIES:

Attendance Policy

Attendance and participation are critical to the achievement of course objectives. You are expected to be on time, regularly attend, and enthusiastically participate in class to the best of your ability. It is your responsibility to inform the instructor regarding the reason for absence or tardiness from class, and to discuss these with the instructor in advance whenever possible. Circumstances that require the student to be absent for any length of time should be discussed with the professor so that a plan can be made for make-up work or extensions.

Classroom Code of Conduct

Faculty and students will at all times conduct themselves in a manner that serves to maintain, promote, and enhance the high quality academic environment befitting UVM. Details of the code of conduct are outlined on the UVM website. Turn off cell phones, messengers, etc. Repeated violations may result in grade reductions.

Religious Holidays

Students have the right to practice the religion of their choice. Each semester students should submit in writing to their instructors by the end of the second full week classes their documented religious holiday schedule for the semester. Faculty will permit students who miss work for the purpose of religious observance to make up this work.

Academic Honesty

The principal objective of the policy on academic honesty is to promote an intellectual climate and support the academic integrity of the University of Vermont. A full statement of the policy can be found in The Cat's Tale.   Each student is responsible for knowing and observing this policy. For the purposes of this course each assignment contains information about the expectations for individual or collaborative work.

Student Learning Accommodations: In keeping with University policy, any student with a documented disability interested in utilizing accommodations should contact Student Accessibility Services (SAS). SAS works with students and faculty in an interactive process to explore reasonable and appropriate accommodations via an accommodation letter to faculty with approved accommodations as early as possible each semester.   Students are strongly encouraged to meet with faculty to discuss the accommodations they plan to use in each course. Contact SAS: A170 Living/Learning Center; 802-656-7753; access@uvm.edu; www.uvm.edu/access UVM's policy on disability certification: www.uvm.edu/~uvmppg/ppg/student/disability.pdf

FERPA Rights Disclosure: The purpose of this policy is to communicate the rights of students regarding access to, and privacy of their student educational records as provided for in the Family Educational Rights and Privacy Act (FERPA) of 1974.
http://www.uvm.edu/~uvmppg/ppg/student/ferpa.pdf

Promoting Health & Safety:
The University of Vermont's number one priority is to support a healthy and safe community:
> *Center for Health and Wellbeing* http://www.uvm.edu/~chwb/
> *Counseling & Psychiatry Services (CAPS)* Phone: (802) 656-3340
> *C.A.R.E.* If you are concerned about a UVM community member or are concerned about a specific event, we encourage you to contact the Dean of Students Office (802-656-3380).   If you would like to remain anonymous, you can report your concerns online by visiting the Dean of Students website at http://www.uvm.edu/~dos/

Final Exam Policy: The University final exam policy outlines expectations during final exams and explains timing and process of examination period.

STUDENT EVALUATION:

Attendance is <u>mandatory</u>. Two unexcused absences will result in the decrease of 1/3 from your final letter grade (i.e. a B will become a B-), and will continue to drop 1/3 of a letter grade with each successive unexcused absence. Coming to class without required materials (i.e. mask) on skills day will be considered a "tardy". (Note: Tardy 2 times is considered 1 absence.)

Class Participation	20%
Reflections	20%
Teaching Portfolio	20%
Practicum	40%

GRADING:
The grading scale is as follows:

A+	97 – 100	A	93 – 96	A-	90 – 92
B+	87 – 89	B	83 – 86	B-	80 – 82
C+	77 – 79	C	73 – 76	C-	70 – 72

NR XXX Module Overview

Module	Description of Content	Readings
Module 1 Week 1-2	**Watershed Alliance and Watershed Education**	• ***Watershed Alliance Handbook*** • ***Streams- Chapter 1*** • ***Principles of Water Resources- Chapter 10*** • ***Louv – Introduction and Solving for Patterns (pg. 31)***

	PRACTICUM
	Curriculum Competencies
	  • *Stream Monitoring and Stewardship Program*
	  • *Keeping the Balance*
	
	Lab training and safety
	
	QA/QC Protocols
	
	Define personalized learning and practice goals	

Module 2
Week 3-4
	Environmental Education and Place-Based Education	***Ecological Literacy:***
		  • ***Power of Words (pg. 41)***
		  • ***Place and Pedagogy (pg. 85)***
		  • ***On Watershed Education (pg. 107)***

	PRACTICUM *Place-Based Education: Diving into Burlington Geographic* *WatershedED Matters: Watershed Education in the Lake Champlain Basin* *Environmental educational experiences: reflective teaching practices* *Develop teaching goals for semester* *Curriculum Competencies*	

	• *Lake Champlain Live* • *Stream Table*	
Module 3 Week 5-6	**Perspectives on water: storytelling as a way to integrate diverse perspectives**	• ***Don Stevens podcast – Streams of Thought*** • ***Shiva – Intro and Chapter 7*** • ***Kolan and Sullivan – Privilege as Practice*** • ***Homme – Chapter 2*** • ***Kimmer – Asters and Goldenrod (pg. 39)*** • ***Single Story TedTalk***
	PRACTICUM *Exploring water perspectives lesson assignment: stories of water and ways of knowing* *Work with peer team to give and receive feedback on lesson*	
Module 4 Week 7-8	**Inequity in Water Resources**	• ***Shiva – Chapter 2*** • ***Homme – Chapter 2*** • ***McDonald and Jehl – Introduction*** • ***Mitchen - Chapter 1*** • ***Greening the Ghetto TedTalk***
	PRACTICUM *The power of language assessment* *Whose water is it – critical reflection and Lake Champlain Basin research project*	
Module 5 Week 9-10	**Globalization of water and water rights**	• ***Shiva Chapters 1,3 and 4*** • ***Hoekstra and Chapagain – Chapters 1, 2, 10, 11*** • ***McDonald and Jehl – Chapter 1, 2, 3***

	PRACTICUM	
Module 6 Week 11-12	**The power of education**	• *Howard – Chapters 1,2,6,8* • *Swalwell – Chapter 4* • *Case – Chapter 11* • *United Nations Sustainability Goals*
	PRACTICUM *Draft teaching philosophy* *United Nations Sustainability Goals activity*	
Module 7 Week 13-14	**Watershed Resources and Education for the Next Century**	• *Homme – Chapter 4* • *Swalwell – Chapter 6* • *McDonald and Jehl – Chapters 15,16,17*
	PRACTICUM *Revise teaching philosophy* *Develop feedback for community partner*	
Module 8 Week 15	**Extended Exploration and Teaching Portfolios** Students will reflect on the course and choose a module or propose a topic to focus on for this 1 week unit that is relevant to their teaching portfolio	*TBD*

	PRACTICUM *Teaching Portfolio Finished and Submitted* *Exit interview with community partner*	