A NARRATIVE INQUIRY INTO MY EXPERIENCES CO-TEACHING ALONGSIDE CREE
EDUCATORS: INDIGENIZATION AND SCHOOL MATHEMATICS

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By

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ABSTRACT

My research puzzle began through considerations around the meaning of Indigenization in school mathematics. I used a narrative inquiry methodology to explore the following research wonder: *What are my experiences as a White Euro-Western mathematician working alongside Cree educators as we co-teach school mathematics to predominantly Cree children?* Working alongside three Cree teachers, the inquiry focused on my experiences co-teaching elementary school mathematics in the middle of institutional mandates of Indigenization. My intention of the inquiry was to provide a more nuanced understanding of Indigenization in elementary school mathematics.

Field texts (data) created by this inquiry included written artifacts (such as student work and lesson activities), my field notes as the researcher, and audio-recorded conversations with the three teacher participants: Miss Moore, Miss Scribe, and Miss Mitchel. This dissertation includes four threads of experience as lived and told stories of my experiences in these three teachers' mathematics classrooms. The first thread emerged as I attended to the methodological commitments of narrative inquiry, Critical Race Theory (CRT), and anti-racist education (ARE) as my interpretive frames of Indigenization. The second thread explains my conceptualizing of Cree mathematizing as a partial representation of identity-making and Indigenization. The third thread developed from tensions when I disrupted experiences of the Cree teachers through my Euro-Western ideologies of generalization in mathematics. The fourth thread explains my learning of *miyō-pimōhtēwin* (walking in a good way) as a way of being in relation in the mathematics classroom. Each thread constitutes a chapter in this dissertation.

ACKNOWLEDGEMENTS

DEDICATION

Θα ήθελα να αφιερώσω αυτή τη διατριβή στον πατέρα μου, Γεώργιο Σταύρου. Μπαμπά, υποστήριξες την πανεπιστημιακή μου εκπαίδευση από την αρχή. Η οικονομική σου βοήθεια και η ατελείωτη συναισθηματική υποστήριξή σου, μου επέτρεψαν να επικεντρωθώ στις σπουδές μου και να πετύχω τους στόχους μου. Υποστηρίξαμε ο ένας τον άλλο μέσα από τα σκαμπανεβάσματα της ζωής και η καθοδήγησή σου με βοήθησε να γίνω ο άνθρωπος που είμαι σήμερα. Πάντα έλεγες ότι αγαπούσα τη μάθηση και ήμουν επιμελής όσο ήμουν μικρός και σ'ευχαριστώ πολύ για αυτό γιατί τώρα πια μπορώ να πω με υπερηφάνεια ότι είχες δίκιο. Είναι οι ώμοι σου μπαμπά μου, που επάνω τους στέκομαι.

Έτσι, για να απαντήσω στην ερώτησή σου «Τελείωσες το πανεπιστήμιο ή συνεχίζεις ακόμη;», μπορώ τελικά να πω «Ναι μπαμπά, τελείωσα!»

Σ'αγαπώ.

I wish to dedicate this dissertation to my father, George Stavrou. Dad, you have supported my university education from the beginning. Your financial help and endless emotional support made it possible for me to focus on my studies and achieve my goals. We supported each other through the ups and downs of life, and your guidance helped me become the man I am today. Thank you for always calling me a scholar, because it pushed me to achieve my goals. It is your shoulders that I stand on.

So, to answer your question, "Are you finished university yet?" I can finally answer, "Yes dad, I am!"

Love you.

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A NOTE ON TERMINOLOGY

I acknowledge that I live and work on Treaty 6 Territory, the traditional homeland of the Neyinowak Inniwak (Cree) and Métis peoples. I also acknowledge the role of my mother's ancestors who were complicit in settler-colonial practices of which I currently benefit. My great-great grandfather was a courier for the North-West Mounted Police, who acted as an informant against Louis Riel and the North-West Rebellion. I recognize this complex relationship of my White-settler identity to this land. However, guilt will get us nowhere, so while I am not responsible for the past, I am responsible in the present to work for a better future.

The words *Indigenous* and *Aboriginal* represent complex relationships between the Canadian state and its original inhabitants, so I will explain their use in my dissertation. According to Plains Cree and Saulteaux scholar Maggie Kovach (2010), the word *Indigenous* refers to the first peoples of a place and their cultures, and the term *Aboriginal* refers to the *Indigenous* peoples of Canada. However, the word *Aboriginal* is a colonial term that was introduced in the Canadian constitution and so it is not necessarily the preferred term for some people since it represents an imposed colonial name. The Cree teacher participants in my research study prefer the term *Indigenous* for this reason. You will notice that I switch between *Indigenous* and *Aboriginal* throughout my dissertation. This may seem haphazard, but I am carefully selecting the terms in accordance to how people have chosen to identify themselves, as well as to remain consistent with the use of these terms in the diverse literature I drew upon (written by both Indigenous and non-Indigenous scholars).

CHAPTER 1: MY NARRATIVE BEGINNINGS

1.1 How Have I Come to this Work?

My name is Stavros Georgios Stavrou. I have White settler identity, and I was born in a Canadian prairie province. I have Greek heritage on my father's side, and French and Ukrainian heritage on my mother's side. I have a BSc and MSc (both in mathematics), and an M.Ed. My intention was to pursue a PhD in pure mathematics, so it is a bit of an accident how I digressed to my current path of studying Indigenous mathematics education.

While I was doing my MSc degree at the University of Saskatchewan, the Department of Mathematics and Statistics received government funding for new initiatives aimed at engaging Aboriginal students in mathematics. So there I was, freshly graduated with some mathematics expertise, tasked with developing programming as the department's new Outreach Coordinator. Right from the start, Indigenous and non-Indigenous educators started asking me about Indigenization and how to incorporate Indigenous perspectives and ways of knowing in school mathematics. Was I qualified to answer this? Not at all! Did I know what I was doing? Not really! Did I act like an expert? Of course! I am a millennial graduate student, so with a degree and some work experience, I thought I knew everything already. But let's brush past my over-confidence, please. I knew I had a lot to learn and so I set out on an educational journey.

I started graduate studies in the College of Education at the University of Saskatchewan to learn more about Indigenous mathematics education and all the buzzwords I was hearing related to Indigenization and incorporating Indigenous ways of knowing in mathematics. Like any good graduate program advises, I was told by my knowledgeable instructors in the Department of Educational Foundations to write a literature review. What did I learn from this review? Well, practitioners (educators, researchers, policy-makers, etc.) report a disparity in the

mathematical literacy and achievement of Indigenous students, and then assert that incorporating Indigenous perspectives and ways of knowing should ameliorate the issue. I also learned that many practitioners cannot explain what they mean by incorporating Indigenous perspectives, and that there are many problematic examples of how people take up this practice. I even saw a stream of literature that does not acknowledge colonialism and racism as part of the root cause of the disparity. What appeared to be an obvious solution claimed by the literature was not obvious at all and required deeper analysis. I co-authored a paper with Dr. Dianne Miller (my committee member and professor in Educational Foundations) that analyzed the complexities of this topic in the literature—see Stavrou and Miller (2017).

In a nutshell, this is how I transitioned from researching in algebra to also researching in Indigenous mathematics education. I used a narrative inquiry methodology to explore the experiences that have brought me to this place and have shaped my research wonder, as well as explore the experiences of the Cree elementary school teachers (Miss Moore, Miss Scribe, and Miss Mitchel). In the next few sections I situate myself in the inquiry and explain how I have come to work with Miss Moore, Miss Scribe, and Miss Mitchel.

1.2 Situating Myself in the Inquiry

Narrative inquiry is a framework for understanding experiences as well as a methodology for inquiring into experiences (Clandinin & Caine, 2013). The intertwining of experience and education is taken up through the work of philosopher John Dewey (1997/1938) who believed studying education means studying life and experiences. Drawing on Dewey, narrative inquiry scholars Clandinin and Connelly (2000) said, "We learn education from thinking about life, and we learn about life thinking about education" (p. xxii).

Clandinin (2013) argued that narrative inquirers come to their research puzzles through an autobiographical introspection of their experiences and education. Clandinin explained, "As we engage in autobiographical narrative inquiry to frame our narrative beginnings, we may reach as far back as our childhoods to understand and, at times, to name our research puzzle" (p.55). This involves self-situating in the research to provide a personal justification of research wonders. Accordingly, I reflected back to my childhood, university education, and the beginnings of my professional work to map how I came to be a mathematician and educator in Saskatchewan.

In this dissertation I share pertinent experiences in the form of a *memory reconstruction*, which Clandinin (2013) explained is a type of field text (field texts are records such as transcripts, notes, pictures, and any other representations or artifacts) that is a remembered construction of an earlier situation. These memory reconstructions serve to create *narrative threads*, which are used to describe particular plotlines that are woven "over time and place through an individual's narrative account" (p. 132). The weaving of threads over time, place, and social interactions is how experiences are expressed in narrative inquiry (Clandinin & Connelly, 2000).

The following memory reconstruction explains when I first became storied as capable in school, which I believe enticed me towards my career in mathematics.

> In the sixth-grade I finally got the computer I had been asking for as a
> gift for Christmas. I took out all the parts and assembled it on my desk
> in the basement at home. In no time at all, I had the computer up and
> running, and excitely saw 'Windows 98' appear across the screen! I
> was eager to play all my new computer games. When I returned to

school from the holiday break, my teacher approached me and

excitedly said, "You got a computer I heard? Your parents said you

set it up all on your own! How did you do that without any help?!

Good for you—I'm proud of you, Stavros! Your parents said you're

very smart with computers and numbers! You'll be a computer

scientist when you grow up." (Memory Reconstruction November

2016)

At the time, I did not think it was a big deal that I set up my computer. I just wanted a computer so badly that when I finally got it, I was determined to get it working. I knew my parents would not be able to help me because neither had used a computer before. When my teacher relayed to me that my parents thought I was smart with computers and numbers, I felt instantly changed. What changed in me? I *felt* smart because I was told that I was smart. For me, this translated into doing well in math and science subjects.

Following that interaction, there was a drastic transformation in my attitude towards my schoolwork: I was more engaged in my learning and I felt motivated to try harder. I always saw myself as an average student, but if I was going to maintain this new accolade of *being* smart, I knew I had better continue to *act* smart. To this day, my parents always introduce me as their 'smart son' and 'scholar' who is 'good with numbers and computers'. Part of my identity was constructed around this idea that I am somehow good with numbers and computers, even though I did not necessarily feel that I was. I felt smart because I was storied that way. This *story to live by*—a narrative conception of identity making (Connelly & Clandinin, 2001)—undoubtedly drew me towards mathematics and science, and carried me through university as I completed a Bachelor of Science degree in 2010, majoring in mathematics and minoring in economics. Ben

Okri (1997) said we are living the stories planted in us that give our lives meaning. I was fortunate to be surrounded by supportive people who planted these positive stories in me. My narrative beginnings included many similarly positive experiences.

1.3 Inquiring Into My Work

I currently research in the field of algebra through the Department of Mathematics and Statistics at the University of Saskatchewan (USask). In 2012, after completing my Master of Science degree in mathematics, I began my work as an Outreach Coordinator doing mathematics education in a term position for USask. I was told by my department head that I was chosen for this position largely because the faculty in my department were aware of my passion for teaching.

My Outreach Coordinator term position was created from funding given to the department for new initiatives aimed at 'engaging Indigenous students in math and science'. My job expectations included working with schools that had a high Indigenous student population, which often had me traveling to rural schools and schools on reserve land (areas of land reserved for Indian bands under the Indian Act). My job was to 'promote mathematics literacy' by holding workshops to encourage studying mathematics in post-secondary education. My understanding at the time was that we (the math department) were content experts who wanted to help Indigenous students and teachers, particularly those in isolated reserve communities where it was my assumption that access to mathematics resources were low. It was my job to develop some sort of programming model to deliver hands-on activity sessions and resources to teachers and students.

Admittedly, there was no clear way as to how I should take up this work. While the program was in its infancy I spent most of my time networking to see what already existed, and

how my work could contribute to the existing provincial curriculum. I was directed to work with school boards and was immediately being called upon to develop resources and activity sessions that included 'Indigenous perspectives'. The general consensus from every direction was that the mathematics curriculum needed to 'incorporate Indigenous perspectives, ways of knowing, and culture'. That was the first time I heard those terms, and there was no explanation as to what such content looked like. When I asked for clarification of these terms and how they relate to mathematics, I never received a meaningful answer. However, I saw some strange applications that used tipis, beading, and medicine wheels that were tangential to school mathematics curriculum content in Saskatchewan. It was obvious that the commonly used word 'incorporating' needed to be analyzed for its meaning, connotation, and consequences. In particular, it seemed that many practitioners took up 'incorporating' Indigenous perspectives by appropriating images (such as medicine wheels) and writing peripheral anecdotes about tipis in Euro-Western lesson plans (Doolittle, 2006). The word 'incorporating' and synonyms like 'infusing' and 'integrating' were problematic because it assumed that Indigenous perspectives are some sort of accessible and static content (in the form of an image, story, object, etc.) that can be represented meaningfully in Euro-Western textbooks and curricula.

I used to be very ignorant to the lives and cultures of Indigenous peoples. When I thought about Indigenous cultures, I imagined people who lived in tipis and hunted with a bow and arrow. I wondered how this would tie into school mathematics. I saw educators teach lessons relating an arrow's trajectory to a parabola. I also saw the medicine wheel being used to teach fractions. Can we look for repeated patterns in beadwork? Are examples like these what was expected for 'incorporating Indigenous perspectives' in school mathematics?

In my experiences, I understood mathematics (through Euro-Western ideologies) to be a universal, objective, apolitical, and acultural subject that is accessible for anyone who wants to learn it. For example, the commonly used phrase 'math is math' is part of a discourse that perpetuates the alleged universality and absoluteness of the subject. I used to think that since mathematics is already universal, why would Indigenous perspectives and ways of knowing help at all? I used to think Indigenous peoples should learn the same mathematics if they were going to be 'successful' in school, university, and the workplace. I used to wonder if the purpose of the Indigenization initiatives in mathematics was just a mechanism to modernize reserves. I wondered many problematic things before ever stepping foot into a reserve school. I am embarrassed writing about how I once understood my work, but it is humbling and necessary to expose my ignorant and racist beliefs, and narrate the tensions I felt as I reflected on the beginnings of my professional work. Reflecting *backward* and *forward* in time on these *inward* tensions that have shaped the *outward* environments of my work exemplifies certain methodological dimensions of a narrative inquiry—which is something I will explain more thoroughly in Chapter 3.

As part of my biographical introspection to frame my research wonders, I had to consider how my research and practice has been (re)shaped. After a year working as an Outreach Coordinator, I applied to do a Master of Education degree in Educational Foundations at USask in hopes of gaining more insight into my practice. My life was forever changed during this program, particularly during the summer term that I took an anti-oppressive education course with Cree and Métis scholar Verna St. Denis. I cannot stress enough how pivotal this course was in influencing the trajectory of my life and academic career. During the course, I was so moved by the content that I felt compelled to speak to program administrators to make her course

mandatory to students in the College of Education. I collected signatures from my classmates who supported this idea, and submitted the signatures with a letter imploring the college to make the course mandatory. Unfortunately, they never did—but they did say they will advertise the course throughout the college.

I vividly remember the 'Aha' moment I had during one of our lectures. We discussed a court case about a Saskatchewan Indigenous girl who was portrayed by the court system as a promiscuous Indian woman (she was under 16). She was depicted by the courts as provoking sex through her choice of clothing and being in the wrong place at the wrong time, while the rapist men were described as *boys being boys* (they were in their late 20s/early 30s) who were seduced after having too much to drink. Something clicked for me while we discussed this story in class and there was no going back: This 16-year-old person's identity was being constructed through stories around her social positioning as an Indigenous female in a small town prairie province. Her life, as an Indigenous youth, held little value against the White male perpetrators whose 'lives would be ruined by an honest mistake'. This was the first time I thought of myself as White, rather than only seeing non-Whites. This experience was a salient moment that disrupted how I understood myself because it forced me to see that I do not have a neutral identity. I learned what it truly meant to be socially positioned as a White man.

I understand my social positioning through the social constructions of race, gender, sexuality, physical and mental ability, religion, culture and language, education attainment, income level, and so on. Social constructions such as race are based on an ascription of value to perceived physiological differences, which create identities with different levels of privilege (Baker, 2006; Henderson, 2000). I had the luxury of being proud to have Greek heritage, and having that heritage respected, valued, and praised by my classmates and community. In my

family's *story to live by*, we aligned with Canada's ideology that we were part of a multicultural mosaic. It was through my schooling in the Department of Educational Foundations at USask that I saw the ways systems of power construct identities and regulate human bodies. I questioned how my work as a mathematician and educator maintained these systems of power. It was at that point that I finally understood mathematics education required a social justice analysis. My awakening to social justice issues surrounding Indigenous mathematics education was an important part of what brings me to where I am now, and the social justice component of mathematics education practice is something discussed later in the literature review chapter.

Attending to the experience of my awakening to social justice issues in mathematics education allowed me to imagine new possibilities of understanding and reshaping my work by being attentive to "interactions within and among all of the stories, all of the personal, social, institutional, cultural, familial, and linguistic experiences lived out and told" (Huber, Caine, Huber, & Steeves, 2013, p. 227). In the context of my work and practice, this meant teaching and learning mathematics through an attentiveness to the stories shaped by the diverse personal, social, political, cultural, familial, and linguistic experiences of Indigenous teachers and students, and myself.

By inquiring into the experiences surrounding my work, I used a social justice analysis to unpack the research and practice surrounding Indigenous mathematics education. I outline this in the next chapter's literature review. In the review, I explain how the literature is divided into different conceptualizations of the educational issues surrounding Indigenous mathematics education. In particular, I considered a decolonizing analysis, an Indigenization and cultural revitalization approach, and an anti-oppressive/anti-racist analysis. I distinguish these

frameworks and explain how solutions surrounding issues in Indigenous mathematics education were taken up.

It was through an understanding of social justice in Indigenous mathematics education that I reimagined and reshaped my practice. As Clandinin and Caine (2013) explained, "inquiring into our changed lived and told stories calls forth the possibility to attend differently, to shift practices, and to create possible social-political or theoretical places we can impact as narrative inquirers" (p. 171). This meant grounding myself in my research by highlighting the experiences that have shaped my research and practice, such as my time in anti-oppressive and decolonizing education courses during my academic studies.

A narrative inquiry allowed me to engage in social justice practices that are attentive to experiences first. While research puzzles are often guided by concerns for social justice and the view that certain social, cultural, or institutional practices are problematic, Caine et al. (2017) said the starting place in narrative inquiry is in storied experience, not in practices and policies. They contend that, otherwise, the social justice problem "becomes the central focus of inquiry, effectively displacing multiple facets of experience" (p. 7), and treating complicated, storied lives "as a manifestation of a social problem in need of a solution" (p. 7). In my research, I begin in my experience and the experiences of my participants as we co-teach school mathematics. Since all experiences are steeped in larger social, cultural, and institutional narratives, I use analytical frames such as CRT and ARE to make sense of the many complex facets of our experiences.

According to Clandinin and Rosiek (2007), connecting narrative inquiry to other forms of inquiry is how individual experiences are understood, expressed, shaped, and enacted in larger social, cultural, and institutional narratives. They argued this is how narrative inquiry can engage

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in analyses that seek to critique and understand causes of oppression and how they are maintained through ideologies. They believed "representations of experience—including representations of the macrosocial influences on that experience—ultimately arise from first-person lived experience and need to find their warrant in their influence on that experience" (p. 50).

Accordingly, my research began in storied experiences and the unfolding of lives. I used a social justice analyses to make sense of some of my educational experiences surrounding Indigenization and mathematics education. In the fourth chapter I attended fully to narrative inquiry as a methodology and how a critical race and anti-racist analyses influenced my research as a narrative inquirer.

1.4 Experiences of Cree Teachers and Students

My work as the Outreach Coordinator for the Department of Mathematics and Statistics at the University of Saskatchewan has taken me to different educational landscapes across Saskatchewan. Since its inception, I have worked with K-12 teachers and students in Saskatoon, as well as rural and reserve schools. During this time, a Cree bilingual school in Saskatchewan captivated me, and so I opted to focus more time there.

Some of the teachers at this school were Cree speakers—some more fluent than others—and they spoke their language in the classroom. Specifically, the language dialect spoken was *nēhiyawēwin* (Plains Cree). In Saskatchewan, there are also the Woods Cree and Swampy Cree dialects. Since I only discuss Plains Cree, I will just write 'Cree' moving forward, as recommended by the Cree teachers in the school.

The (primarily) Cree students also fell on a wide spectrum in regard to their Cree language proficiency. My role in this school was to provide educational resources and innovative

ways to teach school mathematics. This was where I met one of my research participants, Miss Moore (pseudonym), a Cree elementary school teacher who taught the sixth-grade. Coincidentally, we were also graduate students doing a Master of Education degree in Educational Foundations at the College of Education. We also took Dr. Verna St. Denis's anti-oppressive education class together. It was our similar sense of humor that helped us bond so quickly, and our friendship made possible a strong professional relationship.

In the fall of 2012 I joined her sixth-grade classroom in the middle of one of their mathematics units. Miss Moore shared her anxiety of having to move onto the next unit before her students had time to understand the current material. She was also stressed about having to prepare her students for a provincial common math assessment—"Damn Western assessments", as she called them.

As I watched her students study the material with the school's math coach present, their expressions were a mix of exhausted, anxious, confused, and annoyed. There were a few students who seemed to understand everything and were excitedly trying to answer every question, but many seemed agitated. The math coach said to the struggling students, many of whom had their heads buried in their sleeves, "Try! Just try! We went through this type of question already, remember? Do you remember how to do this? We just did this. You need to know how to do this."

As the students quietly worked on their work booklets, I looked at the classroom space and took notice at the posters Miss Moore had hanging on her walls. She kept many pictures with Cree translations posted. I thought of the posters I used to see during my elementary school years—posters of basketball players with cliché captions reading 'You miss every shot you don't take', images of books with the caption 'Reading is fun', and pictures of the solar system with

the slogan 'Reach for the stars'. Miss Moore's multitude of posters included images with Cree translations of numbers, colors, shapes, seasons, months, emotions, body parts, and animals. When I asked where she bought the posters, she laughed and said "You think stores sell Cree posters? I had to make most of these, of course!" I smacked my palm onto my forehead and said, "Of course, sorry!"

1.4.1 "I'm stupid!"

I continued working in Miss Moore's classroom over the next few years. In February of 2015, I had a notable interaction with a sixth-grade student named Nigel (pseudonym) that created tension in how I understood classroom experiences for students. I describe this interaction below in the form of a memory reconstruction that I had in July 2018 (at the time of writing this).

> I was walking around the room making sure everyone was on track. I
> stopped at one particular boy, Nigel, who was sitting with his head
> rested on his desk. When I asked him how he was doing, he
> nonchalantly told me he was stupid at math and didn't want to try. I
> objected immediately, telling him he is not stupid. He quietly repeated
> again and again that he is stupid and bad at math. I was uncomfortable
> but asked why he thinks he is stupid. He replied, "My grandma said I
> am stupid and that I shouldn't bother trying in school because I'm
> never going to be good at math". I objected again but he insisted
> repeatedly that he is stupid. I let him rest his head back on his desk
> and continued with my lesson, unsure how to handle this situation.
> (Memory reconstruction in July 2018 of an event from February 2015)

Tensions emerged for me as I imagined myself in his position, being storied as stupid. Nigel and I had similar subsequent interactions in which I learned more about how he has been called a 'stupid Indian' and told that he was incapable of learning mathematics by certain members of his family. These interactions left me to wonder how this thread of negative storying in mathematics would be woven through his life experiences and constructed identity.

How we relate to mathematics as youth creates threads that become ways we are storied in the mathematics classroom. For example, narrative inquiry scholar Shaun Murphy (2009) made space for students to think of themselves as being mathematical during his time working as an elementary school teacher. He observed a student who thought of people as embodying mathematics: "when you are born, you are adding and when you die, you are subtracting." (p. 13). Cute interpretations of death aside, his students' experiential understanding of equality and justice was represented symbolically (using equality and inequality symbols) and concretely (using Cuisenaire rods). Murphy also helped his students understand the plurality of mathematics so that they can story themselves as skilled in one topic of mathematics even if they were weak in another topic—similar to the way students might see themselves as being fast readers, but weak spellers, which does not necessarily mean that the students see themselves as bad in language arts. Students can excel in different topics of mathematics, but it is just as important to recognize that not all students must aspire to become a mathematician (Gutiérrez, 2013).

Returning to my interaction with Nigel, I wondered how he could disrupt the negative ways he was storied by composing new *stories to live by* that could allow him to see himself as smart and capable. During our ongoing interactions I imagined myself in his place, and wondered how I would have felt being storied as a 'stupid Indian' who was 'never going to be good at math'. What does it mean to see Nigel's world through his eyes rather than mine?

Philosopher Maria Lugones (1987) referred to the metaphor of world-travelling as a way to look at experiences through the eyes of another. She explained that we carry our worlds with us as we engage in the worlds of others. Lugones said we can enter into another person's world through *playfulness*: "an openness to being a fool, which is a combination of not worrying about competence, not being self-important, not taking norms as sacred and finding ambiguity and double edges a source of wisdom and delight" (p. 17). As I world-traveled to Nigel's world, I carried stories of myself and others. These stories were constructed images of who I am and who others are. We can gain an understanding of ourselves and others as we carry these images across worlds (Huber, 2008). I had constructed images of a world in which I was nurtured and respected in my classroom and home life. In math class, I had topics that I loved and hated, and exams that I did well and poorly on, but regardless of the experiences I was always storied as smart and capable by my parents, teachers, and peers.

I thought about how math fits into the flow of the day for Nigel, Miss Moore, and her other students. I noticed Miss Moore spoke in a mix of English and Cree to her students throughout the day but did not speak as much Cree during math class. I was always curious and fascinated by the ways she switched between English and Cree (I called it *Creelish*) to convey different meanings and emotions to students. This inspired me to ask the students to teach me how to count in Cree.

> I had been working in Miss Moore's math classroom for half of the
> school year already and I was always fascinated with the ways she
> spoke in a mix of English and Cree to the students. Initially, she never
> spoke Cree during math when I was present. I was interested in
> learning mathematics terms in Cree, and I was curious to see what

words her students already knew. One day, Miss Moore let me start

the lesson and so I decided to open with asking the students what math

words they knew in Cree. Nigel (who often avoided eye contact and

sat quietly and politely in a withdrawn position) shot up in his chair

and was more animated than I had ever seen. He raised his arm high

and exclaimed "I can teach you to count in Cree!" He excitedly

counted "*pēyak, nīso, nisto, …*" and asked me to repeat after him.

After I repeated the number, he would correct my pronunciation. Miss

Moore and the class giggled and cheered me on as I stumbled through

pronouncing these words for the first time. Nigel then encouraged me

to write the words on the board as he spelled them out for me. He even

told me where to put the accent marks. I was nothing short of

impressed. (Memory reconstruction in July 2018 of an event from

June 2015)

I learned a lot from Nigel during that lesson. He taught me his language and showed me what it

meant for students to teach their teachers by finding their place and voice in the mathematics

classroom. Nigel's story was of cultural pride, and a *story to live by* that disrupted him being

storied as 'bad at math' and a 'stupid Indian'. He could not be prouder to share Cree with me,

and I told him after our lesson how smart he was. Miss Moore dubbed him a Language Keeper.

As I reflected on this day, I returned to my own story of the interaction I had with my

teacher after setting up my computer. I was changed that day when he called me 'smart' and

'good with numbers', and I wondered if Nigel felt changed that day from our interaction. I

wondered how our time together in the mathematics classroom shaped his identity and if it disrupted the negative storying he experienced.

Following the success of the Cree counting lesson, Miss Moore and I were inspired to develop more activities that included Cree translations of mathematical terms from school. This cultural and linguistic focus supported the knowledge of the students, and prompted me to reshape my teaching practice. It also helped me frame my research wonder: *What are my experiences as a White Euro-Western mathematician working alongside Cree educators as we co-teach school mathematics to predominantly Cree children?*

As this work and research took shape during educational initiatives of Indigenizing the curriculum, I attend to how my work related to these initiatives. In particular, I began to see Indigenization as a way of being in relation that centres identity-making through Cree language learning. It is also through my experiences working alongside Cree teachers and students, and during my time as a graduate student in Educational Foundations interacting with Indigenous and non-Indigenous faculty and colleagues, that I was continuously making sense of *Indigenous perspectives* and *ways of knowing*. In the next section I draw upon Indigenous scholars to describe the meaning of these terms and processes.

1.5 Indigenous and Aboriginal Perspectives, and Multiculturalism

You will notice in this section that I shifted between the terms Indigenous and Aboriginal. As I mentioned, my word choice followed the words used in the literature. Just as complex as the terms Indigenous and Aboriginal are, so are the meaning of such perspectives and ways of knowing. Indigenous and Aboriginal perspectives, and ways of knowing required elucidation by various Indigenous and Aboriginal scholars as these words were being used widely across different educational contexts. Indigenous and Aboriginal perspectives regarding cultural

relevance in the curriculum refers to the narration of histories, experiences, values, knowledges, and localized content of Indigenous and Aboriginal peoples (Deer, 2013). Ways of knowing develop from languages, geographic observations, Elder-guided ceremonial traditions, and social relationships—all composed in the spatially and temporally distinct cultures that comprise Indigenous and Aboriginal peoples in Canada (Michell, 2005; Battiste, 2013). Indigenous knowledges are represented through interactional and interrelated relationships, and are animate, evolving, and spiritually-based (Kovach, 2010), These knowledges are conveyed through languages that are derived from evolving interconnected ecologies (Battiste, 2013). Knowledge and ways of knowing grow and are shared by oral traditions through storytelling and protocols of doing that ensure community practices are carried out and passed down in a good way (Kovach, 2010b).

In educational contexts, Indigenous and Aboriginal perspectives in the mathematics curriculum were being taken up in many different ways, resulting in contention around what deep and meaningful connections should look like, an oversimplification of complex cultural phenomenon (Doolittle, 2006), superficial and disjointed add-ons to Euro-Western curricula (Deer, 2013; Lunney Borden, 2013), capacity-building policy from outsider imaginings of what is and is not good for Aboriginal peoples (Kovach, 2014), and cases in which some practitioners were perpetuating racism, stereotypes, and pan-Indigenous/Aboriginal identity because of a lack of anti-oppressive and decolonizing education (Stavrou & Miller, 2017).

I cannot deny that I was an offender of the very things I am critiquing. I was a White outsider traveling to rural and reserve schools with activities based on what I believed would help Indigenous students with mathematics, using appropriated images and stories that I believed represented their ways of knowing. I also thought of my work as a multicultural project because

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that was my initial conceptualization of Indigenization. I was indoctrinated into an ideology that multicultural content would help Indigenous students 'succeed' by helping them relate to the content of school subjects. It was through my experiences taking an anti-oppressive education course in Educational Foundations that I understood this false and damaging assumption about my work. I learned from Dr. Verna St. Denis that meaningful discussions about Indigenous and Aboriginal perspectives can be silenced through multicultural discourses.

St. Denis (2011) shared an experience of being invited to join a provincial discussion about integrating social studies, history, and native studies in Saskatchewan's high school social science curriculum. She voiced that students should take such a course if the starting point and continued foundation is native studies, since otherwise native studies will likely be erased. Another participant at the discussion responded with "Aboriginal people are not the only people here" (p. 306). Meaning, Aboriginal perspectives are tolerated as only part of Canada's multicultural mosaic. This dismissal that Aboriginal peoples' culture is one among many denies Indigenous sovereignty and land rights.

St. Denis (2011) explained that Canada's Multicultural Act in 1988 was a political strategy that was partially intended to address the racial discrimination of ethnic groups and Aboriginal peoples, but has equated Aboriginal peoples with racialized ethnic minorities and immigrants, which erases the specific history and unique location Aboriginal peoples have as being indigenous to Canada. She argued that multiculturalism is a way for schools to ignore the different positionality of Indigenous peoples in the nation state, which results in their treatment as being one of many minority groups, and acts to erase the historical and ongoing displacement of Aboriginal peoples from their land and the denial of their sovereignty. Ultimately, when

people conflate multiculturalism and Aboriginal education, they narrow the space left for "understanding what Aboriginal content might be included and how" (p. 314).

St. Denis (2011) provided examples given by Aboriginal teachers who were tired of being asked "to talk about fluff" (p. 315), such as discussing bannock, feathers, and beading in tipis—which have profound meaning in Indigenous worldviews but are made superficial when they are decontextualized and not taught in a way that connects to the history and knowledge systems of Indigenous peoples. Aboriginal educators and allies want meaningful perspectives that go beyond using artifacts as cliché sources of multicultural enrichment. Another issue around multiculturalism and cultural revitalization is the supposition that Aboriginal cultural knowledge is intact and easily accessible (St. Denis, 2007). According to Battiste (2013), there is a false assumption that "Aboriginal teachers have been raised in and have the requisite cultural, ceremonial, and knowledge experts available to them" (p. 116). Essentially, multiculturalism is often used as a feel-good strategy to preserve Canada's position as fair and culturally-inclusive, and avoids the serious discussions surrounding the dehumanization and systematic attempts at eradication of Aboriginal peoples in Canada, as well as solutions towards Aboriginal sovereignty, land rights, and education (St. Denis, 2011).

I was fortunate to have finally learned anti-oppressive and decolonizing education because it forced me to question my practice, and moved me towards more relational and respectful ways of teaching that challenge racism and colonialism. I have appropriate tools to question the ways Indigenous and Aboriginal perspectives are being taken up as some sort of static content that can be 'incorporated' into Euro-Western curriculum for the purpose of making curriculum multicultural and Indigenized without an understanding of the consequences of this

practice. Such analytic frames allowed me to draw attention to the ways mathematics perpetuates racism.

In the following chapter, I review the literature surrounding social justice in Indigenous and Aboriginal mathematics education. In particular, I describe social justice using a decolonizing analysis, an Indigenization and cultural revitalization approach, and a critical race/anti-oppressive/anti-racist analysis to explain how issues regarding Indigenous and Aboriginal mathematics education are taken up.

CHAPTER 2: REVIEW OF LITERATURE

2.1 Introduction

North American mathematics education research addresses a broad range of topics including student and teacher perceptions of mathematics, pedagogy and curriculum, pre-service and in-service teacher education and content knowledge, language and mathematics, as well as the need to understand complex social issues and promote literacy, accessibility, and cultural relevance for Indigenous/Aboriginal and other minority students (Aikenhead & Huntley, 1999; Bassani, 2008; Barton, 2008; Dorman & Ferguson, 2004; Ezeife, 2002, 2006, 2011; Glanfield, 2006; Higgs & Chernoff, 2014; Liljedahl, 2015; Liljedahl, Chernoff, & Zazkis, 2007; Jegede & Aikenhead, 1999; Lunney Borden, 2013; MacIvor, 1995; Martin, 2013; Murphy, 2009; Russell & Chernoff, 2016; Smith, 1994; Sterenberg et al., 2010).

Many practitioners outlined a disparity in achievement and literacy for Indigenous learners, and consider the political, cultural and linguistic, social, and ethical concerns surrounding education (Aitken & Head, 2008; Davison, 1992; Donald, Glanfield, & Sterenberg, 2013; Doolittle, 2006; Doolittle & Glanfield, 2007; Ezeife, 2002, 2006, 2011; Graham, 1988; Greer, Mukhopadhyay, Powell, & Nelson-Barber, 2009; Higgins, Madden, & Korteweg, 2015; Iseke-Barnes, 2000; Jegede & Aikenhead, 1999; Ledoux, 2006; Lunney Borden, 2013; NCTM, 2002; Nolan & Weston, 2014; Sterenberg & Hogue, 2011). This examination has led to a growing call for *cultural relevance*, and a need to *Indigenize* the curriculum in respectful ways through Indigenous and Aboriginal perspectives, and ways of knowing (Aikenhead, 1997, 2000, 2001; Deer, 2013; Kanu, 2005; Ledoux, 2006; Madden, 2015; Pidgeon, 2008; Sable, 2005; Snively, 1990; Smith, 1994; Sterenberg et al., 2010; Thompson, 2003). In consideration of the social issues surrounding mathematics, science, and education overall, there is also a need to

incorporate decolonizing and anti-oppressive practices (Battiste, 2013; Belczewski, 2009; Bishop, 1990; Gutiérrez, 2013; Kumashiro, 2001; Nolan, 2009; Stavrou & Miller, 2017; St. Denis, 2004, 2007, 2011).

I summarize the literature into three main strands so that I could systematically explain the varied ways Indigenous and Aboriginal mathematics education was being taken up in terms of the analysis of the issues surrounding it, and the 'solutions' being presented. The three strands were Indigenization and cultural revitalization, decolonization, and CRT and anti-oppressive/anti-racist education. I see these three strands as being part of the overall need to include social justice in mathematics education. I believe that amidst the growing body of literature, my synthesis provides a bird's-eye view for readers to see the main conceptual underpinnings of the issues surrounding Indigenous and Aboriginal mathematics education. The analytical frameworks of Indigenization and cultural revitalization, decolonization, and CRT and anti-oppressive/anti-racist education offer different interpretations to the issues described in the literature. The commonality of these strands is that they are all theories and practices that are intended to work towards social justice.

More generally, social justice addresses issues such as lack of environmental protection, denial and restriction of access to resources and land, institutionalized violence targeting specific groups, inequities in education and healthcare, and policies and practices that produce and maintain racialized and inferiorized identities (Anderson, et al., 2009; Bishop, 2001; Brandes & Kelly, 2004; Bullard & Johnson, 2000; Lawrence & Dua, 2005; St. Denis, 2007; Razack, 2002; Schick, 2000). In educational contexts, social justice challenges how schools are complicit in preserving economic and cultural inequality through classroom discourse, student and teacher interactions, and the curriculum (Kumashiro, 2000, 2001, 2004). Social justice education also

addresses issues related to marginalization based on certain identities, as well as cultural and cognitive imperialism through the universalization of a dominating group's culture, ways of being, and knowledge (Battiste, 1986, 2011; Smith, 2001).

In the context of Indigenous and Aboriginal mathematics education, I considered Indigenization and cultural revitalization, decolonization, and CRT and anti-oppressive/anti-racist education as three interwoven strands of social justice. I expound upon these strands in the following sections, and discuss the relevant literature that is contributing to this growing area of mathematics education. The literature review emphasized research and practice with specific Indigenous and Aboriginal groups in Canada in order to avoid discussions that homogenize the diverse peoples across Canada through a singular pan-Indigenous/Aboriginal identity. I also chose literature by practitioners who did not invoke multiculturalism or contribute to the belief that Indigenous and Aboriginal perspectives are only part of Canada's multicultural mosaic, since such discourses "effectively limit meaningful incorporation of Aboriginal content and perspectives into public schools" (St. Denis, 2011, p. 307), enable racism and colonialism, and prevent anti-colonial analysis.

In the midst of teaching alongside Cree educators, I needed to make sense of the discourses and practices involving Indigenization in school mathematics. It was through our experiences that I made sense of Indigenization in the context of our practice and educational landscapes. Decolonization provided a framework for understanding and contesting the ways mathematics education contributes to present-day colonialism through cognitive and cultural imperialism. CRT and anti-oppressive/anti-racist education works at identifying and challenging the processes of domination through White supremacy that maintain ideologies (such as Whiteness, colorblindness, and meritocracy) that create White privilege and systemically

marginalize non-White students. It is through decolonization and critical race/anti-oppressive/anti-racist analyses that I made sense of Indigenization, as well as how experiences are expressed, shaped, and enacted in larger institutional, cultural, and social narratives through a narrative inquiry.

2.2 Indigenization and Cultural Revitalization

The Canadian education system has been implementing many initiatives around Indigenization and engaging with Indigenous and Aboriginal perspectives across different subject areas and school programs (Gaudry & Lorenz, 2018; Truth and Reconciliation Commission, 2015). This is occurring at all levels of education, ranging from primary to post-secondary school. Indigenization has an imperative to acknowledge the treaty and traditional rights of Indigenous and Aboriginal peoples, and to recognize these peoples as traditional stewards of the land that they continue to occupy (Korteweg & Russell, 2012). One key component of Indigenization given by the Truth and Reconciliation Commission (2015) of the Canadian federal government was a list of 94 recommendations in calls to action aimed at rectifying the hideous and destructive legacy of residential schools. Some items in this list included education directives such as improving attainment levels and success rates, developing culturally-appropriate curricula, eliminating education and employment gaps between Aboriginal and non-Aboriginal Canadians, and preserving, revitalizing, and strengthening Aboriginal cultures and languages.

A major motivation of Indigenization and cultural revitalization is the situation of Indigenous languages. It is necessary to promote linguistic revitalization and language learning so that Indigenous knowledges that have been actively repressed can be reclaimed (Wildcat, 2001). Indeed, Mi'kmaw scholar Marie Battiste (2013) cited the diversity of First Nations, Inuit, and Métis languages across Canada as having between 53 to 73 languages in 11 different

language families. She explained that these languages have constitutional protections through the Canadian Charter of Rights and Freedoms as human rights. She stated that in 1976, Canada agreed to United Nations protections of Aboriginal languages and cultures through the International Covenant on Civil and Political Rights, which protects the use and practice of language, religion, and culture by minority groups, as well as by the International Covenant on Economics, Social, and Cultural Rights which prohibits discrimination on the basis of language.

Battiste reported that 68.7 percent of First Nations students in Canada attended public schools in 1996, with one-third being under 14 years of age. She mentioned that this demographic data leads to national and provincial mandates in education to implement action plans such as teacher training and in-service programs, and developing inclusive curricula. For example, she cited that in 1983, Saskatchewan Education initiated a five-year action plan that required schools with over 15 percent Aboriginal enrolment to report equity plans that responded to the issue of Aboriginal educational achievement. Unfortunately, according to Battiste, Equity Reports by the Human Rights Commission in Saskatchewan saw that language learning and systemic social issues were largely ignored in the action plan.

Battiste (2013) explained that in 1988, the Assembly of First Nations studied the state of Aboriginal languages and reported the following (based on surveying 151 out of 600 First Nations): Two-thirds of the communities had endangered languages. While more than 75 percent of older age groups are fluent, there is a rapid decline towards younger generations, with less than 10 percent of youth being fluent; and First Nations people on reserves were 51 percent more likely to be fluent, 12 percent for urban Aboriginals, and less than 4 percent for Métis people. She asserted that this data is consistent with global trends, demanding worldwide urgency to protect Aboriginal languages from being wiped out. Battiste (2013) argued that educational

reforms must redefine literacy to support and legitimize Aboriginal languages, not just for the purpose of 'success' in school, but because Indigenous knowledges cannot be adequately tapped into, articulated, and understood without language.

One focus of Indigenization and cultural revitalization in the literature was the response by educators. It is important to attend to their receptiveness of these mandates to make sense of the ways Indigenization, cultural revitalization, and Indigenous and Aboriginal perspectives get conflated with feel-good multiculturalism by non-Aboriginal educators. Mohawk scholar Frank Deer (2013) said there is debate and confusion amongst students and academics on the reasons why Aboriginal perspectives are important for public and Aboriginal education. He explained that receptiveness to these perspectives sometimes comes from politeness and the desire for some educators to embody "the values of Canadian multiculturalism" (p. 203), and that there are many educators who believe Aboriginal education is only for Aboriginal students, rather than for everyone.

The Royal Commission on Aboriginal Peoples (1996) argued that Aboriginal education benefits all students. It recommended that non-Aboriginal teacher education include a compulsory Aboriginal component that discusses the history, traditions, practices, and ways of knowing of Aboriginal peoples in an accurate and respectful way because such study would have a positive impact on Aboriginal and non-Aboriginal students. Challenging the multicultural ideology held by educators is critical because such an ideology silences Indigenous and Aboriginal perspectives and impedes deep and meaningful progress towards mending the inequality created from land theft, destruction of livelihoods, denial of access to resources, and acts of violence from Canada's colonial practices, including the residential school history and the ongoing racism to which Indigenous and Aboriginal peoples are subjected.

One major theme in the literature around Indigenization and cultural revitalization was the apprehension of these mandates in curricular developments by pre- and in-service educators. For example, in separate studies by Deer (2013), and Nolan and Weston (2015), they reported similar findings: many non-Aboriginal pre-service teachers were hesitant to engage with Indigenization because they believed they lacked appropriate and accurate knowledge about Aboriginal peoples, they felt they were only contributing tokenistic pedagogy, they felt inauthentic when teaching other worldviews, they believed there are inadequate classroom resources, they perceived a lack of support from the community (teachers, administrators, and parents), they believed emphasizing only Aboriginal cultures in a multicultural classroom was problematic, and they felt that Aboriginal-focused curriculum is better suited in social studies. On the other hand, both studies also reported a few educators who found sufficient resources and felt comfortable and prepared due to their experiences in educational foundations university courses that emphasized Aboriginal education.

The Royal Commission on Aboriginal Peoples (1996) argued that teachers need educational foundations courses that emphasize Aboriginal education in order to be appropriately prepared to talk about Aboriginal education in respectful ways in the classroom. Such courses might have a positive influence on teacher perceptions of these mandates. This is discussed in Kitchen and Raynor (2013), who reported on how receptive teacher candidates were to an Indigenizing education course. Through "means such as ceremony, modeling by instructors, visiting Elders, Talking Circles, activity-based learning, and reflection" (p. 54), the goal of the course was to have teacher candidates recognize the accurate history and culture of First Nations, Métis, and Inuit peoples; to experience Indigenous knowledges as a way of being in the world; to understand the impacts of colonization and the role of residential schools; to examine models,

practices, and curriculum suitable for Aboriginal education; and to develop strategies for incorporating Aboriginal perspectives into the curriculum. Kitchen and Raynor reported that the majority of candidates found practices such as smudging and Talking Circles to be a constructive, cathartic, and positive experience. One particular strategy that was noted as being very effective was the use of storytelling as a critical part of Aboriginal history and culture.

In the direction of providing a conceptualization of Aboriginal education in mathematics through Indigenous knowledges, Sterenberg, Barrett, Blood, Glanfield, Lunney Borden, McDonnell, Nichol, and Weston (2010) considered the following questions: *What do Indigenous knowledges offer the teaching and learning of mathematics by both Aboriginal and non-Aboriginal students and teachers? What role does language play? What role does place, community, and culture play?* Drawing on their individual experiences, the authors organized their stories into four themes: "Culturally responsive education, Language and culture, Learning mathematics from place, and Relationships" (p. 419). The authors explained that Indigenous knowledge is understood and conveyed through language, which is situated in the relations between place and people. They explained that learning mathematics from place means teaching from the particular culture and language of the host territory because it provides context to the learners. Through this perspective, students can find what is meaningful and relevant in a way that honors the host territory in which they live and learn, demonstrating how perspectives are revealed through the diversity of specific knowledges, cultures, languages, and places. The authors also spoke to the continuous cycle of relationships, responsibility, and the recursive reliving and retelling of relationship through mathematics education. This means that the educator must locate the experiences and relationships that inform their teaching practice in mathematics.

The consideration of mathematics education through place, Indigenous and Aboriginal cultures, and the relationships born from these interactions influenced my research in narrative inquiry. I considered my understanding of the teaching and learning of mathematics through experience as I worked with Miss Moore, Miss Scribe, and Miss Mitchel. I believe that responsibility in tending to experiences and relationships needs to be emphasized in mathematics education. This disrupts the Euro-Western ways that mathematics is taught as a depersonalized subject that transcends human experiences (Iseke-Barnes, 2000). Emphasizing experience allows practitioners to consider mathematics education in a student-centered way, rather than teaching mathematics as a rigid subject to which all students must conform, which has the consequence of storying them as 'stupid' and 'incapable' when they cannot do so.

2.3 Decolonization

Decolonization counters processes of colonization, racialization, violent control of Indigenous bodies and their land, practices of cultural and linguistic genocide, and forced assimilation through policies such as the Indian Act, disease dissemination, land theft, restrictions on farming that inhibited survival through deliberate starvation, and the subjugation and death of an untold number of Indigenous children during the sixties scoop and in institutions such as residential schools (Barman, 2012; Bourassa, McKay-McNabb, & Hampton, 2004; Carter, 1986; Daschuk, 2013; Truth and Reconciliation Commission, 2015; Razack, 2002, 2015). These events, as well as ongoing racism and colonial projects, are having an unquestionably negative impact on the livelihood, health, education, cultures and languages, and economic and physical well-being of Indigenous peoples through generations of families and communities (Adelson, 2005; Morrison, Morrison, & Borsa, 2014; Regan, 2010). Decolonizing education provides a counter-hegemonic framework that generates empowerment for Indigenous knowledge systems, health, and well-

being through education, and seeks to repair and restore cultures and languages from the damages of colonization (Battiste, 1986, 2011).

One of the oppressive systems created by Euro-Western colonization is cognitive imperialism—the universalization and domination of one language, culture, and knowledge system that delegitimizes all others. The subjugation of Aboriginal peoples by Eurocentrism is enacted and maintained through social constructions of race and ideologies such as meritocracy (e.g. the perceived incapability of Aboriginal peoples is a result of their inherent laziness and poor work ethic), culturalism (cultural incompatibility that creates and perpetuates a two-race binary), and paternalism (Aboriginal peoples need to be controlled for their own good under the guise that the dominating White culture is 'helping') (Battiste, 1986, 1998, 2011; Battiste & Henderson, 2000, 2009; Blaut, 1993; McConaghy, 2000; Minnich, 2005). In education, cognitive imperialism is enacted through English as the dominant language of instruction, a lack of access to and retention of Aboriginal students in higher education, and the depiction of Aboriginal students as maladjusted and as having a deficiency for not meeting Euro-Western education standards and norms (Battiste, 1986, 1998, 2002, 2011).

I drew on Battiste's (2013) decolonization framework to make sense of Indigenization in curriculum. In her article "Animating ethical trans-systemic education systems", Battiste outlined the progress being made across Canadian universities to improve Aboriginal student access and retention in higher education, increase diversity in programming, and augment the number of Aboriginal scholars and faculty. She argued that while progress is evident in the area of culturally-inclusive curricula, it is necessary to challenge cognitive imperialism by interrogating Euro-Western knowledge, which seeks to perpetuate stereotypes through forms of 'difference' based on perceived physiological, cultural, and linguistic variations; definitions of 'success'

through assimilation to the dominant norms and languages; and the suppression of Indigenous knowledges. She explained that one particular way Aboriginal peoples are assimilated is by Euro-Western knowledge operating in a depoliticized and culture-free way. She remarked on how Euro-Western interpretations of Aboriginal cultures accommodate their inclusion through superficial add-ons to mainstream curricula. This goes unquestioned because teachers often do not critically examine why Aboriginal content was not included in the first place, and fail to interrogate their own assumptions and social locations in education.

Battiste (2013) aptly critiqued science and mathematics, stating that in these subject areas there is a low representation of Aboriginal peoples. She argued that the Euro-Western scientific method is a social construction that is viewed as a universally applicable, objective method to seek truth through tests of validity and reliability. Indeed, Euro-Western knowledge claiming and privileging these warrants does not make them true, since socially constructed knowledge cannot be value-free. Battiste (2013) argued that "Eurocentric science, like Indigenous science, is socially constructed, meaning that it is contingent on variables involving language, values, thought, and reality. There is no neutral knowledge system" (p. 119). She specified that there is a need for Eurocentric science to be transformed—not just corrected or supplemented—to recognize Indigenous sources of knowledge as legitimate.

Decolonization and Indigenization allow practitioners to center pedagogy and ways of knowing that support oppressed Indigenous knowledges, as well as rightly exposes historical and ongoing colonial practices that subjugate Aboriginal peoples through assimilative practices. St'at'imc educator Jacqueline Ledoux (2006) provided a review of North American literature regarding Aboriginal perspectives and mainstream curricula. She cited reports on graduation rates and retention, and outlined the history of Aboriginal education, framing it through the

assimilative practices and (physical and cultural) genocide enabled by policies such as the Indian

Act that allowed children to be effectively removed from their families and communities. She

referenced literature addressing learning styles of Aboriginal students and noted teaching

strategies more in-line with Aboriginal education such as storytelling, talking circles, and

experiential learning. In regards to teacher education, she raised concerns by Aboriginal

educators who felt pressured to conform to Euro-Western styles of teaching, as well as non-

Aboriginal teachers who recognized their complicity in ongoing cultural genocide by being

unable to move away from Euro-Western traditions of teaching.

Pre-service and in-service educators who lack decolonizing education contribute to

cognitive assimilation, whether they are cognizant of it or not. This occurs through their

resistance to changing teaching styles, which they justify by challenging the efficacy of

Indigenization initiatives. Another important part of cognitive assimilation is how Aboriginal

peoples themselves internalize the idea that Eurocentric knowledge is the only knowledge, so

that they may not even be aware of their own knowledge systems, or be led to believe that those

knowledge systems are 'inferior'. Paradies et al. (2008) explained internalized racism causes

people to accept the negative, stereotypical beliefs, attitudes, or ideologies about the inferiority

of one's racial group.

Yatta Kanu (2005) argued that in curricular reforms involving changes in teachers'

practices, their attitudes and perceptions about the changes are a crucial factor in their use and

efficacy. Kanu observed a sample of non-Aboriginal teachers and reported that while they

generally supported the idea of Aboriginal perspectives, they contributed to "assimilation by

allowing the curriculum topics, not Aboriginal issues/perspectives, to remain at the center of

their teaching" (p. 56). Non-Aboriginal teachers' lack of content knowledge, their perceptions of

what such content should be, their beliefs about its usefulness in the classroom, and the fact that non-Aboriginal teachers did not know how to engage the expertise of community Elders were among the many issues noted by Kanu.

In another study of teacher perceptions, Aikenhead and Huntley (1999) interviewed several northern Saskatchewan science teachers to understand how they viewed Western science alongside Aboriginal perspectives in their classroom teaching. The authors reported the following on non-Aboriginal teachers' attitudes: teachers did not view Western science as culturally-produced, teachers believed Aboriginal worldviews were unrelated to learning science, and teachers only discussed a small amount of Aboriginal content as an add-on to Euro-Western school science. This view was contrasted with that of Aboriginal teachers who were also interviewed: "Aboriginal educators view science as a part of Western 'progress' that has oppressed Aboriginal peoples since the time of contact" (p. 169). Although the non-Aboriginal teachers interviewed were unanimous in rejecting the idea that their science classroom practices intentionally assimilated Aboriginal students into a Western worldview, they were still doing so through tokenistic pedagogy and by not understanding science as a Euro-Western cultural construction.

Sterenberg et al. (2010) argued Indigenization must challenge the hegemonic colonial practice of searching for mathematics in cultural activities and validating it through a Euro-Western perspective. Without decolonizing discourses, the framing of Aboriginal cultures is critiqued by Euro-Western standards of knowledge in an attempt to validate how mathematically-rigorous the cultures are (or were) and how well these cultures approximated Euro-Western mathematics. For example, it is problematic to look for ways Aboriginal peoples

quantified and used shapes for designs in the same ways that Europeans traditionally have (Iseke-Barnes, 2000).

The progress of Indigenization is impeded by educators who resist centring Aboriginal perspectives because they do not have a correct conceptualization of these perspectives, and thus contest its efficacy and value. This resistance to challenging Eurocentrism means that educators are contributing to cognitive imperialism by maintaining the status quo that Euro-Western knowledge is neutral and cultureless knowledge. Consequently, educators accommodate Aboriginal knowledges through tokenism and meaningless connections to the existing curricula, which often remains untouched.

Decolonization is a necessary framework that describes the way colonization has fragmented Indigenous cultures in such a way that only material artifacts are presented through multiculturalism, which then informs what often passes as Indigenization. Alex Wilson (2016) used an iceberg analogy to aptly describe the way culture is viewed. The iceberg represents Indigenous cultures, shaped by knowledge systems that are connected to the earth. She explained that the tip of the iceberg represents the material expressions of cultures (e.g. food, music, and clothing) that are prominent in multiculturalism. The more enduring aspects of culture—such as worldview, philosophy, cosmology, epistemology, ontology, and methodology—constitute the substantial part of the iceberg that is hidden below the waterline. She likened colonization to be a process that splits the iceberg of Indigenous cultures so that the small multicultural fragment (remaining in view above the waterline) is disconnected from the enduring aspects (which remain out of view below the waterline).

Building off Wilson's (2016) work, Marie Laing (2018) explained that the tip of the iceberg has come to define what it means to be Indigenous. She said that while the systemic and

institutional violence of colonization has severed the top of the cultural iceberg from the critical aspects of cultures below the waterline, "decolonization requires repairing that damage and restoring the relationships between our visible and material culture and deep knowledge, value systems, philosophies, cosmologies and other invisible aspects of our cultures" (p. 60).

Decolonizing education provides a framework for identifying ways education assimilates, and then provides subversive tools to decenter Euro-Western knowledge while reclaiming Indigenous (and other) knowledges. I required this analysis in my narrative research because my experiences and the experiences of the Cree educators I worked with are steeped in such colonial practices, and so I wanted to demystify discourses that denigrate Aboriginal peoples and Indigenous knowledges.

2.4 Critical Race Theory and Anti-Oppressive/Anti-Racist Education

The third strand of social justice that I used was CRT and anti-oppressive/anti-racist education, which is a framework for understanding and challenging social dynamics in which certain identities and ways of being are normalized and privileged while others are disadvantaged and marginalized. This framework challenges the ways classroom discourses, the curriculum, and student-student and student-teacher interactions are complicit in perpetuating oppressive and racist educational practices (Kumashiro, 2000, 2001, 2004).

There are different forms of oppressions, including racism, classism, sexism, heterosexism, ableism, ageism, ethnocentrism, religious imperialism, and colonialism (Grant & Zwier, 2011). Oppressions work as an interconnecting web that reinforce one another, and are created and maintained through discourses of 'difference' (Bishop, 2001). The oppressing group maintains power by ascribing value and dominance to a constructed identity that is White, male, middle-class, university-educated, heterosexual, able-bodied, English-speaking, young/middle-

aged, Christian, and so on (Hunter, 2002; McIntosh, 1992). These identities receive unearned privilege and power based on physiological features, ways of being, and membership to specific organized groups that have been constructed through pseudo-scientific and historical discourses as superior, while those that deviate from these identities and group memberships experience compounding forms of oppression. Moreover, the superior value of the oppressing group is normalized so that those oppressed also accept it, resulting in the system reproducing itself (Bishop, 2001). Consequently, there is a constant control of power in social, political, educational, and economic institutions that strategically restricts the oppressed groups' access to education, healthcare, employment, financial stability, safety, and resources for livelihood (Dei, 1999; Leonardo, 2004; Schick, 2000).

Anti-oppressive scholar Kevin Kumashiro (2000) used the term *Other* to describe the groups of people who are traditionally marginalized because they deviate from privileged identities. He explained that in education, oppression of the Other is operationalized through the overt ways by which the Other is mistreated through harassment, verbal and physical violence, exclusion, and isolation in schools. Oppression is also operationalized in covert ways, such as by "assumptions and expectations for the Other—especially those held by educators—that influence how the Other is treated" (p. 27), particularly the internal thoughts and values that justify and prompt the mistreatment of the Other (such as stereotypes that lead educators to have racial and ethnic prejudices against their students).

Since oppression is so pervasive and normalized in educational practices, it is not enough to teach cultural content. Indigenization and Indigenous education need to move beyond content and address issues surrounding racism. A necessary starting place for educators is an examination of the widespread systemic social practice of racism that negatively affects

Indigenous education (Goulet, 2001; St. Denis & Hampton, 2002). The focus of cultural programming in Indigenous education does not adequately examine issues of racism, power relations, and societal issues such as poverty (Friedel, 2010; Orr, Paul, & Paul, 2002).

St. Denis (2007) identified the complexities surrounding Indigenization, cultural revitalization, and racialization. She explained that Indigenization curricula often stems from stereotypical beliefs about Indigenous peoples, which contributes to their racialization and creates conflict as they negotiate their identities under ongoing colonialism. For example, teachers and students may feel shame when they are expected to be experts on their culture and language, despite the intentional destruction of these through violent historical and ongoing colonialism (St. Denis, 2004). St. Denis (2007) explained that if an analysis of race that identifies root causes of inequality is absent, then well-intentioned efforts of Indigenization and cultural revitalization may actually preserve an already limited understanding of Aboriginal peoples, their complex history in colonial Canada, and may further contribute to their racialization.

If practitioners located racism and colonialism in mathematics education, then research and literature about Indigenization would move away from notions that Indigenous peoples are disengaged in mathematics due to a lack of cultural relevance. Stavrou and Miller (2017) synthesized literature in Indigenous mathematics education to determine what some practitioners say were the motivating factors for disparities. The authors pointed out that, without a critical understanding of racism and oppression, many practitioners fell into deficit discourses to describe why Indigenous students were underachieving, and then overemphasized cultural content as the answer to rectifying achievement disparities.

Drawing upon the work of anti-oppressive and anti-racist scholars provided me an important framework for understanding Indigenization in my work and research. My

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understanding of anti-racist education relies on understanding Whiteness. As notions of Whiteness influenced how I took up my work, I drew on the literature to describe Whiteness in mathematics education to extend my understanding of racism and racialization in mathematics education and Indigenization.

Racism is based on the concept of Whiteness, which according to Kivel (2011), is a "constantly shifting boundary separating those who are entitled to have certain privileges from those whose exploitation and vulnerability to violence is justified by their not being white" (p. 17). An analysis of Whiteness and White supremacy is needed to understand the processes of domination that creates and sustains White privilege. As Leonardo (2004) explained, "a critical pedagogy of white racial supremacy revolves less around the issue of unearned advantages, or the *state* of being dominant, and more around direct processes that secure domination and the privileges associated with it" (p. 137). Domination is more than condemnable acts—it includes specific processes, policies, and patterned and persistent actions of social groups that give White identities unearned privilege through the subjugation of the dominated group. In other words, White supremacy is the systemic preservation of dominance that engenders White privilege, sustained through the constantly shifting boundaries of Whiteness (Leonardo, 2004).

While it is important to consider intersectional oppression based on race, gender, sexuality, class, and so on, my focus was on racism in mathematics education. I agree with Martin (2009) that "more nuanced understandings of race—understandings that do not reinforce deficit explanations for disparities in achievement and schooling experiences—must be developed among mathematics educators and policy makers if these intersections are to be considered" (p. 300). An understanding of racial dominance using CRT will offer insight into intersectional forms of domination.

Whiteness, White supremacy, and White privilege have been explored in the literature in broader educational contexts, but have received less attention in mathematics education, according to Battey and Leyva (2016). In their article "A framework for understanding Whiteness in mathematics education," they provided a framework for analyzing mechanisms that oppress African American, Native American, and Latina/o mathematics students by naming how institutional spaces in the United States are White. They argued that Whiteness is an ideology, since it is a set of beliefs with a particular purpose that devalues and discriminates against those who are not White while simultaneously maintaining White people in an objective and neutral position of power. This results in White ideas and behaviors being valued institutionally, and oppresses non-White people through racial deficit theorizing and offering lower quality classroom instruction. Battey and Leyva explained that the objective neutrality of Whiteness is reinforced by a colorblind ideology that not only avoids racial discourses, but also resists defining Whiteness and how it operates. Colorblindness often takes the form of proud declarations by educators claiming not to see color in their students. Colorblindness has the effect of harming students who experience oppression through racism because it ignores the material effects of racism. Similarly, avoiding discussion of oppressive forms such as sexism and homophobia by claiming neutrality in the classroom ignores the power structures that are oppressing students in the classroom.

Battey and Leyva (2016) used the term passive collective to describe how Whiteness is enacted through institutional racism and unearned benefits without the intentionality of White people. Meaning, White people have White privilege whether they identify as White or not. In mathematics, this means White people generally benefit from better instruction, access to advanced placement courses, and more resources due to the historic advantages of White people,

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made possible through the intentional impoverishment of non-Whites through exclusionary practices such as lack of access to the labor market, and through housing segregation that leads to funding differentials for schools from property taxes. Consequently, achievement disparities in which White students score better than non-White students are created. The institutional benefits White people have, as well as the statistical data reporting lower achievement for non-Whites means that blame is placed on the lower-achieving students and their families, communities, and cultures, rather than pervasive Whiteness. The higher value of White people is then validated from the achievement differences created by White people.

Battey and Leyva (2016) provided three dimensions (*Institutional, Labor,* and *Identity*) to understand the framework of Whiteness in mathematics education. In the *Institutional* dimension, Whiteness is accompanied by ideologies of colorblindness, meritocracy, neutrality, and innate mathematical ability. Physical spaces such as classrooms manifest ideologies that indicate power through "images, charts, symbols, and objects serving as concrete representations that communicate values and other central aspects of institutions" (p. 64).

In the *Labor* dimension, the authors explained that non-White people shoulder the burden of more emotional labor from experiencing discrimination and racism in their classrooms. Since emotions and discussions of racial experiences are deemed inappropriate in mathematics classrooms, Whiteness maintains classrooms as racially neutral spaces. There is also a behavioral burden for non-White students to conform to White behavior by dressing, acting, and speaking in specific ways.

The *Identity* dimension described how non-White students (except for some Asian countries) are asked more often to prove themselves as mathematically capable under White notions of success, whereas White students are assumed to be legitimate participants in the

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mathematics classroom. Non-White students are both invisible in the classroom (because their histories, perspectives, and experiences are not represented) and hypervisible (because there are fewer of them). This hypervisibility "runs the risk of tokenism, essentialism, and having to represent their race" (Battey & Leyva, 2016, p. 73).

Martin (2003, 2007, 2008, 2009, 2013) was noted as giving the most extensive attention to Whiteness in mathematics education research, policy, and practice. He urged for practitioners to interrogate Whiteness in the field, and points out that despite sociologists explaining that discourses around race are rooted in systems of racism, mathematics education research does not acknowledge how race is socially constructed and the sociopolitical consequences. Practitioners continue to use race to create categories for analyzing test scores (Martin, 2009). The focus of closing the so-called racial achievement gap has assumptions about the inferiority of non-White students, as well as implications that non-White students must become White in their values and dispositions if they are going to become higher achievers (Martin, 2007, 2009).

Martin (2009) described how racial hierarchies are constructed in the U.S. in order to devalue African American, Latina/o, and Native American students in mathematics literacy by comparing them to White and Asian American students. Asian Americans are represented as high achievers "despite differential patterns of achievement within their many subgroups … afford(ing) them status as *honorary Whites*" (p. 318). Moreover, Martin pointed out that although there is extensive attention to the Black-White achievement gap (where Blacks are the low achievers), the White-Chinese/Korean/Japanese American gaps (where Whites are the low achievers) are rarely discussed because Whiteness ensures that White students are not pathologized through descriptions of limited cognitive ability, lack of engagement, and dysfunctional familial and community environments. Instead, Asian students are framed

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negatively internationally as being a threat to U.S. global standing, and Asian Americans are often resented for their presence in college mathematics and science programs due to their high achievement. Furthermore, White students are not faulted for achieving lower than Asian Americans. Instead, blame is placed on inadequacies in teacher knowledge and gaps in the curriculum to justify the White-Asian American gap.

By not interrogating racial hierarchies, mathematics educators accept that the stratification of achievement based on race is the natural starting point. Students are reduced to a certain race, and their achievement based on race is compared. Then the goal becomes closing the so-called achievement gap by bringing African American, Latina/o, and Native American students to the level of literacy of White and Asian American students. This is often accomplished through colorblind programming models which, Martin (2009) explained, are problematic because it frames non-White students as needing to appropriate White behaviors, sets an artificially low standard of achievement for non-White students, and privileges White as the ideal social category.

Another important part of my critical race and anti-racist analyses of Indigenization in the literature was the consideration of Whiteness and White supremacy with regard to teacher perceptions of race, culture, and anti-racist classroom practice. As institutional mandates of incorporating Indigenous cultures, perspectives, and knowledges are being sought in education, Whiteness is maintained through colorblind ideologies in which White educators do not see their school subjects as representing White education and White culture. Many educators believe they are bringing culture into a culturally-neutral domain. If educators see their knowledge and school subjects as cultureless, this tendency suggests they may not even see themselves as cultural beings. I summarized some literature that supports this below.

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I considered work by Higgins, Madden, and Korteweg (2015) who did a study with White teachers involved in Aboriginal education reform. The authors argued that ideologies of universality and colorblindness resulted in the teachers perceiving themselves as cultureless, not having a clear understanding of culture, and being ill-equipped to teach students about cultural matters. The authors also reported that the teachers admitted to not understanding Aboriginal culture, and their belief about Aboriginal peoples was that there is a singular pan-Aboriginal culture that reflects the romanticized and stereotypical notions of the 'imaginary Indian', despite evidence to the contrary by Aboriginal students and the students' families.

Colorblind ideologies make teaching cultural matters difficult because of the assumptions that White culture is not already present in the classroom. Colorblindness protects Whiteness through the teachers appearing not to be racist, and it reproduces the fictive social hierarchy that Aboriginal students are inferior to White students through unquestioned, stereotypical perceptions of their Aboriginal students. The common discomfort that discussions of race provoke causes silence, anxiety, guilt, resistance, anger, and a general avoidance of the topic altogether. This response, named *White fragility* by DiAngelo (2011), serves to reproduce White supremacy by maintaining the status quo. When forced to confront White privilege, White fragility prompts Whites to respond with anger and denial using discourses based on the ideology of meritocracy so that Whites can claim that all benefits are earned through hard work. It can also be difficult for some Whites to admit White privilege is real when they have amounted to very little despite having it.

In an American study, Brewley-Kennedy (2005) observed the experiences a White female professor had in implementing equity in her mathematics methods course to pre-service teachers. Teacher preparation programs are predominately White spaces in which the system of

Whiteness is protected through the failure to recognize and disrupt racism. Brewley-Kennedy reported that the professor felt ill-equipped to deal with the emotions that came along with discussing racism, and thus did not challenge her students' beliefs as much as she wanted in order to maintain "a safe place in her classroom" (p. 21). While the professor's knowledge of mathematical and pedagogical content knowledge was evident, she admitted to not having the same confidence with regard to discourses around equity and racism. The study goes on to report that while there is a high level of discomfort with discussions of race, other equity topics such as gender and special needs do not invoke the same emotional response by students. Brewley-Kennedy made a noteworthy connection between avoidance of race discussions and the 33 female pre-service teachers (31 White and 2 Latina) by drawing on literature that looked at women's silence in acknowledging Whiteness due to their socialization to be quiet and conflict-avoidant. In response, White women act colorblind (or admit to seeing color but do not acknowledge that it is a determinant of how people are treated).

An analysis of Whiteness in mathematics education is applicable to my understanding of anti-racism in Indigenization. It provided me a framework for seeing the ways Indigenization is perceived and taken up by educators. Understanding Whiteness through CRT and anti-oppressive/anti-racist education taught me that mathematics education is not a neutral space, and that I am complicit in reproducing oppressive systems of power if I do not draw attention to and challenge the pervasive forms of oppression in the curriculum and mathematics classroom. In the next chapter, I define and describe narrative inquiry methodology, and explain how I conducted my research.

CHAPTER 3: METHODOLOGY

3.1 Introduction

I chose narrative inquiry as the methodology to study my experiences and the experiences of Indigenous elementary school teachers. I wondered: *What are my experiences as a White Euro-Western mathematician as I co-teach school mathematics with Cree elementary school teachers to their predominantly Cree students?* It is through our experiences that we see ways to reshape mathematics teaching—from abstract, decontextualized, and universal—to a subject composed in local cultures and traditions, and personalized by our stories. My experiences working alongside Miss Moore, Miss Scribe, and Miss Mitchel exemplified mathematics teaching that is steeped in local cultures and traditions, animated by our lived experiences.

Clandinin and Caine (2013) explained that narrative inquiry is both a way to view experience and a methodology for inquiring into experience. It is a way to study experience as researchers and participants meet *in the midst* of their lives. Narrative research occurs in the middle of ongoing lives, making space for the ways participants are in the midst of living out their personal and professional stories. Each story allows for new stories to be lived and shared, and there is never a final story to be told since we are always in the process of becoming (Clandinin, 2013). Researching in the midst of ongoing lives means that inquirers have a *commitment to seeing lives in motion,* and representing lives as always in the making as we live our storied lives (Clandinin, 2013).

3.2 The Twelve Touchstones of Narrative Inquiry

There are a number of methodological commitments, called *touchstones*, in narrative inquiry. Including *living in the midst* and a *commitment to seeing lives in motion*, there are twelve touchstones of narrative inquiry (Clandinin, 2013). These touchstones provide a benchmark of quality in narrative inquiry and are used to distinguish narrative inquiry from other forms of

narrative research (Clandinin & Caine, 2013). Clandinin (2013) explained that there may be

other touchstones, and the current list may evolve, but for now, the twelve emphasized explain

the methodology of inquiring into experience. I will discuss these touchstones throughout this

chapter.

One touchstone that is key to narrative inquiry research is the *three-dimensional*

narrative inquiry space consisting of time, place, and sociality. These three dimensions form the

basis of how experiences are represented in narrative inquiry.

3.2.1 The Three-Dimensional Narrative Inquiry Space and its Deweyan Foundations

Education philosopher John Dewey (1938/1997) provided an ontological conception that

experience and education are intertwined through three interconnected criteria: continuity,

interaction, and situation. He explained continuity of experience to mean that "every experience

both takes up something from those which have gone before and modifies in some way the

quality of those which come after" (p. 35). That is to say, experiences are not inert—they affect

and are affected by other experiences to form a continuum of entangled experiences. Dewey said

experiences influence the quality of further experiences and thus are distinguished as being either

educative if they lead to further growth, or mis-educative if they cause a disruption in growth.

Narrative inquiry as a methodology is founded on Dewey's ontological framework that

experiences are shaped by physical and social surroundings (Clandinin & Murphy, 2009).

Drawing on Dewey's (1938/1997) theory of experience, Clandinin and Murphy (2009) explained

that it is through relational, temporal, and continuous understandings of reality that researchers

and participants can conceive how reality can be known. An ontology of experience in time,

place, and relationships gives rise to the epistemological framework that experience is

knowledge, and inquiring into experience generates new understandings between the observer

and their surroundings (Clandinin & Murphy, 2009; Clandinin & Rosiek, 2007). That is, experiences are a site of knowledge production.

Experiences constitute a collection of knowing that informs the interaction criterion. Interactions are carried out through objective conditions (actions that are in the power of the educator to regulate) and internal conditions (knowledge that comes from experience). Taking the objective and internal conditions together gives the third criterion called a situation. Dewey (1938/1997) said living in a world means living in a series of situations, and wrote "The conceptions of situation and interaction are inseparable from each other. An experience is always what it is because of a transaction taking place between an individual and what, at the time, constitutes [their] environment" (p. 43). He also said that continuity and interaction are the longitudinal and lateral aspects of experience, and experiences are carried forward into other situations by way of continuity. He argued the experiences we have are connected to external environments and conditions, giving rise to the criterion of interaction. Our interactions form the basis of the situations we have, which in turn form the continuum of our educative and mis-educative experiences. Clandinin and Rosiek (2007) argued that experience forms the foundation of all inquiry, including a narrative inquiry.

Clandinin and Connelly (2000) considered narrative inquiry to be a research methodology into experience. A touchstone of narrative inquiry is representing experiences in ways that show *temporality*, *sociality*, and *place*. These narrative commonplaces are founded on Dewey's (1938/1997) epistemological and ontological terms of continuity, situation, and interaction. Continuity of experience informs the temporal considerations of past, present, and future. Interaction informs sociality—the personal and social contexts. Situation informs the narrative backdrop of place in which the experiences unfold (Clandinin & Connelly, 2000).

Within the sociality (i.e. personal-social contexts) commonplace, researchers also move *inward* to the internal conditions of "feelings, hopes, aesthetic reactions, and moral dispositions" (p. 50) and *outward* toward the existential conditions of the environment and place. Within the *temporal* commonplace, researchers move *backward* and *forward* in time when attending to the continuum of experiences. Clandinin and Connelly stated that doing research into an experience means experiencing an experience in the *inward*, *outward*, *forward*, and *backward* dimensions and asking questions along each direction. This view of narrative inquiry as the study of experience over time and in spatial contexts makes it both a way to view phenomena and a research methodology (Caine, Estefan, & Clandinin, 2013).

Narrative inquiry is distinct from other methodologies because it requires the simultaneous exploration of all three commonplaces and movement along the four directions described above (Connelly & Clandinin, 2006). Clandinin and Caine (2013) explained that all three commonplaces and four dimensions must be attended to during the research process, and caution that "There may be times where one dimension foregrounds the inquiry, but all dimensions are attended to" (p. 173). It is the attention to these narrative commonplaces and dimensions that allow researchers to see the disruptions, fragmentations, or silences in our lives or the lives of the participants. Experience is lived in the midst, unfolding over time, in diverse social contexts and place, and co-composed in relationships (Caine, Estefan, & Clandinin, 2013), and thus all dimensions must be present in narrative inquiry.

3.2.2 The Touchstones of Narrative Beginnings and Negotiating Entry to the Field
Narrative beginnings is a touchstone of narrative inquiry in which researchers begin by recognizing stories of experience, and revisiting those experiences through the narrative commonplaces during the inquiry process with participants. Continually inquiring into

experiences before, during, and after each inquiry is part of the reflexive and reflective nature of narrative inquiry (Clandinin & Caine, 2013). It is also through the preliminary considerations of narrative beginnings that researchers frame research puzzles. Clandinin (2013) explained that engaging in autobiographical narrative inquiry to frame the research puzzle is the beginning of all narrative inquiries, although narrative beginnings do not necessarily make their way entirely in the research texts (only the parts that help audiences better understand the research puzzle may be included). This can also be a source of tension as inquirers try to piece together the experiences that display a coherent story.

In the first chapter, I included stories of my childhood as my narrative beginnings of becoming a mathematician. Stories of my educational and work experiences outlined how I came into working alongside educators to make sense of Indigenization in school mathematics curriculum. This brought me to my research puzzle and helped me frame my research inquiry.

Proceeding narrative beginnings and framing the research wonder, narrative inquirers negotiate entry to the field with their participants. Clandinin and Caine (2013) explained that the touchstone of *negotiating entry to the field* and negotiating entering the relational space of the field means negotiating the research puzzle and treating the purpose, intentions, transitions, and texts as ongoing processes. Part of negotiating entry into the field with my participants was opening up discussions around how field texts would be composed through our interview conversations. In helping participants before, during, and after the research, narrative inquirers may situate themselves in the research by explaining their social positioning and sharing their experiences. While the "intent is to enter the relationships with participants as researchers, participants come to know and see us as people in relation with them; a reminder that we always carry ethical responsibilities" (p. 170). Researchers lay their stories alongside participants'

stories to seek parallels, resonances, and reverberations that provoke new ways to imagine who researchers might become (Caine, Estefan, & Clandinin, 2013; Clandinin & Raymond, 2006).

3.2.3 The Touchstone of Co-Composing Field and Research Texts

Clandinin and Caine (2013) explained that field texts are co-composed by researchers and participants through the narrative commonplaces of time, social relationships, and place. They wrote:

> *Temporality* comes into play in two ways: the first is that field texts are
>
> composed over multiple interactions with participants, and the second is that
>
> field texts are co-composed through participants' and researchers' reflections
>
> on, and of, earlier life experiences. *Sociality* directs attention inward toward
>
> the participants' and researchers' thoughts, emotions, and moral responses
>
> and outward to events and actions. *Place* directs attention to places where
>
> lives were lived as well as to the places where inquiry events occur. (p. 167)

In my work, field texts took the form of memory reconstructions, lesson plans, classroom activities, and transcribed interview conversations with teachers. These field texts were co-composed over multiple meetings, and represented our relational negotiations of what lessons we taught on a particular day.

Inquiring into experiences also involves attending to emotions and social relationships. Clandinin and Murphy (2009) explained that narrative inquiry involves the study of people in a research relationship who are studying the experiences of people in a research relationship. Relationships are integral to making sense of the temporal and spatial dimensions of narrative inquiry. Attending to relationships means simultaneously considering both the personal and social conditions—where the social condition refers to the circumstances in which experiences

and events transpire, understood "in terms of cultural, social, institutional, familial, and linguistic narratives" (Clandinin, 2013, p. 40), and the personal condition refers to the internal condition of emotions, hopes, and moral dispositions (Connelly & Clandinin, 2006). Clandinin and Rosiek (2007) explained that narrative inquiry focuses on both the individuals' experiences and the social, cultural, and institutional narratives that shape, express, and enable these experiences: "Narrative inquirers study the individual's experience in the world, an experience that is storied both in the living and telling and that can be studied by listening, observing, living alongside another, and writing, and interpreting texts" (p. 42).

A commitment to relationships and attending to personal and social conditions means that there are social responsibilities throughout the inquiry process (Clandinin & Caine, 2013). *Relational responsibilities* as well as the *negotiation of relationships* as researchers and participants engage in the research are both touchstones of narrative inquiry that have an ethical imperative to center the researcher-participant relationship and the commitments involved as field and research texts are co-composed.

For example, my participants and I negotiated how the field texts of transcribed interview conversations would be shaped into stories in the research texts. My ethical commitments included protecting the stories told by my research participants by negotiating how they wanted their stories shared throughout the research process. Stories represent knowledge, and storytelling as a method of educating and healing is part of doing research with Indigenous peoples (Kovach, 2010). Stories and storytellers must be protected and respected, and so there is an ethical imperative to work in a good way, relationally, in a community context that upholds trust (Kovach, 2014). Narrative inquiry proceeds from a relational ontology that aligns with the relational work required to working alongside Indigenous peoples in research.

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3.2.4 The Touchstone of Moving from Field Texts to Research Texts

Narrative inquirers must foster relational spaces in the form of interviews and meetings in the midst of the researchers' and participants' lives. Relational spaces such as interviews allow for the living, telling, retelling, and reliving of stories (Clandinin & Connelly, 2000). Clandinin (2013) explained that people live out stories and tell stories of their living. Inquiring into the lived and told stories is a retelling of these stories, and because "we see that we are changed as we retell our lived and told stories, we may begin to relive our stories" (p. 34). A narrative inquiry might begin as researchers come alongside participants and experience a living of stories with the participants, or instead, as researchers inquire into experiences by listening to and recording the stories told by participants (Clandinin, 2013).

After entry into the field is negotiated, narrative inquirers co-compose field texts in the form of conversations, transcripts, interviews, participant observations, and artifacts such as art, pictures, documents, and memory box items (Clandinin & Caine, 2013). This *movement from field to field texts* is another touchstone of narrative inquiry that includes negotiating the relational spaces of how, where, and when meetings will take place, and the imaginings of how field texts will be included in the work. Clandinin and Caine emphasized the importance of multiple ways to tell and live experiences through diverse field texts, which allows meaning to be made from experience, "and might also point us to possibilities of diverse final research texts, that is, the representation of retold stories" (p. 172). Clandinin and Murphy (2009) added that field texts are representational forms that signify the dynamic, multiple, partial, and incomplete nature of experience.

When *moving from field texts to interim and final research texts*—another narrative inquiry touchstone—inquirers maintain relational commitments throughout the process.

Negotiating the interim texts means co-composing how field texts relate to the research puzzle, with attention to the three-dimensional narrative inquiry space. Composing interim texts invites more experiences to be told and lived, while negotiating agreement on the understanding of the experiences (Clandinin & Caine, 2013). The continuous relational process of moving from field texts to research texts is full of relational tensions as researchers represent experience that is necessarily partial and incomplete (Clandinin & Murphy, 2009).

Clandinin and Caine (2013) cautioned that the final research texts are challenging because researchers and participants must consider the audience, who may be far-removed from the lived and told experiences of the participants. Final research texts may take academic forms such as journal publications, dissertations, and presentations, as well as for non-academic audiences in the form of art, plays, poetry, and public texts (Clandinin & Caine, 2013). The touchstone of *being attentive to audience* means considering all the ways research texts can be shared, respecting the lives represented in these texts, and reflecting the multiplicity of researcher and participant voice and experience.

3.2.5 The Touchstone of Justifying the Inquiry
In the ongoing process of co-composing field, interim, and final research texts, narrative inquirers participate in *relational response communities*—which is another touchstone. Response communities are sounding boards to help the inquirer shape the research puzzle. Consisting of trusted participants, relational response communities can enrich the research "if they are composed of interdisciplinary, intergenerational, cross-cultural, academic, and nonacademic members" (Clandinin & Caine, 2013, p. 173). Just as with participants, researchers must continuously negotiate the short- and long-term obligations with response communities so that trust, respect, and care is maintained. Response communities help researchers retell and relive

what it means to be an inquirer (Clandinin, 2013). My response communities included my

doctoral committee and my peers (other doctoral students in my program).

Response communities also help researchers justify the research. Clandinin and Caine

(2013) argued that, just like with all research, narrative inquirers must answer the questions of

"so what?" and "who cares?" This is the narrative touchstone of *justifying the inquiry personally,*

practically, and *socially*. The personal justification of narrative inquiry comes from the narrative

beginnings of the researcher.

Personal grounding is a cornerstone of research with Indigenous peoples (Kovach, 2010).

According to Dei (2013), "Research does not exist outside of place nor outside of history" (p.

27), and thus we must explain the perspectives we bring to research through our positioning and

background. One intention of my narrative inquiry was to emphasize the reshaping of my

practice and understanding of Indigenization through anti-oppressive/anti-racist and decolonizing

education. Being critical of our positioning is an awakening that allows us to create decolonizing

spaces (Henhawk, 2013). This is interwoven with the practical justification of a narrative inquiry,

which considers issues of social justice. Clandinin and Caine (2013) argued it is the practical

justification of narrative research that connects us to the experiences of participants and makes us

mindful of the social contexts that position and shape researchers and participants.

The theoretical justification comes from considerations of social action and policy

justification (Clandinin & Huber, 2010). My research puzzle began through considerations

around the meaning and practice of Indigenization in school mathematics. This was born from

the Canadian education system implementing many policy initiatives around Indigenization

across different subject areas and school programs (Battiste & Henderson, 2009; Gaudry &

Lorenz, 2018; Goulet & Goulet, 2014; Truth and Reconciliation Commission, 2015). Working

alongside three Cree teachers, the inquiry focused on my experiences co-teaching school mathematics to provide a more nuanced understanding of the Indigenization policies being put into action in the education system. My understandings of the social actions and policies of Indigenizing school mathematics were shaped by the analytical frameworks of CRT and anti-oppressive/anti-racist education.

3.3 Narrative Inquiry and Narrative Research

Narrative inquiry is different from other forms of qualitative narrative research. Caine, Estefan, and Clandinin (2013) explained that narrative inquiry developed out of narrative research in the late 1980s to early 1990s. They stated that narrative inquiry is different from narrative research that use stories as data, or narrative analysis such as phenomenology, ethnography, and case study. One distinction is that narrative inquiry comes from the epistemological and ontological centring of experience through the narrative commonplaces of temporality, sociality, and place. Another distinction of narrative inquiry is that the experiences of participants and researchers frame the entire research process through relational commitments (Clandinin & Murphy, 2009).

It is through contesting and addressing definitions of narrative research that allows such discussions around the epistemological and ontological understandings of narrative inquiry by researchers in the field. For example, in an article on analyzing and representing narrative data, Hunter (2010) talked about the challenges in narrative inquiry involving truth, validity of narratives, and whether memory reconstruction represents facts. I argue that representing experiences does not require that complex, layered stories be reduced to verifiable, replicable, abstracted, and generalizable facts about human experience. Memory reconstructions served a purpose in my research that allowed me to draw upon experiences that happened outside my

doctoral studies. For example, I used memory reconstructions in my narrative beginnings to help frame experiences that shaped my research wonder.

Clandinin and Caine (2013) explained that since narrative inquiry is a relatively new methodology, it is important that researchers make explicit the methodological contributions made—whether it is revealing epistemological and ontological understandings, the development of methods, or applying narrative inquiry to fields other than the predominant place of education. In my case, since my coming to learn of Critical Race Theory and anti-oppressive/anti-racist education were pivotal experiences in my educational journey, I was mindful of the ways these frameworks informed my narrative inquiry. In the next chapter, I attend to some of the methodological aspects of the intersecting forms of scholarship I applied throughout my research.

3.4 Methods

I already had a professional working history with the Cree bilingual school that I introduced earlier in this dissertation. This school was the site where I fostered a research relationship with two of the three participants for my research: Miss Moore and Miss Scribe. The third participant, Miss Mitchel, was introduced to me through a colleague. Miss Mitchel is in another school that also had a high Cree student and teacher population (but is not a Cree bilingual or Cree immersion school).

3.4.1 Participant Selection and Ethics

The participants I worked with at both schools were selected by purposive sampling (Hays & Singh, 2012) based on the criteria that they were: (1) Cree-identifying (2) K-12 educators who (3) taught school mathematics. I had three teachers who agreed to be participants. In the Cree bilingual school, there were two teachers: Miss Moore and Miss Scribe (they chose their pseudonyms). Both teachers were fluent in Cree and taught grade 6 during the research period. In

the other school (not considered to be Cree bilingual or Cree immersion), I had one teacher participant: Miss Mitchel (she also chose her pseudonym). She was not fluent in Cree, but grew up with Cree-speaking parents and grandparents, and practiced Cree traditions. Initially, I had the criteria that the participants all be fluent in Cree but decided that having a teacher like Miss Mitchel (who was not fluent in the language but was raised and worked in a Cree-influenced environment) added another layer to the research.

The participants chose pseudonyms beginning in 'Miss' to reflect the ways our research took place in their classrooms with their students present. In turn, they addressed me as Mr. Stavrou during class. Keeping these titles was a classroom formality that we playfully used throughout my research.

Although participants were given pseudonyms of their choosing to protect their identities, the context of their work and stories means complete anonymity may not be possible. Ethics for this research was approved by the University of Saskatchewan Behavioural Research Ethics Board in October of 2016, and was renewed in September of 2018 and May of 2019. The approval certificates are in the appendix of this dissertation.

3.4.2 Negotiating Entry into the Field
Narrative inquiry requires a relationship between the researcher and participant: "Relationship is key to what it is narrative inquirers do" (Clandinin & Connelly, 2000, p. 189). Fortunately for me, my entry into the Cree bilingual school as a researcher was a simple transition since I already worked there as part of my service work for the University of Saskatchewan. I had a close relationship with Miss Moore for a year prior, as we would co-teach mathematics in her classroom. When it came time to recruit participants, I asked if she would consider joining, and she was happy to oblige.

I met the second participant, Miss Scribe, through Miss Moore. During the days I would come do math activities, Miss Moore asked if she could invite Miss Scribe and her students to join the lesson. I was fine with this since they both taught the same grade. After hearing about the research project we were doing, Miss Scribe volunteered to be a participant. To meet institutional and ethical requirements, I went through the consent forms with each participant after class in late October of 2016. We agreed to continue co-teaching the lessons to their students, and negotiated our interviews to be right after class during the lunch break in the school. Miss Moore and Miss Scribe were fine with being interviewed together.

I met the third participant, Miss Mitchel, through a colleague who knew of my research. She called Miss Mitchel a rock star in the mathematics classroom. My initial meeting with Miss Mitchel took place in November of 2017 over lunch break at her school (this school was not Cree immersion or Cree bilingual, but had a high Cree student and teacher population). We worked through consent forms after I gave more context to my research project. Since we had no prior working relationship, we needed to negotiate how the research would be carried out. Miss Mitchel asked if this research project would take away from teaching hours and if she would have to stray away from the content she needed to teach. I assured her that I wanted neither to happen and that I simply wanted to be part of her classroom in the usual ways she conducted her teaching. She explained that the students in her school—not just her class—were accustomed to a rigid schedule, and were sensitive whenever something disrupted that. As we negotiated the weekday that I would come to her classroom, it seemed I would be responsible for disrupting the carefully organized scheduling of her classroom: She explained that math class runs in the morning right before lunch, which unfortunately did not work in my schedule. However, she

graciously accommodated me by moving her math time to the afternoon on Fridays, with the interviews being conducted during lunch time before class.

She chuckled knowing that her students would ask why there is a change in the schedule. I was impressed by her students' attention to their routine, as I did not recall being as observant when I was in sixth-grade. Miss Mitchel explained that the time table represented an important expectation of the students and teachers—everyone knew where they should be and what they should be doing at all times of the school day. For example, when the students came back from morning recess, they knew that math followed, so they grabbed the required materials (e.g. pencils, work booklets, textbook) and waited in their seats.

I want to mention that during our initial meetings, Miss Mitchel displayed some tensions of coming into a research-participant relationship with me. She felt she might not be a good participant because she was not fluent in Cree. Since she could speak and understand some Cree, and since she grew up with her Cree culture, I told her that would not be a barrier in my research. Her *inward* feeling of uncertainty shaped the *outward* conditions of how my research will unfold. This is how I attended to the *sociality* commonplace of the inquiry.

During the initial meetings with all three participants, I asked how we should consult with their schools' Elders. All three teachers did not feel the need to include an Elder for any part of the process. I mention this because institutional ethical requirements expect that I make space for Elders if appropriate, and at the discretion of the participants. All three participants deemed it unnecessary to include Elder consultations because we were not doing anything spiritual or ceremonial, and they were not offering a sacred knowledge that would require an Elder. Since they did not feel it was appropriate to consult an Elder, at their discretion I did not approach any for this research.

3.4.3 Negotiating Interviews as Field Texts

I negotiated 15 hour-long interviews with Miss Moore and Miss Scribe together (at their request) after class. The interviews took place in their regular classroom during lunch break following the math lessons. The interviews were conducted over the time span of two years, from October 2016 to April 2018 (with breaks in the research during the summer holidays). I negotiated 10 hour-long interviews with Miss Mitchel in her classroom during lunch before the math lesson. The interviews with her occurred during the school year from November 2017 to April 2018.

The interviews for all three participants were informal conversations, which Clandinin (2013) explained "create a space for the stories of both participants and researchers to be composed and heard. Conversations are not guided by predetermined questions, or with intentions of being therapeutic, resolving issues, or providing answers to questions" (p. 45). Our conversations were often around how our math lessons went that day, which often involved reflecting on our own experiences as students learning mathematics. The conversations were filled with storytelling—a way of sharing knowledge that reflected self-in-relation, self-situation, and a dialogic engagement (Kovach, 2010b). The open-structured nature of conversations in narrative inquiry research "shows respect for the participant's story and allows research participants greater control over what they wish to share with respect to the research question" (Kovach, 2010, p. 124). Participants were asked to share experiences from early years, schooling, and family experiences to draw them backward and forward through different times, places, and social interactions.

Narrative inquiry has a methodological imperative to attend to the researcher-participant relationship. In our research relationship, trust and respect were maintained by ensuring the participants felt their story had been accurately represented through their voice. Following each

interview, I summarized the conversation and discussed the salient points in the follow-up

interviews to ensure their voice and story were accurately captured. It was important to me that

Miss Moore, Miss Scribe, and Miss Mitchel felt comfortable sharing their stories, and so I made

it my responsibility to provide them many opportunities to rework their stories to reflect what

they wanted shared. Between interview days, as I sat in my office and summarized our

conversations, my reflections led to wonderings and further inquiry in follow-up conversations.

In accordance with University of Saskatchewan policies, all research conversations were

stored in locked and encrypted files with secure, password-protected computer storage. Any

transcribed paper copies were stored in a locked cabinet inside a locked office only accessible by

me.

3.4.4 Negotiating Interim and Final Research Texts
All conversations with the three participants were recorded and later transcribed by me. I also

composed field notes in the form of classroom observations and reflections from our

conversations. I collected artifacts such as curriculum documents and resources the teachers used

in their lessons.

My participants and I co-composed *interim research texts* by listening to, transcribing,

and summarizing our field text interview conversations. Interim research texts are "partial texts

that are open to allow participants and researchers opportunities to further co-compose storied

interpretations and to negotiate the multiplicity of possible meanings" (Clandinin, 2013, p. 47).

Interim research texts occur in the process of moving from field texts to creating the final

published research texts (Clandinin & Connelly, 2000).

We also co-composed word images (a word image is a collection of words and phrases—

not necessarily a graphic image—used to create brief but compelling representations of lives

(Young et al., 2012)). Word images taken directly from the field notes and interviews gave an untouched and more immediate view of the participants' and my living experiences, and allowed for plurality of voice (Clandinin, 2013). I wanted plurality of voice in the final research texts to give the participants more control over the narratives they shared, and to offer the imagined reading audience a direct view of the participants' experiences without always including my narrating voice. The interview conversations and word images led us to co-constructing narrative accounts that expressed the participants' experiences around learning and doing school mathematics, as well as teaching school mathematics amidst Indigenization mandates.

As I co-composed interim texts with my participants, resonant threads and patterns emerged (Clandinin, Caine, & Steeves, 2013). In composing the final research text, I identified four narrative threads that developed into the next four chapters of this dissertation. I also developed these chapters into four manuscripts that have all been submitted for publication in academic journals.

Attending to the audience of final research texts is significant for narrative inquirers. There are multiple audiences: the inquirer, the participants, and the imagined reading audience. Connelly and Clandinin (2006) cautioned that

> Inquirers who forget their participants and their readers and write only for
> themselves, become narcissistic; inquirers who write for imagined audiences
> and neglect their participants could be unethical; and inquirers who write only
> for self and/or participants may be unable to answer the questions "Who
> cares?" and "So what?" (p. 485)

As I composed the final research text (this dissertation), I was conscious of who my reading audience might be. My first reading audience were academics (my doctoral supervisor and committee members) who vetted my work. They supported me completely along my journey, and I am grateful for the attention, direction, honesty, and respect they have given me throughout this process. I imagined the reading audience to include other educators who are looking to make sense of Indigenization and social justice in mathematics education. I also imagined interdisciplinary researchers like myself, who are drawing on multiple analytical frames to make sense of their work. In my case, I had a background in pure mathematics before transitioning to educational foundations, where my practice became influenced by CRT and anti-oppressive/anti-racist education.

Being conscious of audience is a way narrative inquirers justify the "so what?" and "who cares?" of their inquiry (Connelly & Clandinin, 2006). By making explicit the social significance of the work and how it contributes to the larger body of literature, narrative inquirers are directed towards the inquiry's end point (Clandinin, Pushor, & Orr, 2007). I came to my inquiry positioned as a mathematician and educator. As I began to work alongside Indigenous teachers and students in my work, I began to craft my research wonders. As I co-taught school mathematics in the classroom, experiences of Cree teachers and students presented in ways that showed how we are storied as we learn and do school mathematics, with particular plotlines moving towards the meaning of Indigenization as represented by the Cree teachers, and the ways our mathematics classroom was made into a relational space through their Cree ways of being. The phenomena coming out of the mathematics classroom was the product of our experiences, and how these experiences shaped the teaching of school mathematics and Indigenization.

My work of co-teaching school mathematics with Miss Moore, Miss Scribe, and Miss Mitchel pointed me to my research wonder: *What are my experiences as a White Euro-Western mathematician working alongside Cree educators as we co-teach school mathematics to predominantly Cree children?*

3.4.5 Narrative Commonplaces, Dimensions, and My Four Narrative Threads

Recall that narrative inquirers view experiences through the narrative commonplaces of *temporality*, *sociality*, and *place* because experiences show social interactions that occurred in specific times and places of a person's life. I explained earlier that the *temporal* commonplace has *backward* and *forward* dimensions that show how our present experiences are influenced by the past and influence the future. The two personal-social dimensions of the *sociality* commonplace are our *inward* hopes and dreams, directed *outward* to our spatial environment.

Our personal narratives of experience shape and are shaped by community narratives (such as school and classroom narratives), as well as dominant narratives (such as social, cultural, and institutional narratives). I made sense of personal, community, and dominant narratives using frameworks such as CRT and anti-oppressive/anti-racist education. These analytical frameworks were significant to understanding my experiences Indigenizing school mathematics. Connecting narrative inquiry to other forms of scholarship allowed me to make sense of how individual experiences are understood, expressed, shaped, and enacted in larger social, cultural, and institutional narratives (Clandinin & Rosiek, 2007).

Based on the work of Clandinin and Connelly (2000), Kirkpatrick (2008) provided a visual representation of the three narrative commonplaces and four dimensions, which I present in the following image.
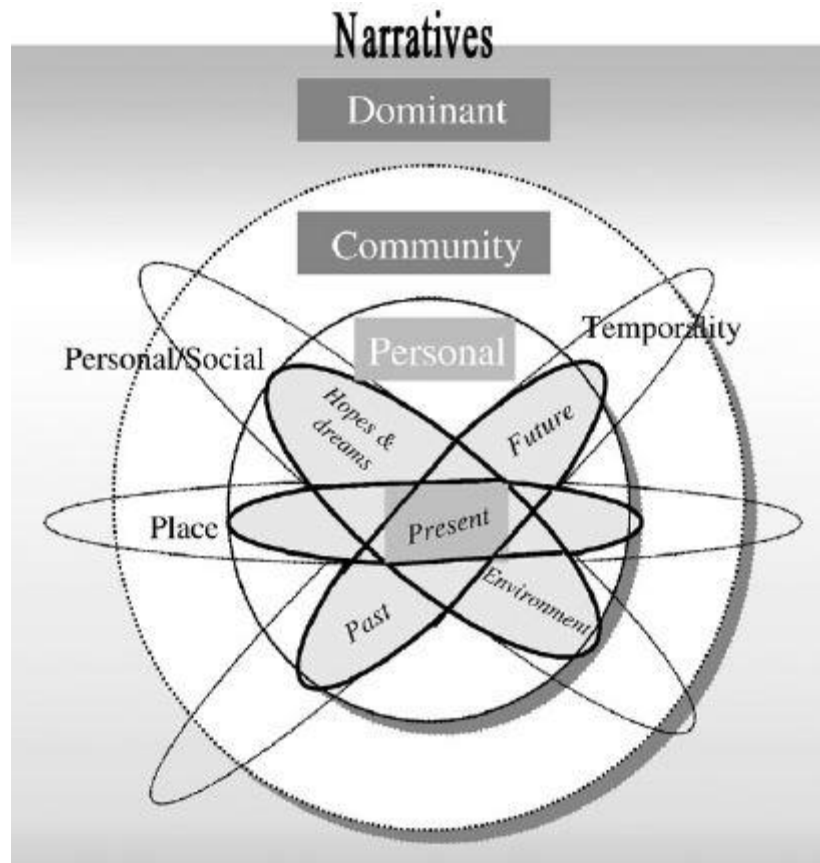
Narratives

(Image from Kirkpatrick, 2008)

Earlier I explained that *narrative threads* are plotlines of experiences that show social relationships over time and place (Clandinin & Connelly, 2000). Weaving together the individual threads (sub-plotlines) of researchers and participants give the main threads (plotline) of a narrative inquiry. The weaving of threads over time, place, and social interactions is how experiences are expressed.

During the research inquiry, I wove together four threads of experience as lived and told stories in Miss Moore, Miss Scribe, and Miss Mitchel's mathematics classrooms. The first thread emerged as I attended to the methodological commitments of narrative inquiry, CRT, and anti-oppressive/anti-racist education as my interpretive frames of Indigenization. The second thread

explains my conceptualizing of Cree mathematizing as a partial representation of identity-making and Indigenization. The third thread developed from tensions when I disrupted experiences of the Cree teachers through my Euro-Western ideologies of generalization in mathematics. The fourth thread explores my learning of *miyō-pimōhtēwin* as a way of being in relation in the mathematics classroom. Each of the four threads informs the next four chapters of my dissertation.

CHAPTER 4: METHODOLOGICAL COMMITMENTS OF NARRATIVE INQUIRY ALONGSIDE CRITICAL RACE THEORY AND ANTI-OPPRESSIVE/RACIST EDUCATION

Narrative inquiry invites researchers, research participants, and the imagined reading audience to share and consider their storied lives through specific methodological features. In the telling of stories, some narrative inquirers apply other forms of scholarship as an interpretive lens. While using narrative inquiry to explore storied lives, I applied CRT and anti-oppressive education—particularly, anti-racist education (ARE)—to make sense of the complexities surrounding Indigenizing school mathematics. Since intersecting different forms of scholarship require particular kinds of attentiveness, I considered the methodological features of narrative inquiry, CRT, and ARE, and offer design elements for other narrative inquirers considering CRT and ARE in their research. It is not my intention to resolve any issues, but I do think it is practical to delineate the tensions surrounding overlapping scholarships.

This chapter was developed around the thread that emerged as I attended to the methodological commitments of narrative inquiry, CRT, and ARE as my interpretive frames of Indigenization. My and the participants' experiences were woven together to form this thread. The narrative commonplaces of *sociality*, *temporality*, and *place* are evident in this chapter through my transcribed interviews with Miss Moore, Miss Scribe, and Miss Mitchel, which took place over multiple interactions in the space of their classrooms. The personal-social dimension of narrative inquiry reminded me to connect experience *inward* to my "feelings, hopes, aesthetic reactions, and moral dispositions" (Clandinin & Connelly, 2000, p. 50) and *outward* toward the classroom environment. I attended to the *backward* and *forward* dimensions of *temporality* as I reflected on my growing knowledge of CRT and ARE throughout the chapter.

4.1 Ontology of Narrative Inquiry

In educational research, narrative inquiry was introduced by Connelly and Clandinin (1990) based on a Deweyan (1997) ontology that education and life are intertwined. While narrative inquiry has been used in contexts such as studies of community, healthcare, and anthropology, my use of narrative inquiry is in educational contexts related to teacher and student identity-making in the mathematics classroom. Classroom experiences and subject matter influence the way researchers and participants compose stories to live by (Lawrence, 2008).

We all lead storied lives and interpret our past and imagine our futures through these stories. According to Connelly and Clandinin (2006), *narrative inquiry* is a way to think of experience as story, where story is "a portal through which a person enters the world and by which their experience of the world is interpreted and made personally meaningful." (p. 477). Narrative inquiry is thus a framework for understanding experiences (Clandinin & Caine, 2013).

Recall from the previous chapter that what makes narrative inquiry distinct from other forms of inquiry are the commonplaces of *temporality*, *sociality*, and *place* present in the inquiry. *Temporality* means being attentive to people and events evolving through the past, present, and future. *Sociality* refers to the inquirer and participants' personal conditions of "feelings, hopes, desires, aesthetic reactions, and moral dispositions" (Connelly & Clandinin, 2006, p. 480), as well as the social conditions of the environment and people that shape contexts. *Place* means the location or sequence of locations where the inquiry and events under inquiry take place. An integral part of a narrative inquiry is the "simultaneous exploration of all three commonplaces" (p. 479).

I said earlier that Clandinin and Connelly (2000) explained that in narrative inquiry experiences are expressed through narrative threads, which are plotlines woven over the

commonplaces of time, place, and social interactions. Clarke wrote, "It is in the stories we tell about ourselves, the stories that people tell about us, in the stories we act by, and the stories we tell in our actions. Story becomes the warp and weft of all experience as it weaves its way through every moment. Stories are central to understanding the nuances of human interactions in any context" (p. 56). The use of threads in a narrative inquiry is one possibility of understanding nuanced experiences in stories. These stories about ourselves, Clarke reminds us, are told by us, by others about us, and are lived and told through our actions.

Recall from the previous chapter where I explained that the starting place of an inquiry occurs when researchers locate themselves in the inquiry. Narrative beginnings provide a personal justification of the research wonder through an autobiographical introspection (Clandinin, 2013). After the researcher frames their research wonder, they negotiate entry into the inquiry site. Negotiating entry, as well as how the collection of field texts shape the interim and final texts are part of being in relation with the participants in a narrative inquiry (Connelly & Clandinin, 2006).

One of the considerations of my research and teaching with my Cree teacher participants is how Indigenization is conceptualized and operationalized in school mathematics. These curricular directives created tensions in the teachers, as discussions evoked stories around their own mathematics education. Tensions also arose within me as I positioned my stories alongside theirs, including my tensions with regard to learning Indigenization in mathematics education. Reflecting on tensions took us *backward* and *forward* in time to different experiences, which reflects the *temporal* commonplace of a narrative inquiry. Attending to the *inward* emotions evoked by tensions and the *outward* environment of the classroom is part of the *sociality* commonplace.

Our experiences are stories to live by that show the complexities around learning and teaching school mathematics with the added intricacies of Indigenizing school mathematics. As part of my journey learning Indigenization, I relied on anti-racist and critical race analyses to make sense of the literature I was reading, and the Indigenizing practices I experienced taking place in local schools. Since these analyses inform my work as a narrative inquirer, it was important to me to locate these forms of scholarship within my work and practice.

4.2 Locating Critical Race Theory and Anti-Racist Education in my Inquiry

Prior to my doctoral research, I came to understand Indigenization through my service work of teaching hands-on activities and lesson plans in K-12 provincial and reserve schools. There were civic and provincial education reports addressing Indigenous student achievement and success rates, barriers and challenges, and attitudes of educators (Pete, 2013; Whiteman, 2010), as well as a call for curricula that incorporated Indigenous perspectives and traditional knowledge (Gabriel Dumont Institute, 2011; Truth and Reconciliation Commission, 2015). In my narrative beginnings in the first chapter, I explained that I collaborated with teachers and school boards to determine ways Indigenous perspectives could be included in the provincial mathematics curriculum guides. As I mentioned earlier, after seeing the problematic ways practitioners took up Indigenous perspectives in mathematics, I furthered my education by taking a graduate degree that included a course emphasizing ARE.

ARE was significant to my life and academic work because it allowed me to see that learning, teaching, and practicing mathematics are not neutral endeavors. What we learn, how we learn it, and who gets access to education are all regulated by political, social, and cultural processes and institutions that favor White identities. I used CRT and ARE to attend to the political, social, and cultural aspects of mathematics, as well as describe and problematize

Indigenization in mathematics education. In particular, CRT and ARE played a role in my inquiry by helping me frame how the assumed inclusiveness of Indigenization within multiculturalism often avoids or underemphasizes colonization, historical and ongoing racism, and other forms of oppression in Indigenous mathematics education (Stavrou & Miller, 2017).

As I inquired into my narrative beginnings to shape my research puzzle, CRT and ARE played a role in how I understood my practice. Since I cannot ignore the interpretive lens of CRT and ARE in my education and work experiences, I attended to the ways these theories informed my narrative research alongside my participants. To understand the borderlands of these theories, I drew upon the work of Clandinin and Rosiek (2006) who mapped the methodological landscape of narrative inquiry alongside other forms of scholarship such as post-positivism, Marxism and critical theory, and post-structuralism. Since CRT and ARE were not explained in-depth in their work, I extended their review of these philosophical territories by expanding on their arguments about critical theory to CRT and ARE. I demarcated these traditions of inquiry, as well as located my research within their overlapping borders. As a consequence, I provide design elements in this chapter for inquirers who wish to traverse the borderlands of narrative inquiry, CRT, and ARE.

4.3 Ontology of Critical Theory

I began by considering how Clandinin and Rosiek (2006) mapped the methodological landscape of narrative inquiry alongside the scholarship of critical theory. They explained a narrative inquiry is not only a focus of lived experience, but also

> an exploration of the social, cultural, and institutional narratives with
>
> which individuals' experiences were constituted, shaped, expressed, and

enacted—but in a way that begins and ends that inquiry in the storied

lives of the people involved. (p. 42)

That is to say, narrative inquiry has an orthodoxy of beginning and ending in lived experience, while making space for larger social, cultural, and institutional narratives that may shape these experiences. Critical theory, for example, is a potential framework that allows researchers to attend to the social justice contexts in narratives of experience. However, as Caine et al. (2017) argued, inquirers must be mindful that the starting place in narrative inquiry is in storied experience, not in theory, practices, and policies. Otherwise, they contend that the social justice problem "becomes the central focus of inquiry, effectively displacing multiple facets of experience" (p. 7), and complicated, storied lives become "a manifestation of a social problem in need of a solution" (p. 7).

Clandinin and Rosiek (2007) explained that connecting narrative inquiry to other forms of inquiry is how individual experiences are understood, expressed, shaped, and enacted in larger social, cultural, and institutional contexts. They argued this is how narrative inquiry can engage in analyses that seek to critique and understand causes of oppression and how oppression is maintained through ideologies. They believed "representations of experience—including representations of the macrosocial influences on that experience—ultimately arise from first-person lived experience and need to find their warrant in their influence on that experience" (p. 50).

I considered the ways the methodologies of narrative inquiry and critical theory are mapped to better understand their common goals and conceptual differences. From there, I applied this understanding to CRT and ARE. Clandinin and Rosiek (2007) explained that narrative inquirers and critical theorists want to know the realities of how social, political, and

cultural institutions dehumanize people, but they explained that one difference between these methodologies lies in their approaches to how realities are conceived.

Narrative inquiry has its philosophical roots in Deweyan ontology, while critical theory, developed by the Frankfurt school, has its roots in Marxist philosophy. Marxist philosophy is motivated by observing how social, political, and cultural institutions deliberately create and maintain unequal power dynamics between people on individual and macro scales. This is based on an ontological fact that the unequal distribution of wealth and power create unequal material conditions that influence life and knowledge. According to critical theorists, the sources of oppression are obscured through ideologies, which are "systems of thought and practice that gives rise to false consciousness in individuals and communities" (Clandinin & Rosiek, 2007, p. 47). Marxist scholarship "seeks to change the material conditions that underlie oppressive social conditions" (p. 49). Critical theorists argue that if narrative inquirers focus on individual experiences (shaped by larger social, political, and cultural ideologies), and these ideologically-influenced experiences are pointed to as fundamental truth, then the "result is an inversion of reality and falsehood" (p. 48). This may result in experiences that are influenced by problematic ideologies to represent truth when, in fact, the experiences point to misrepresentations of reality. Extending this understanding of critical theory to CRT and ARE helped me locate these frames in my work as an inquirer. I was also able to provide a theoretical understanding of how I see narrative inquiry intersecting with CRT and ARE.

4.3.1 Critical Race Theory

I have outlined the beginnings of CRT and described its methodological features in this section. The information in this section relies heavily on the doctoral thesis of my colleague, Dr. Carmen Gillies (2017). The important and necessary work she so eloquently pieced together in her

dissertation allowed me to easily provide the content of this section. The complex historical contexts of CRT, its influence by interdisciplinary and cross-global theories, and its contributing theorists are profound and significant. For the purposes of this dissertation, I have limited the scope to the methodological features, so I welcome you to read her timely dissertation for a full analysis.

CRT was founded as an academic discipline in the late 1980s as American legal scholars examined limitations of Civil Rights litigation (Bell, 1980, 1992). CRT developed into a framework for centring the rights of racially oppressed peoples, outlining histories of White supremacy that construct racially oppressed peoples as inherently inferior, and challenging policies and practices that maintain their subjugation.

The concept of *racial consciousness* is fundamental in understanding the methodological tenets of CRT, which Gillies (2017) explained is "an ability to recognize racialization practices, how racism operates, and how Whiteness is reproduced through individual, cultural, and institutional processes." (p. 12). CRT requires that we develop a critical consciousness to the racism in which we are complicit, as well as the societal and institutional structures of racism. It also requires identifying *dysconscious racism*, which is an "impaired consciousness or distorted way of thinking about race." (King, 1991, p. 135).

Drawing on the work of integral CRT scholars, Gillies (2017) detailed six tenets of CRT, which I concisely summarized below.

- "Racism is endemic" (p. 14). Rather than striving for the futile goal of its eradication, it is more practical to learn realistic strategies that challenge injustices and identify ways non-Whites are subjugated.

- "Skepticism of liberalism" (p. 15). CRT is a critique of ideologies such as race neutrality colour-blindness, individualism, meritocracy, and post-racialism that maintain Whiteness by normalizing White supremacy and denying or minimizing the privilege it engenders.

- "Value racially oppressed peoples' epistemologies" (p. 16). Legitimatize racially oppressed systems of knowledge, including the experiential knowledge that comes from victims' perspectives and stories. These stories are pivotal in a nuanced understanding of how racial subordination is a common knowledge base of racially oppressed peoples.

- "Rejection of ahistorical analyses" (p. 16). Research must be situated within an historical contextualization of racial oppression so that historical racism is traced to current day manifestations.

- "Racial justice" (p. 17) means countering oppressive social and institutional structures, and fighting for the basic rights of racially oppressed peoples.

- "Interdisciplinary" (p. 18). Frameworks that share the aim of racial justice are necessary in CRT. "The interdisciplinary nature of CRT ensures that the complex socio-economic and political conditions of particular sites of White supremacy are understood through broad areas of study which are grounded in CRT." (p. 16).

These brief summaries are meant to give an immediate snapshot of the methodological features of CRT required for my dissertation. The philosophical origins, scholarly contributions, and theoretical and practical complexities of these tenets are defined comprehensively in Gillies's dissertation.

CRT also effectively describes North American Indigenous peoples' experiences of land theft and dispossession, deliberate starvation, disease dissemination, genocide, institutional abuse, and destruction of knowledge systems through colonialism (Harris, 1993, 2002). As

Gillies (2017) stated, "the common experience of White supremacy thus weaves together the struggles of all racially oppressed peoples regardless of differing historical experiences, rights, and connections to land." (p. 36).

Brayboy (2005) used tribal critical race theory (which has its roots in CRT, anthropology, political and legal studies, American Indian literatures, and education) to theorize the unique racial, legal, and political issues that Indigenous peoples face in the United States. These theories may be appropriate in describing the racialization of Indigenous peoples in Canada, and may contribute to Canadian anti-racist scholarship around Indigenous education. CRT and ARE were significant in my research as I considered the function and implications of Indigenization in mathematics education.

For my work, the key overlap of CRT and narrative inquiry is in the valuing of stories. As I noted above, one tenet of CRT is the importance of racially oppressed peoples' epistemologies. Ladson-Billings (1998) explained that stories or narratives are important among CRT scholars because "they add necessary contextual contours to the seeming "objectivity" of positivist perspectives." (p. 11). In regards to the legal orientation of CRT, there is a tradition of storytelling through stories of litigation (Lawrence, 1995). In CRT, voices of lived experience are shared in parables, chronicles, stories, counterstories, poetry, fiction, and revisionist histories to provide context for understanding and interpreting narratives (Ladson-Billings, 1998). In a narrative inquiry, these representations of lived experiences are research texts, negotiated between narrative inquirers and their research participants (Connelly, 2013).

4.3.2 Stories in Narrative Inquiry and Critical Race Theory
In a narrative inquiry, stories and methodology are intertwined in a specific way. Clandinin and Caine (2013) explained that narrative inquiry is both a way to describe experience and a

methodology for inquiring into experience, where story is a portal to describing experience. As I cited earlier, narrative inquiry is a way to study experience as researchers and participants meet in the middle of ongoing lives, making space for the ways participants are in the midst of living out their personal and professional stories. Each story allows for new stories to be lived and shared, and there is never a final story to be told, as we are always in the process of becoming (Clandinin, 2013). Researching in the middle of ongoing lives means that inquirers have a commitment to seeing lives in motion and representing lives as always in the making (Clandinin, 2013). That is to say, we are always in the process of becoming as we live our storied lives, and thus, attention to stories in a narrative inquiry does not end in larger social issues since there is no conclusiveness of stories, as lives are always in-the-making and an inquiry must return from any macrosocial analysis.

Narrative inquiry is not apolitical, but the methodology does not necessitate the use of stories as an analysis of social issues. In CRT, stories serve to challenge and make sense of larger social issues. Stories have a theoretical and practical orientation to describe racialization experiences involving legal rights in the context of citizenship (e.g. property rights) and education (e.g. curriculum, instruction, assessment, school funding, and desegregation) (Ladson-Billings, 1998). These are the stories chosen to be told when CRT is the selected methodology. The point to hold onto moving forward is that stories serve a role in a methodology, and methodologies serve a role in the stories chosen to be told. While stories are significant in narrative inquiry and CRT, their function have key differences, and there are distinct methodological tenets researchers must attend to in the sharing of stories.

4.4 Locating Anti-Racist Education

CRT was created to understand how legal systems maintained White supremacy and has since evolved from legal scholarship to hypothesize inequities involving race in areas such as education, social work, and healthcare (Crenshaw et al., 1995; Delgado & Stephanic, 2012; Ford & Airhihenbuwa, 2010; Ladson-Billings & Tate, 1995; Parker & Lynn, 2002). CRT also informs ARE (review Section 2.4 for definitions of anti-oppressive and anti-racist education). As a quick reminder, I explained that in schooling contexts, ARE addresses the ways classroom discourses, the curriculum, school policies, and the social dynamics between students and teachers are often complicit in reproducing societal oppression based on the constructed category of race (Kumashiro, 2000, 2001, 2004); i.e. perceived physiological differences, primarily skin colour, are used to justify social, political, economic, and educational inequality.

Anti-racism draws on CRT to conceptualize how racism operates in society. Anti-racist research, according to Brewer (1993), focuses on the lived experiences of minoritized peoples through the simultaneity of their oppressions, and how these oppressions produce and constrain identities. Dei (2005) stated that anti-racism research does not involve the researcher locating in another's lived experience, but rather how experiences of the oppressed shapes the search for knowledge with the goal of affecting political and social change. Focusing on relations of domination and subordination,

> Anti-racism is about power relations. Anti-racism discourse moves away
> from discussions of tolerating diversity to the pointed notion of difference and
> power. It sees race and racism as central to how we claim, occupy, and defend
> spaces. The task of anti-racism is to identify, challenge, and change the

values, structures, and behaviors that perpetuate systems racism and other

forms of societal oppression (p. 3)

Just as with CRT, anti-racism critiques liberal multiculturalism, seeks to disrupt the status quo maintained through Whiteness, and acknowledges the "powerful connection between race identity and knowledge production." (p. 5). Narrative inquiry, however, does not have the political goal of disrupting power dynamics in its presenting of stories of experience. Not to say that narrative inquiry is apolitical (there is no such thing as an apolitical framework), but social issues of power are not necessarily at the fore, while there is a political imperative to challenge such issues in anti-racism scholarship. Anti-racism focuses on the powerful connection between race identity and knowledge production. Narrative inquiry accepts that knowledge production is born from the experiences of a person taken across their life, not just their racialized identity. Narrative inquiry has, as one of its tenets, the expectation that inquirers socially-locate, and explain their coming to know of certain knowledges and interpretive frames used in their research.

Dei (2005) explained that "Anti-racism change requires that research and researchers see local peoples/subjects as theorists of their own everyday lives and practices. Local people live and create theory. They are creators of knowledge not simply subjects of study." (p. 5). This is also consistent with narrative inquiry, which is founded on a Deweyan ontology that participants produce knowledge through their narratives, since education and experience are intertwined. Dei (2005) stated further that the researcher is also a learner and will engage in self-examination throughout the research process. Similarly, Connelly and Clandinin (2009) explained that in a narrative inquiry the researcher positions their narratives alongside their participants' through self-examination.

Anti-racist research also asks the epistemological question of how the researcher determines the validity and legitimacy of knowledge when they have no embodied knowledge of the particular experiences being researched. Dei (2005) stated there is no definite answer to the question: "How can we assign discursive authority and authorial control to experts (including researchers) who have no embodied connection to knowledge or to the particular experiences that produce the knowledge they seek?" (p. 8). Narrative inquirers deal with authorial control through relational negotiations of how to represent the voice of participants, as well as how to negotiate the transition of field notes to interim and final research texts with the imagined audience in mind. For example, narrative inquirers could draw upon word images—a collection of words and phrases (not necessarily a pictorial image) that give a captivating representation of lives—taken directly from field notes (such as interviews) to give a view of experience through the voice of the participants (Clandinin, 2013; Young et al., 2012). Final texts in a narrative inquiry can take the form of written texts (such as manuscripts and dissertations), as well as videos, imagery, and spoken word.

Anti-racist scholars are also attentive to the ways participants want their voice written into text so that participants do not feel their stories are misrepresented (Cruishank, 1992; Dei, 2001, 2005). Care must be taken for disenfranchised groups who are historically silenced by forms of oppression, which might be perpetuated if researchers do not allow participants to have control over representations of their story (Clandinin & Rosiek, 2007).

Narrative inquiry "begins with an ontology of experience. From this conception of reality as relational, temporal, and continuous, it arrives at a conception of how that reality can be known" (Connelly & Clandinin, 2006, p. 44). Individual narratives of experience are privileged and representations of the macrosocial influences on that experience arise from first-person lived

experience. Narrative inquirers may attend to the oppressive effects of macrosocial conditions, but they must first begin in individual lived experience (Clandinin & Rosiek, 2007). Anti-racist research begins in broader social and institutional contexts of racial domination and oppression, then proceeds to participants sharing their individual experiences within these broader contexts (if it is part of the research inquiry to have participants).

The methodological commitments of narrative inquiry, CRT, and ARE stem from different ontological frameworks that have both distinct and overlapping features, and are operationalized in varied ways for varied purposes. However, these frames make space for each other with open borders by providing practical ways to situate and represent experiences, as well as understand and analyze experiences in larger social, cultural, and institutional contexts. In other words, narrative inquirers begin in the expression of experiences, and then draw on other forms of scholarship and analytical frames to make sense of the macrosocial phenomena influencing experiences.

4.5 Inspirations and Tensions in the Inquiry

I examined some of the inspirations and tensions that I attended to while I constructed field notes during interviews with Miss Moore, Miss Scribe, and Miss Mitchel. While I recognized that my research puzzle was guided by concerns of racism in Indigenization and Indigenous mathematics education, I did not start with the policies or practices of Indigenization during my interviews, but rather with my and the teachers' experiences. Attending to all of these elements—the motivation of the research puzzle, the foregrounding of researcher and participants' stories, and how these stories may create changes in policies and practices—acknowledges the personal, practical, and social justification of narrative inquiry, which is central to narrative inquiry methodology (Clandinin, 2013; Clandinin, Orr, & Pushor, 2007; Connelly & Clandinin, 2006;).

My narrative beginnings included stories to live by in which I was viewed by my family, teachers, and classmates as being smart and good at math. I was told by my parents that I could be a doctor or lawyer when I grew up. I wondered about the participants' experiences learning and doing mathematics, and how they were storied in regards to their schooling. In the following field note, I summarized a conversation I had with Miss Mitchel about her schooling experiences.

> Stavros: I was told you are quite a rock star math teacher. Did you like learning mathematics growing up?
>
> Miss Mitchel: A rock star? Ha! Sure, I'll take it! I did like math and science growing up. I took advanced math classes when I had free time to do it. Both of my parents are university-educated. Everyone in my family is—we were raised being told that education is important and we need to graduate with a university degree. My dad wanted me to be a lawyer or a doctor. He told me I could be whatever I wanted to be growing up, but he said I should be an Indigenous doctor because there aren't many. Whatever I wanted to be or do, my parents made it happen. (Transcribed conversation, May 2018)

Miss Mitchel shared how she was storied by her parents as capable. I felt her story resonate with me in the ways we were both told we had many career options and could be whatever we wanted when we grew up. It was the similar ways we constructed our identities around being good at math and science that compelled me to ask about her career aspirations growing up. I retold my shifting aspirations of wanting to become a scientist, educator, and mathematician as I grew up. I reflected being surrounded by people 'like me' (White men) in these roles. Miss Mitchel's story to live by included being told by her father that she should be an Indigenous doctor because there are not many. I invited her to share what she thought about this, and our conversation continued.

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Miss Mitchel: I didn't understand why there weren't a lot of Indigenous doctors. We grew up speaking English and French. I went to a French immersion school and was raised to take my schooling seriously. We just didn't have an option not to, and I had every opportunity given to me, so if I wanted to go down that route of being a doctor I know my parents would help me make it happen. I have been asked things like "How did you graduate?" and "How come you are different from them (Indigenous people)?" I thought the questions were weird because graduating is what was expected of us.

Stavros: What do you think they meant by asking if you are different from other Indigenous people?

Miss Mitchel: I don't remember experiencing racism growing up at my French immersion school. My friends thought it was cool that I was Indigenous. Maybe because I am lighter-skinned? My sister is darker-skinned and she said she experienced some racist comments, so maybe that's why?

(Transcribed conversation, May 2018)

As Miss Mitchel reflected on her experiences, she shared ways she negotiated her identity through understandings of being Indigenous but looking almost White, and how this played into her schooling experiences. She was raised being told that a university education was important, and that she could be any professional she wanted. Her parents emphasized the importance of receiving a university education in fields like medicine and law. She also explained that by excelling in school and being lighter-skinned, she was questioned about her success as an Indigenous person. By being asked by peers how she was able to graduate and what made her

different from 'them' (other Indigenous people), her racial identity was being held against larger social, cultural, and institutional narratives of Indigenous peoples underachieving in school subjects.

As our conversation continued, she told stories of experiencing more racism from her Indigenous peers. She explained that she has been accused of being 'too assimilated' and 'acting too White'. She struggled to understand what her Indigenous peers expected of her, and wondered if having a Cree accent and wearing beads and feathers would make her more Indigenous to them. She shared stories of her cousins making fun of her for having lighter skin. At family functions, she remembered hearing some relatives refer to her as a 'White woman' in Cree. She also recalled an experience as a youth participating in the North American Indigenous Games, and being called 'White Girl' by some of her Indigenous peers, with one boy saying he could not talk to her anymore because she was too White.

Similar threads of the importance of mathematics education and creating opportunities to do math and science emerged in conversations I had with another participant, Miss Scribe. She described how her father wanted to take math class beyond eighth grade but was not allowed. She explained that even though her father was good at math, only the White students could take math after a certain grade and so her father would do some of his classmates' homework just so that he could experience studying a subject he enjoyed. Growing up, her father always impressed upon her the necessity of taking all the possible opportunities to learn and excel in school subjects like math. Miss Scribe said her father emphasized how it is a privilege to get the opportunity to study subjects like math. Her parents told her she was good at math and had potential to go far in the subject as long as she took every chance to take it.

I considered the stories of Miss Mitchel and Miss Scribe's experiences within larger institutional narratives in which non-White identities and women have historically been restricted from studying subjects like mathematics. I made these considerations through my interpretive lens of anti-racist education. Reflecting on my own experiences, I understood that I had every opportunity to study mathematics. I never thought about being excluded from the subject for any reason, which is one of my privileges as a White middle-class male. Weaving together the experiences of Miss Mitchel and Miss Scribe, while they were storied as capable of learning school subjects, both learned from their parents that it is an opportunity that is not always present for Indigenous peoples. Reflecting on these conversations with my participants made me wonder more about the racialization of Indigenizing school mathematics. In particular, I grew up understanding it to be a neutral subject and wondered if they did too. Do Miss Mitchel and Miss Scribe see the subject as being for White people? Based on our interview conversations, I composed the following word image of seemingly contradictory words and phrases to reflect the complexities surrounding Indigenization and the racialization of school mathematics.

Indigenization is for everyone…

It's nice to see representation in the curriculum…

Indigenization is vague and inconsistent…

We need to know our language and culture…

I want my students to be successful in math and enjoy it without thinking they need to represent Indigenous people…

Math and Indigenization do not mix…

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Counting tipis and beading…

Be proud of your cultural identity…

Seeing mathematics in our culture and other cultures is important…

Indigenization is needed in all school subjects to show more than one way of knowing…

There is no Cree mathematics because we do not separate our knowledge into subject

areas…

Promoting language is key…

Math was developed by more cultures than just ancient Greeks…

Reserve students don't receive the same math education…

My father was not allowed to learn math.

(Word image based on transcribed interview conversations, June 2018)

The word image highlighted the complexities surrounding how we saw Indigenization in classroom teaching. It reflected how both teachers saw the importance of Indigenization for all learners—not just Indigenous students. The word image summarized Miss Mitchel's concern that Indigenization is vague in the curriculum. She described this in the context of the sixth-grade mathematics curriculum that contained outcomes of First Nations, Inuit, and Métis perspectives, but lacked indicators of how those outcomes could be accomplished or measured for understanding. The lack of consistency in how educators took up Indigenization troubled her. Miss Scribe argued that Indigenization can be problematic due to the ways it can be a search to unearth some kind of ancient and mystical cultural content for the purpose of meeting curricular outcomes. I attended to the sociality commonplace of our *inward* concerns by directing them

outward in our research conversations. Our *backward* and *forward* reflections on the use and efficacy of Indigenization reflected the temporal commonplace of my inquiry.

The word image reflected the teachers' pride in cultural identity. Miss Mitchel saw success in mathematics as something that can be enjoyed by her students without feeling obligated to represent their cultures. This was tied to her narrative that she did not feel she needed to represent Indigenous peoples by being a doctor or lawyer.

Even though Miss Scribe shared concerns regarding Indigenization, she also saw it as a way to make space for promoting and centering Indigenous languages in education, which I included in the word image. She also saw value in the stories to live by in which Indigenous peoples excel in Eurocentric curriculum to dispel myths of cultural deficits. The word image also included tensions in regards to mixing school mathematics and Indigenization, as the teachers shared stereotypical examples and the misconceptions by many practitioners who take up this work.

I used an anti-racism framework to interpret and make connections of these experiences within larger educational issues surrounding Indigenous teachers' experiences. I drew upon the work of anti-racist scholar Verna St. Denis (2007) who described the conflicts that cultural revitalization in curricula has on Indigenous peoples who are trying to reclaim and negotiate their identities following the cultural and physical genocide and violence of residential schools. St. Denis (2004, 2007, 2011) explained that cultural revitalization and cultural authenticity can reinforce feelings of cultural deficits within Indigenous peoples who are unable to be authorities on their cultures and languages due to Canada's historic and ongoing colonialism and racism. She argued that engaging in critical race analysis would provide a deeper understanding in the

processes of racialization that continue to affect Indigenous peoples. Knowing her work helped me make sense of the complexities around Indigenization.

Miss Scribe explained that being called upon to share Indigenous mathematics through her Cree perspective is a meaningless question in the first place because Cree people do not split and categorize their knowledge and worldviews into subject areas. Counting, sharing, locating and moving, patterns, and measurements are examples of practical and embodied processes resulting from their lived experiences. By virtue of Indigenous worldviews of interconnectedness, these processes and activities are not thought of as a distinct category of knowledge within Indigenous epistemologies and ontologies, and cannot be separated from context and human experience (Michell, Vizina, Augustus, & Sawyer, 2008).

The attempts of Euro-Western worldviews to compartmentalize Indigenous knowledges and create dichotomous comparisons are rooted in a Eurocentric practice of dividing knowledge into subject areas (Aikenhead, 2006). The very act of quantifying and describing Indigenous mathematical knowledge is a colonial practice in which Euro-Western worldviews are used to solve an ill-posed problem formulated by Euro-Western worldviews—a problem created by Whites to be solved by Whites. Since the question of how to describe Indigenous mathematics education is ill-posed, many of the solutions imagined and brought forth are erroneous and problematic. Returning to my research wonders surrounding the interplay between Indigenization and school mathematics, Miss Scribe and Miss Mitchel's narratives of experience provided contexts for discussing, problematizing, and understanding this interplay through their unique positions as Cree elementary school teachers alongside my experiences and unique position as a White, Euro-Western mathematician.

4.5.1 Tensions in Notions of Success

Miss Scribe and Miss Mitchel shared narratives of identity-making in school mathematics. Miss Moore saw Indigenizing school mathematics as being an indication of having cultural pride and promoting her Cree language, while Miss Mitchel felt that cultural pride is important but Indigenization singles Indigenous peoples out with an expectation that they be representatives of their cultures. The topic of Indigenous peoples representing success in school subjects was also apparent in conversations with Miss Moore, my third Cree elementary teacher participant. Below is a field note in which Miss Moore expressed her contention with Indigenization and notions of success as being based on a colonial standpoint.

> My take is that some White people only want the success stories that come with Indigenization. The success they want is just for us to quietly assimilate and do well in their subjects. As soon as we make noise and talk about colonialism, racism, genocide, cultural appropriation, land rights, the conditions of our reserves, and our assimilation then the story is no longer about success but about us being whining Indians. We are told to get over our trauma. They want success stories about a young Indigenous person with trauma who gets in touch with her culture and then succeeds in school subjects like math and gets a great job and all that. This success is from a colonial standpoint. Colonial success in education, jobs, politics, everything... I have a big problem with success being defined on colonial terms.
> (Transcribed conversation, June 2018).

Miss Moore shared her understanding of success in Indigenization being defined on colonial terms, which to her meant assimilation and Whites ignoring their part in the presumed 'failure'. I

asked her to talk about school mathematics as being assimilative. She explained this but also described how she imagined Indigenization might be used to counter assimilation (rather than reinforce it). She explained school mathematics is full of written tests that only certain types of learners are successful at doing. She argued the abstractness of mathematics makes it difficult for students requiring practicality to grasp. She also bluntly explained that if her students come to school hungry, then the last thing on their minds is doing long-division. She said that is a systemic issue—not just specific in her classroom or school.

On the one hand, she believed that Indigenization has its place in her classroom because she is bilingual and wants to teach her Cree language and traditions. On the other hand, she argued that Indigenization is assimilative when its focus is finding ways to graduate Indigenous students and push them into Eurocentric university schooling so that they can be named successful by the Eurocentric school system. Her *inward* tensions shaped how she taught in the *outward* environment of her classroom.

I used CRT and ARE to understand the larger social, cultural, and institutional narratives that she described. The intention of Indigenization in the mathematics curriculum, and the ways it is taken up by practitioners is open for critique by these and other intersecting forms of scholarship, such as decolonization. I used these lenses to problematize Indigenization by addressing discourses of deficit-theorizing, racialization, and ideologies of paternalism, cultural dissonance, and notions of success. After attending to this investigation, I shifted the focus from the macrosocial back to experience, since narrative inquirers must begin and end in experience.

I asked Miss Moore how she saw herself modeling Indigenization in her classroom as a way of being, rather than a focus on content. We reflected on the ways we co-taught her students.

I am a Cree woman and I will speak Cree to my students because I was raised

speaking Cree as my first language. I share what I know and you share what

you know, and we work together to make sure the students feel valued and

respected. I don't want to speak for all *nēhiyaw* people when asked about

Indigenization, because I am only one voice. If someone wants to describe how

we teach as an example of Indigenization, great, but I want the success of my

teaching to be on my terms, not based on the White school system being happy

the students are doing well on their math tests. (Transcribed conversation, May

2018)

There is space for intersecting forms of scholarship to frame and problematize larger

narratives. Conceptualizing power relations, systems of domination, and racialization

in education was pivotal in my work and research. I demonstrated my application of

CRT and ARE in interpreting the larger social, institutional, and cultural narratives in

which experiences are shaped and enacted. I ended, as narrative inquirers do, by

returning to my experiences and the experiences of my participants.

4.6 Suggested Design Elements

I conclude this chapter by offering design elements for narrative inquirers considering CRT and

ARE, as intersecting these forms of scholarship require particular kinds of wakefulness (Caine et

al., 2017; Clandinin, Orr, & Pushor, 2007). Narrative inquiry is a methodology that appeals to

critical race theorists as they see the possibilities of analyzing power dynamics in the stories of

their participants through considerations of the larger societal issue of racism. While attention to

such issues is important and necessary, narrative inquirers must adhere to certain methodological

commitments. To this end, I propose four design elements to consider when crafting a narrative inquiry that includes forms of scholarship such as CRT and ARE.

The first design element is the *positioning of experience*. Narrative inquiry is the study of human experience and the storied lives we lead. As inquirers consider the personal, practical, and social justifications of their research, we begin by inquiring into our narrative beginnings in order to situate ourselves in the research. The practical justification addresses how the research will provide insights into how the inquirer and other scholars think about their research. The social justification considers the larger societal issues that the research might address. The social justification of narrative inquiry makes space for CRT and ARE. These do not supersede the experience, but rather shapes an understanding of the context in which the experience occurs. I demonstrated this by starting in the experiences of Miss Moore, Miss Scribe, and Miss Mitchel as Cree elementary school teachers, as well as my own experiences of coming-to-be a mathematician and educator.

The second design element is *negotiating theoretical frameworks with participants*. A tenet of narrative inquiry is the commitment we have to negotiate how our participants' stories are presented. As researchers and participants move from field texts to interim and final research texts, the participants and researchers decide the role of theory in their lives. Furthermore, while the theory informs our understanding of experience, it cannot eclipse the experience. If researchers apply other forms of inquiry to the stories lived and told by participants, they may be ignoring the relational ethics central to narrative inquiry. Relational ethics involves foregrounding the inquirer-participant relationships and representing the stories in ways that show the lived experience of the participant (Connelly & Clandinin, 2006). Imposing other forms of inquiry may move the focus from individual experience to macrosocial phenomena, resulting

in the participant experience being told in ways they do not want. By negotiating how the field texts are shaped into final texts, my participants confirmed their agreement of the representation of their stories told. For example, my participants and I discussed the analytical frames that shaped the inquiry. In particular, I explained that I interpreted educational practices (including Indigenization) using ARE and CRT, since this helped me make sense of the ways mathematics education perpetuates racism and colonialism. Miss Moore, Miss Scribe, and Miss Mitchel were made aware of this, and provided their own frames of analyzing educational practices, which may or may not have used ARE or CRT. My participants were aware that this research also serves to help my personal endeavors of obtaining a doctoral degree, writing my dissertation, and publishing manuscripts—all of which they supported.

The third design element considers how *theory (such as CRT and ARE) can expand an understanding of experience across the narrative commonplaces of time, social context, and place*. Narrative inquirers, like all researchers, position their work alongside different methodologies and ontologies. Often, there are many research frameworks that are applied to a particular phenomenon, and so it is important for narrative inquirers to take a step back and consider how their research is positioned amongst other forms of inquiry. For example, my research alongside Indigenous teachers and students in educational contexts was an area studied by others who applied analytical frameworks such as anti-oppression and anti-racism, decolonization, and phenomenology, as well as Indigenous research methodologies. By socially-locating through my narrative beginnings, I laid out how interpretive frames such as CRT and ARE were used in my research. Tracing where and when I learned these interpretive frames and applied them throughout my work demonstrated the spatial and temporal commonplaces. My participants acknowledged that these frames were practical ways I made sense of my work and

practice, which was part of demonstrating the sociality commonplace of the research. They located these frames within their own educational contexts, and negotiated times they wanted their stories to be told without a follow-up analysis of these theories. That is to say, while the interpretive frames of researchers and participants were always present and shaped the inquiry, an analysis of the stories using ARE and CRT discourses were not always applied to the stories.

Finally, the fourth design element is to *end in experience*. Indeed, after considering the macrosocial, linguistic, familial, and cultural grand narratives in which individual experiences are steeped, shaped, expressed, and enacted through analytical frames such as critical race theory, the inquirer comes full circle to individual experience. This is not just the experience of the research participants, but also the experience of the researchers who must ground themselves in a way that explains the analytical frames they bring to the inquiry. Since researchers are also steeped in macrosocial conditions that shape how the world is viewed, it is necessary that the researcher makes their particular frames explicit. It is these frames that help participants and researchers make sense of how experiences are enacted.

By attending to possible design elements, I believe that narrative inquiry and theoretical orientations, like CRT and ARE, can and do exist side-by-side. For the narrative inquirer, experience and our understanding of a life will always be the primary concern. Ignoring theoretical constructs is impossible, and so considering the ways I positioned my work in relation to other work was a necessary and standard academic practice. Since I brought various frameworks to my research, these frameworks and the tensions they might carry were addressed. Clandinin, Orr, and Pushor (2007) stated that "The answer to which literatures we position our work in relation to is given by noting what conversations we most want to join within the larger

conversations" (p. 30). Researchers are alert to stories of a life due to our interpretative lens, but

the careful attention to a life requires attention to life always in the making.

CHAPTER 5: IDENTITY-MAKING THROUGH *CREE MATHEMATIZING*

In this chapter, I take up an experience in Miss Moore and Miss Scribe's classroom in which their Cree language provided insight into how they negotiated their Cree identities while teaching school mathematics. I used the term *Cree mathematizing* to describe the ways Miss Moore translated mathematical terms between English and Cree, which she shared through personal stories situated in time, place, and relationships (thus demonstrating the narrative commonplaces of *temporality*, *place*, and *sociality*). Cree mathematizing school mathematics was the process of engaging in school mathematics in a way that foregrounded the unique experiences of Miss Moore, Miss Scribe, and their students, which provided a partial representation of identity. It also provided me insights into Indigenization through a contextual practice. These experiences, when woven together, became the third thread: my conceptualizing of Cree mathematizing as a partial representation of identity-making and Indigenization.

I attended to the personal-social dimension of this inquiry by connecting experiences *inward* to my hopes (Cladinin & Connelly, 2000) that Cree mathematizing might provide a promising practice in regards to the shaping of Indigenization. This hope was directed *outward* in the classroom environment as I was prompted to learn Cree words for mathematical terms in school. I attended to the *backward* and *forward* dimensions of *temporality* as I reflected on how my conceptualization of Indigenization has shifted and changed.

5.1 Introduction

This chapter was modified to be a manuscript that was submitted to the Canadian Journal of Education and has been accepted for publication. The manuscript was co-authored by my doctoral supervisor, Dr. M. Shaun Murphy, and so it was written using first person plural

pronouns with reference to me using my first name when discussing the field work interviews with my research participants. For this dissertation, I use my singular voice for continuity.

In this chapter I centred identity-making in the learning of Euro-Western school mathematics as an important facet of Indigenous mathematics education. How do Indigenous, particularly Cree, educators and students see themselves as producing school mathematics through their unique experiences and stories? Miss Moore, Miss Scribe, and Miss Mitchel negotiated their Cree identities as they taught school mathematics to their predominantly Cree students. These experiences were shaped by the added complexity of Indigenizing school mathematics. My hope was to elucidate the complexities surrounding how Cree educators and students include their perspectives in school mathematics through a promising practice called *Cree mathematizing*. In this chapter I describe an experience in which *Cree mathematizing* unfolded in the context of Miss Moore's classroom, and how this process not only exemplified narrative conceptions of identity-making, but also provided a subversive teaching practice that challenged the way mathematics is taught as a culture-free, apolitical, and decontextualized endeavour.

5.2 Indigenization and Cree Mathematizing in Euro-Western School Mathematics

It is through our experiences that we make sense of *Indigenization* in the context of our practices and educational landscapes. There is no conceptual consensus about what *Indigenization* looks like in Euro-Western school curriculum, but some Indigenous scholars have explained that it involves exploring pedagogies that have been repressed, acknowledging treaty and traditional land rights, and foregrounding Indigenous languages and knowledge systems as key in supporting Indigenous epistemologies and ontologies (Battiste, 2013; Deer, 2013; Korteweg & Russell, 2012; Kovach, 2010; Wildcat, 2001).

Nēhiyawak (Plains Cree) culture is the classroom context in which Euro-Western school mathematics is being taught, through the perspectives and experiences of Cree educators and their students. This context allowed me to describe the ways school mathematics is situated in experiences, understood socially, across time, and in place by the participants.

I adopted the term *mathematize* in the context of *school mathematics* to describe the processes by which students and teachers create mathematical meaning out of their daily lives, and this term takes into consideration social and historical contexts that are influenced by the culture, age, class, social groups, political motivation, and language of the people mathematizing (Beckmann, 2008; Wheeler, 1982). For example, Wager and Parks (2016) suggested mathematization to be a process of attaching mathematical language to experience by reflecting upon how mathematizing recreational play is another way to understand how students make mathematical meaning of numbers. Restrepo (2013) used the term mathematization in chemistry to describe an iterative process of acting upon chemical knowledge in a mathematical way to produce new chemical statements. Thus, mathematizing is a general framework for viewing the world through a mathematical perspective. This framework is dependent upon the unique perspectives of *who* is doing the mathematizing. *Cree mathematizing* Euro-Western school mathematics described the ways the Cree teachers and students were engaging in Euro-Western school mathematics through their specific positioning as Cree people in the prairies. Consequently, Cree mathematizing is not a consistent and generalizable activity—the process will unfold differently depending on who is doing the Cree mathematizing. I illustrate Cree mathematizing through specific social, temporal, and spatial contexts. Indeed, the ways Miss Moore and her students Cree mathematized Euro-Western school mathematics showed their

unique signature, and consequently influenced the shaping and production of Indigenization in her classroom.

Before illustrating this experience, I locate my narrative inquiry research with Indigenous research in the next section. I believe this is important to discuss, since I am a White, non-Indigenous scholar researching alongside Indigenous participants. As with any research methodology, it is important that the researcher can justify why their chosen methodology is the appropriate one, and the implications of that methodology in researching alongside specific peoples and within certain context.

5.3 Narrative Inquiry in Indigenous Research

Narrative inquiry is a Western methodology, so it is expected that one might wonder why an Indigenous research methodology was not used, given that I was researching alongside Indigenous teachers and students. In attending to this matter, I located narrative inquiry in Indigenous research. To this end, it is important to first distinguish Indigenous research from an Indigenous research methodology.

Kovach (2018) explained that *Indigenous research* is a broad term in which Indigenous matters are studied and does not necessarily include directly researching with Indigenous peoples, nor does it require using Indigenous methodologies given by Indigenous researchers. She explained that Indigenous research can be found in many disciplinary contexts, such as "education, social work, law, sociology, health, and environmental studies" (p. 215), and includes "community-based, ethnographic, grounded theory, phenomenology, narrative inquiry, decolonizing, and Indigenous methodologies" (p. 215). That is to say, Indigenous research is interdisciplinary and is open to study by *Indigenous methodologies* (which are founded on Indigenous knowledge systems), as well as Western methodologies (such as narrative inquiry).

5.4 Situating the Inquiry

The research I describe in this chapter was conducted in Miss Moore's sixth-grade math classroom. Since Miss Moore was a Cree speaker (who teaches Cree to her students), the focus we established for the school year was to incorporate the Cree language in the mathematics classroom. I highlighted language by beginning some of the lessons with asking the teachers questions such as "How do we say _____ in Cree?" or "How do we represent _____ in Cree?" The intent was to see how Euro-Western school mathematics is understood, developed, conveyed, and made significant through the linguistic and cultural perspectives of these Cree teachers and students. The identity-making focus came from the teachers and students implicitly constructing themselves through Cree mathematizing while doing Euro-Western school mathematics.

I was inspired to use a language-focused approach by Lunney Borden (2013), who asked "Is there a word for…?" (p. 5) to consider how mathematical concepts in the school curriculum can be understood through Mi'kmaq grammar, as represented by the Mi'kmaw students, teachers, and Elders in a specific Eastern Canadian maritime context.

Lunney Borden (2011, 2013) used a process called verbification (converting nouns to verbs) to translate mathematical nouns (in English) to verbs (in Mi'kmaw). Verbs were spoken in English but were consistent with grammar structures of Mi'kmaw so that static Euro-Western mathematical terms could be represented in ways that show motion. It is a limitation of the noun-based English language to adequately and accurately describe verb-based Indigenous languages, such as Mi'kmaw (Battiste, 2013), but I hope the following examples by Lunney Borden (2011) provide clarity. In Mi'kmaw, the word *pekaq* means *goes straight*, and *pektaqtek* describes anything that would *go straight*, such as a road. These nouns are characterized as being in a linear motion, rather than as static objects. As another example, the word *kiniskwikiaq* means

moves into a point, which can be used to describe objects that are pointed, such as a pyramid. Lunney Borden also explained that tensions emerged for some community Elders in Mi'kmaw schools when the word *nesikk* was developed as the translation for the word *triangle* because the word did not convey the motion that is consistent with Mi'kmaw grammar.

Pimm and Wagner (2003) argued that verbification disrupts the standard practice of nominalization (converting verbs to nouns) which seems to be privileged in Euro-Western mathematical discourses. Turning mathematical processes into static nouns (Schleppegrell, 2007) creates tension for many learners who would be more naturally engaged through words that elicit action and movement. Furthermore, Battiste (2013) argued that the very nature of the verb-based, process-orientation of Indigenous languages offers an understanding of Indigenous worldviews and consciousness that cannot be adequately described in English.

5.4.1 Centring Cree Language

In my work of Cree mathematizing with my Cree teacher participants, I was taught translations that also animated static English mathematical terms. For example, *kakwayaskwak kikway* translates to *something that goes straight*. You may wonder about the presence of the word *something*, which contradictorily indicates a noun, but this word is used to bridge the translation into a sentence that is consistent with English grammar. That is, *kakwayaskwak kikway* refers to the embodying of linear motion that indicates straightness. The phrase *kawawîyak kikway* is the embodying of roundness. The translation is *something round*—again, the word *something* is a bridging term that provides a noun for English grammar. Another example is *ka napakak*, which means *it goes flat* (*it* is a bridging noun). The word *ka* is short for *kēkā*, and is the word that means *goes to*, which explains that a change is occurring. For example, change is evident when counting: *mitātaht* means *ten* and *kēkāmitātaht* means *goes to ten* (i.e., nine).

It was not easy for me to understand how these terms are verb-based and would elicit motion, because I was limited to how these words translate into the noun-based English language. This was something I hoped to learn more about as I continued this relational research. The dissonance (an *inward* narrative dimension) I experienced occurred because the interpretations required translations between Cree verbs and English nouns. Recalling stories of being taught to count in Cree by Nigel demonstrated the forward and backward dimension of temporality in a narrative inquiry.

The language-based activities and lessons that were composed in Miss Moore's classroom exemplified representing school mathematics through a local Cree language and culture, in the physical location of her classroom. Our research also disrupted the pan-Indigenous/Aboriginal identity that is over-emphasized in how Indigenization work often gets taken up. One of the misconceptions of Indigenizing the curriculum is that there is a singular Indigenous identity and knowledge, and so practitioners must be mindful of the multiplicity of Indigenous knowledges that are not uniform across Indigenous cultures (Battiste & Henderson, 2009; Kovach, 2010). It does not make sense to think of the diversity across Canada in a singular way. Since the national consideration of Indigenous mathematics education is often thought of in a generalized and singular way, contextual experiences are reduced or not present at all. Cree mathematizing was attentive to the experiences of people in the way I saw narrative inquiry being attentive to the individual and their experiences socially, across time, and in place.

Centring Cree language learning has a larger social imperative to support, protect, revitalize, and share the gift of Cree, as Indigenous languages and cultures are in a precarious position due to Canada's historical and ongoing colonialism (Battiste, 2013). The Truth and Reconciliation Commission (2015) published 94 Calls to Action imploring all levels of

government to work at rectifying the harm caused by the legacy of residential schools and other colonial policies that marginalized Indigenous peoples by separating them from their languages and cultural identities. Recently, the Government of Canada has proposed a bill called Bill C-91 Indigenous Languages Act, which is intended to create long-term sustainable funding of Indigenous languages, establish an Office of the Commissioner of Indigenous Languages, and promote collaboration between federal, provincial, and Indigenous governments to deliver supports for Indigenous languages (Brake, 2019).

5.5 Cree Mathematizing without Euro-Western School Mathematics

As I explained earlier, Cree mathematizing depends on *who* is doing the mathematizing. In the context of my work, Cree mathematizing of Euro-Western school mathematics was a process in which Cree students and teachers began with school mathematics and then looked at creating the meaning of the content through their unique linguistic and cultural perspectives. School mathematics was the starting point, and Cree mathematizing was a way to conceptualize the static nouns of the subject by considering translations in the verb-based Cree language, and vice versa. In this way, Euro-Western school mathematics content was at the forefront, and the Cree mathematizing taking place was a way to understand and represent the content through perspectives that reflected the linguistic experiences of Miss Moore and her students.

This representation of Cree mathematizing had many complexities that I want to acknowledge further. To start, it was colonially-driven through the pursuit of learning Euro-Western school mathematics. Furthermore, without the relational aspect being established first there would have been a risk of Miss Moore feeling upset if she could not share her language— an issue St. Denis (2004) explained occurs in some educational spaces in which Indigenous languages and cultures are called upon. There was also the often overlooked issue by me that translations between English and Cree may not exist when considering Euro-Western

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mathematical terms. Care had to be taken by me to establish this type of work in relational ways in order to identify, discuss, and navigate the complexities surrounding how Cree mathematizing was used. The relational facet of narrative inquiry enabled productive and meaningful conversations during our time in the classroom.

5.5.1 *"How do you describe directions in Cree?"*

I wondered how we position Cree mathematizing strictly in our experiences so that the process unfolds independent of prompting by Euro-Western school mathematics. In other words, how would Cree mathematizing look if we removed the motivations by Euro-Western school mathematics from the equation? I illustrate one way of moving in this direction in the following field note collected and recounted after one of my classroom visits.

> Miss Moore's classroom is located upstairs and there are two stairwells on opposite sides of the school that can be used to get there. I normally take the north stairwell but today I was running behind so I decided to take the south stairwell in hopes that it might be faster. I got briefly mixed-up as I was trying to find the classroom. When I arrived, the class was ready to go and the students jokingly said "You're late Mr. Stavrou!" and Miss Moore said something in Cree that she said translated to "Did you get lost?" I explained that I did, and then I asked "How do you describe directions in Cree? Left, right, up, down?" Miss Moore walked to the whiteboard and began writing the translations *nīkan* (up), *nāwey* (down), *sahkastinohk* (east), and *pahksimonohk* (west).

> "We don't say left or right because there is no word for it," she explained. As I repeated after her, the students who already knew the words giggled at my pronunciation—something I am very used to! I pulled up a picture of a map

with gridlines off Google and asked, "How would I describe moving from this spot to this spot?"

Miss Moore looked at my starting and ending points and said, "So you are moving two spots up? *Itohti niso nīkan*—move two up."

I recognized that the word *niso* means *two* from when Nigel taught me to count so it was clear the word *itohti* means *move*. I responded, "Cool! How would we indicate moving three down and one west?"

Miss Moore watched my hand move down three gridlines then left by one gridline. "Why would I travel like that? I would just go straight from here to here. *Kaskam*—straight across. It's faster."

I laughed at her logical answer. "Fine, let's pretend there is a river we cannot swim across so we must travel this way. How would we say it?"

We both looked at the class as they started offering answers. Very quickly we concluded that "*Itohti nisto nāwey ekwa peyak pahkimonohk*" is how we move three down and one west. (Field note, March 2017)

Reflecting on the experience in this field note, I saw new ways to imagine Cree mathematizing by beginning without problems situated in Euro-Western school mathematics. In this case, Miss Moore and her students made meaning of spatial movements and drew on their linguistic experiences to convey that meaning. It was my *inward* curiosities of learning the Cree language that, when directed *outward* to the classroom, shaped our teaching. Attending to these dimensions is how I attend to the *sociality* commonplace of my narrative inquiry. My *backward*

reflections of experiences and how these have potential to shape experiences moving *forward* is how I attended to the *temporal* commonplace.

5.6 Identity-Making through *Cree Mathematizing*

Prior to beginning my research work, Miss Moore and Miss Scribe provided me with an understanding of the value in peoples' linguistic and cultural experiences being represented throughout their mathematical learning. This motivated more lessons in which students continued to describe Euro-Western school mathematics in Cree, and became an integral piece to my research work. While I have interpreted this teaching practice as a form of Cree mathematizing, I want to emphasize that school mathematics is situated within particular contexts. In the field notes above, we can imagine alternative scenarios for such contexts— situating experiences through *Cree mathematizing*—by illustrating how *Cree mathematizing* is a process that can occur independently of Euro-Western school mathematics. This reaffirms the importance of letting school subjects like mathematics emerge from community context by beginning with community context (Lunney Borden & Wiseman, 2016).

Mathematics is paradoxically produced as a culturally-neutral and apolitical subject that is devoid of human context, and so I saw Cree mathematizing as a subversive practice because it foregrounded experience, rather than side-lining it. I saw experience contextualizing mathematics through the ways Miss Moore shared her coming-to-know of specific Cree phrases (from her family, community, Elders, friends, books, the Internet, and so on) and how these phrases described mathematical experiences that were meaningful to her. The identity-making from Cree mathematizing came from a linguistic description of a phenomena from her perspective, as the person who was doing the mathematizing. Rather than the conventional practice of imposing decontextualized mathematical rules, formulas, and processes on students,

Cree mathematizing offered an approach in which Miss Moore, Miss Scribe, and their students'

specific linguistic and cultural experiences supported their mathematics education.

5.6.1 Tensions When Identity is not Evident

Miss Moore described feeling conflicted when it came to using class time to emphasize her

language in mathematics. During one of my classroom visits, Miss Moore and I were trying to

decide what to teach before class began. Below is a field note recounting our discussion:

> *Stavros*: What would you like to cover today?
>
> *Miss Moore*: We can cover converting between mixed fractions and
>
> improper fractions. The students need this for the CMA (Common Math
>
> Assessment). Whatever lesson you have in mind that would help with this
>
> would be great.
>
> *Stavros*: Yes, I have an interactive game we could play online. Can we
>
> look at Cree translations, too?
>
> *Miss Moore*: Maybe. We are behind and I still need to show them a few
>
> more things to get them ready for this damn assessment. Everything is
>
> rushed and there is no time for the students to understand the material
>
> before I have to move on. (Field note, March 2017)

This field note speaks to the tensions educators face when they negotiate class time to do

activities that are not being formally evaluated through local, provincial, or federal assessments.

While there are government directives of Indigenization, the current curriculum is rigid in the

content that must be covered and assessed. Indigenization does not make its way into mandatory

government assessments, making it difficult for teachers like Miss Moore to spend even a limited

amount of time exploring Cree ways of knowing. This results in the curriculum overriding

identity-making possibilities for students and teachers, and de-emphasizes the ethical responsibility to teach to the life of a child.

5.6.2 The Role of Experience

In a context of Cree mathematizing, where math is animated through the act of verbification, experience was necessary in understanding mathematical terms. I saw in my work with Miss Moore that Cree mathematizing was an embodied act, and therefore in order to take static mathematical terms and situate them in action entailed a body's sense of movement. The act of naming *kakwayaskwak kikway* (something that goes straight) entailed that we have to have a sense of how to go in a straight line, and *mitātaht* (ten) and *kēkāmitātaht* (goes to ten, i.e., nine), suggested that we have *experience* with such actions. Such a shift in school mathematics teaching suggested to me that mathematics arises from the body and must return to an embodied experience in order for it to make sense.

The act of understanding mathematics as an embodied subject matter interrupted the idea of mathematics as an abstract language communicated in static classrooms, and encouraged me to consider the actions of mathematics. I began to understand the body as a mathematical manipulative, in the ways that the body needs to understand *going straight* in order for the body to be able to move an object in a straight line and eventually move a writing implement in a straight line to create a straight line.

I had a similar realization for the act of counting, which was certainly about understanding that a starting point number *goes to* a larger or smaller number. Understanding the idea of *goes to* was foundational to adding or subtracting, and especially in relation to counting as I taught the meaning of 'moving to' larger or smaller numbers and amounts. In work with young children, good mathematics teaching involves the doing of mathematics (Fosnot & Dolk,

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2001; Van de Walle & Folk, 2005; Wheatley, 1990). By introducing verbification and

mathematizing, the doing becomes clearly reflected through both language and action.

5.6.3 *Cree Mathematizing* in Euro-Western Mathematics Curriculum Guides

Curriculum guides are one aspect of curriculum making in a classroom between teacher and

children. Curriculum making is a term developed by Clandinin and Connelly (1992) to describe

how "an account of teachers' and students' lives over time is the curriculum, although

intentionality, objectives and curriculum do play a part in it" (p. 365). This understanding of

curriculum considers how teachers and students live out the curriculum, as opposed to a typical

understanding of where it is delivered and received.

In earlier work, Connelly and Clandinin (1988) described curriculum as a course of life.

This is a more complex understanding of curriculum beyond typical references to subject matter

guides. In this conceptualization, the idea of identity-making becomes central to the act of being

in curriculum-making contexts. This was evident in my own experience of coming to know a

different way of mathematics education through language learning.

5.7 Concluding Remarks

I described Cree mathematizing as a process in which the Cree teachers and students with whom

I worked created and made meaning out of school mathematics through their diverse linguistic

and cultural experiences. I contrasted ways this process unfolded in situations where students are

centring Euro-Western school mathematics, as well as situations in which Cree mathematizing

worked independently of the presence and prompting of school mathematics. Either way, I

centred identity-making in school mathematics as an important facet of Indigenization in

mathematics education in hopes of providing a more nuanced understanding of how this process

could be imagined.

My findings are rooted in a narrative understanding of experience. It is evident from the previous sections that the role of temporality has played a part in the lives and experiences of the various participants. Their identity as students and teachers has been shaped over time in relationship with particular people like other teachers, myself, and different community and family members. All experience happens in a place, and these places have provided a variety of contexts. As I worked with the field texts, I simultaneously attended to their experiences and mine. In this way, I attended to the four directions of narrative inquiry as I considered my experiences as the researcher. Clandinin and Connelly (2000) stated that researching into an experience means analyzing the *inward*, *outward*, *forward*, and *backward* directions. The *inward* feeling of confusion learning Cree led to the *outward* experience of asking to learn more translations with Miss Moore. Reflecting on past experiences of learning Cree terms is an example of the *forward* and *backward* dimensions of *temporality*.

Miss Moore shared her coming-to-know of Cree, and her linguistic experiences directed some classroom lessons to take shape in ways that supported language learning. These experiences exemplified conceptions of Indigenization through the foregrounding of Cree language and cultural experiences that promoted positive identity-making. This subversive teaching practice challenged Euro-Western methods of presenting mathematics as a culture-free, apolitical, experience-devoid, and decontextualized subject area.

I noted the tensions of Miss Moore's *inward* anxiety as she was negotiating classroom time needed to prepare students for provincial exams while trying to fulfill government mandates of Indigenization that were not included on provincial assessments. These tensions shaped the *outward* environment of what content she chose to teach. Attending to the *inward*/*outward* dimension is part of attending to the sociality commonplace in a narrative inquiry. The tensions

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were apparent in the students as they became detached from lessons in which they were forced to prepare for these stressful assessments. Standardized testing seldom leaves room for initiatives such as Indigenization, and making a space for this is essential in moving forward with such initiatives.

Cree mathematizing has been a successful conceptualization of Indigenizing school mathematics in my teaching and research work, and offers a promising practice. This research shifted my understanding of mathematics education and I have continued this pedagogical approach in the classrooms. Along with the successes I highlighted in this chapter, there were also tensions along the way. In the next chapter, I explore my educative experience with Miss Moore and Miss Scribe in which my Euro-Western ideologies of generalization (within mathematics) disrupted their Cree mathematizing.

CHAPTER 6: "What Comes After *Nēwāw*?"

6.1 Introduction

This chapter was modified to be a manuscript that was submitted to the Canadian Journal of Native Studies, and is currently under review.

This chapter describes the third thread: considerations of tensions when I disrupted experiences of the Cree teachers through my Euro-Western ideologies of generalization in mathematics. I explore tensions that arose with Miss Moore and Miss Scribe during math class when I attempted to generalize the Cree words they were teaching me and their students. *Generalization* is a process in the mathematics discipline that practitioners use to create things such as theorems and formulas. For example, this might be achieved by generalizing patterns amongst specific things. While this is a conventional practice in the discipline, my imposition of generalization did not align with the Cree perspectives these teachers were representing, and disrupted the sharing of their experiences. By inquiring narratively into my experiences and the experiences of these teachers, I explain how a mis-educative teaching moment on my part led to me having an educative experience.

These considerations of my experiences with the participants in their classrooms show the narrative commonplaces of *temporality*, *sociality*, and *place*. I attended to the personal-social dimension of my inquiry as I noted the *inward* internal conditions of my expectations of generalization. This expectation, directed *outward*, resulted in tensions when I disrupted Miss Moore and Miss Scribe's experiences.

6.2 A Mis-Educative Experience

It was 'math day with Mr. Stavrou'. Miss Moore and I were co-teaching

the lesson, as we normally do. Today, I was playing the role of an

inquisitive student who wanted to learn translations of mathematics terms from English to Cree. Miss Moore patiently taught me and her sixth-grade class the words she knew. "*Nīswāw* means *two times*, *nistwāw* means *three times*, and *nēwāw* means *four times*". She explained that this is how you talk about *doubling*, *tripling*, and *quadrupling* the quantity of something. As she wrote *2x, 3x, 4x* on the board I raised my hand and asked, "What comes after *nēwāw*? Since five is *niyānan*, then based on that pattern, wouldn't *five times* be *niyānanwāw*?" Miss Moore paused and stared at me. "I don't know. No, it doesn't sound right to me. Hmm…it sounds strange. I haven't heard it before." Then I asked, "Why does it sound weird? It should be correct. I mean, what about *six times*, *seven times*, and so on? How do you generalize this to any positive integer?" (Field note, October 2017).

When I entered the school after recess, the halls were filled with students making their way to class. I was carrying a big blue bin with activities, so the students I bumped into in the hall were excitedly interrogating me as I made my way to Miss Moore and Miss Scribe's classroom. They asked, 'Hi Mr. Stavrou! What's in the bin?'

Miss Moore and Miss Scribe often combined their grade six students together during the one-hour session I attended each week so that all the grade six students could participate in the session.

On one particular day, we were learning about order of operations—the all-too-familiar acronym *BEDMAS* (Brackets, Exponents, Division, Multiplication, Addition, Subtraction) reminder of the order of operations probably comes to your mind. I wanted to know how

arithmetic terms like addition and subtraction were represented in Cree. Miss Moore had the numbers 1 through 20 written in Cree on the chalkboard: *pēyak, nīso, nisto, nēwo, niyānan, nikotwāsik, tēpakohp, ayēnānēw, kēkā-mitātaht, mitātaht,…, nīstanaw.*

Miss Moore explained that the word *mīna* means *and*, and *katīna* means *remove*, which are used to represent addition and subtraction, respectively. She gave the examples: *pēyak mīna nisto* is *nēwo*, and *mitātaht katīna ayēnānēw* is *nīso*. Next, Miss Moore taught us the words for *doubling*, *tripling*, and *quadrupling*: Since *nīso, nisto,* and *nēwo* mean *two*, *three*, and *four*, respectively, then *nīswāw* means *doubling*, *nistwāw* means *tripling*, and *nēwāw* means *quadrupling*. She explained the words are formed by changing the ending of the numbers to *wāw*. She wrote *2x*, *3x*, *4x* on the board. She told a story of baking with her mother as a child and doubling the ingredients of a recipe they were using.

I always enjoyed learning languages, and seeing how phrases translate back and forth is interesting to me. When I am learning something new, I create patterns for myself. The students were staring at me and giggling because of my own captivation in the lesson. Admittedly, I might have been enjoying the lesson more than they were. Miss Moore explained the way the numbers were appended by the suffix *wāw*, and since Miss Moore did not go beyond *nēwāw,* I raised my hand and asked, 'What comes after *nēwāw*?' Miss Moore paused, her brow furrowed, and she said, "I don't know."

I anticipated that she was going to say *niyānanawāw*, and so the intention of my question was to set her up to continue with the pattern. When she said she didn't know, I became confused and explained that if we are just adjoining *wāw* to the end of the numbers, then it seemed natural to me that the next few should be something like *niyānanawāw, nikotwāsikawāw, tēpakohpawāw*, and so on. She said that those words do not sound right to her and that she had

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not heard of them. I pressed with more questions, "But, how would you say *five times*, *six times*, and so on? Why doesn't it generalize? Why does it sound weird?"

I became fixated on the pattern I was seeing and pushed for Miss Moore to explain why my pattern did not seem natural to her. I figured that there must be some way to continue with the numbers by appending *wāw* at the end. I wanted to generalize. In my mind, because of how I learned Euro-Western mathematics, I wanted to see a general way to represent multiplying by any positive integer: *2x, 3x, 4x, ... nx*, where *n* is any positive integer.

Miss Moore kept saying that it does not work like that. She said that she hadn't heard of any of the words that I suggested, and said she only knew up to *nēwāw*. I was so absorbed with my ideas of creating patterns and trying to generalize that I derailed the lesson and took away from the context that she was providing through her language. Miss Scribe, who is also a Cree speaker, was mostly silent during this interaction between me and Miss Moore. She was also unsure about my line of questioning.

As I reflected on this experience, I was troubled by my response to Miss Moore. What experiences did I have in my education that influenced my questions? I shifted away from the sharing of her language and its significance in the context of her life and the lives of the students, to a decontextualized discussion of generalization. As I inquired into this experience, I was struck by my use of the word *natural*. The word *natural* is commonplace in mathematics, and carries the connotation of something being inevitable and typical. In the context of this lesson viewed through a mathematical framework, the notion of *natural* indicated that, not only was there an expected pattern (made by appending the suffix *wāw*), but that the next step ought to be generalizing this pattern to any arbitrary positive integer. *Natural* may be *natural* to a

mathematician, but it certainly derailed Miss Moore and Miss Scribe's lesson and imposed a framework that disrupted their cultural and linguistic experience.

6.3 Thinking Narratively about Education

I often returned to my feelings of uneasiness around the lived experience in Miss Moore and Miss Scribe's classroom. I wondered how my understandings of their classroom lessons might change as I considered the tensions that arose within me. The personal-social dimension of narrative inquiry reminded me to connect experience *inward* to the internal conditions of my "feelings, hopes, aesthetic reactions, and moral dispositions," and *outward* "toward the existential conditions, that is, the environment" (Clandinin & Connelly, 2000, p. 50). What stories of teaching and learning were Miss Moore and Miss Scribe enacting in the mathematics classroom? How were their familial stories of language and culture being silenced in the mathematics classroom by my questions? How did my experiences learning and doing mathematics result in perceptions of doing mathematics that did not make space for Miss Moore and Miss Scribe's linguistic and cultural experiences? What were the frictions caused by our intersecting lives, and what might I learn from these lived stories?

Thinking about my response to Miss Moore brought me backward to different times and places of my university education. Below I wove a sequence of experiences that highlighted times in my education that shaped my perception of mathematics education in ways that I believed contributed to my response toward Miss Moore.

> I am sitting, confused, in a 200-level mathematics course for honors
> students. This class began with 28 students and has dwindled to four. I
> cannot remember the last lecture that made sense. I wonder if my three
> classmates are just as confused. Erin (pseudonym) definitely understands

everything because she randomly catches the prof's mistakes, leading me to roll my eyes in envy. This prof is so long-winded. The only things he seems to write on the board are theorems. Everything is too generalized—I need to see specific examples. I raise my hand and ask him to show some concrete examples. He said, "This theorem is a powerful tool that captures so many things. On your own time, solve examples by applying this theorem." It is fall of 2007 and I am anxious for the upcoming midterm exam. (Memory reconstruction, spring 2018).

My experiences in this and subsequent classes pushed me to think of solving mathematical problems by using generalized ideas. I am not denying that this orthodoxy does not serve a useful purpose, since it allows practitioners to describe and quantify some phenomenon, and advance mathematical knowledge. My contention began with the difficulty in understanding concepts that are abstracted from contextual experience—the very thing I tried to do in Miss Moore and Miss Scribe's classroom. Being taught to generalize was ingrained in my education. When I close my eyes now, I can recall a homework assignment from one of my undergraduate mathematics classes returned to me with the following comment in red pen: *You need to generalize this*. On one particular question, I wrote *I will show that…*, to which the professor crossed out the pronoun *I* and wrote *We*. We? Why *We* when I am the one writing this? I saw in all my textbooks the use of the word *We*, everywhere.

After completing my undergraduate program, I started a Master's degree in mathematics. The game became writing and publishing papers. New to that process, I wondered how a person comes up with something to publish.

It is fall of 2010 and I am in the midst of my Master's degree in

mathematics. I am talking with a post-doctoral researcher. She is very

insightful and we are discussing how to write publishable manuscripts. We

are sitting in her office drinking coffee and I ask her how she thinks up

ideas to research and publish. She replies, "You just start with something

that other people have published and you try to generalize it further."

(Memory reconstruction, spring 2018).

Retelling these memories of my struggle as a mathematics undergraduate student has helped me

consider how my mathematics education shaped the way I responded to Miss Moore and Miss

Scribe. I struggled with the emphasis of *generalization* in mathematics. I felt a dissonance in the

way I learned mathematics in high school compared to how it was being taught at a university

level. Everything was to be abstracted. My professors always provided so much theory that I

could not seem to contextualize. I eventually got used to the ways mathematicians teach

mathematics—*generalize* and *abstract*. Start with a general and abstracted result, then provide an

example. Theorem first, example after. Wash, rinse, repeat. Certainly mathematicians see

patterns and make connections through specific examples, but the goal is to abstract the pattern

to a generalizable form that encompasses as many specific examples as possible. The theorem is

most useful if, in its generalized state, it describes as many specific examples as possible.

I want to emphasize again that I am not contesting the importance of generalized results,

but rather, I am drawing attention to the dissonance I felt learning topics that were abstracted to a

point that I could not relate to the objects and topics I was studying. I am also drawing attention

to the privileging of generalization and abstraction in the discipline, which moves away from

experience and context.

Carrying these experiences in my university education alongside the classroom lesson with Miss Moore, I wondered what emotions she felt when I asked her to be more general. She taught me specific Cree words for doubling, tripling, and quadrupling, and then I derailed her lesson and focused on how she could abstract and generalize these terms in Cree. I want to clarify that this particular interaction never hurt our friendship and professional relationship—in fact, it is the candidness of our relationship that allowed for these personal and educative discussions.

Dewey (1997) described educative experiences to be those that promote growth and push us forward on the experiential continuum, while mis-educative experiences are those that have the effect of distorting the growth of further experience. I believe that by emphasizing generalization and shifting the focus of the lesson away from her experiences, I unintentionally created a mis-educative experience for myself. However, I saw potential to make this experience educative by inquiring narratively into these tensions. Attending to the *inward* emotions that shaped the *outward* teaching environment and my dissertation is how *sociality* is evident in my inquiry. The *backward* and *forward* reflection on these experiences shows *temporality*.

6.3.1 Thinking with a Colonial Mindset

I have always appreciated how forward Miss Moore could be with me in regards to the ways I see things as a mathematician, and how it is irrelevant to the experiences she may be conveying. During a follow-up interview, we discussed the tensions surrounding that classroom experience.

> *Stavros*: After you taught us *nīswāw*, *nistwāw*, and *nēwāw*, I kept asking if
>
> the words *niyānanawāw, nikotwāsikawāw,* and *tēpakohpawāw* follow in
>
> the pattern and how Cree speakers would generalize these ideas of
>
> multiplication to higher numbers. You said the words don't make sense.
>
> Can you explain more?

Miss Moore: I can't explain it. You're thinking of it in a colonial mindset because those concepts exist in English but to me they don't exist in Cree. It doesn't mean there aren't any words. It just means I don't know.

Stavros: This discussion is teaching me that my colonial mindset, as you called it, involves generalizing mathematical ideas because that is what I have experienced. Cree isn't about decontextualization or generalization— it's about relationships with people and experiencing what you are learning and teaching. How did you learn the words *nīswāw*, *nistwāw*, and *nēwāw*? What was the context? Who taught them to you?

Miss Moore: How did YOU learn the words for *doubling*, *tripling*, and *quadrupling*, and so on? I cannot pinpoint in my life when I learned certain aspects of my *nēhiyawēwin*.

Stavros: That's a good answer! I don't know how, when, or where I learned those words and ideas in English either. I mean, I probably used and understood them well before I learned multiplication in the third grade.

Miss Moore: I was born to an 18-year-old *nēhiyaw iskwēw*. We all lived on the reserve most of my growing up years. I only spoke Cree because my grandparents only spoke Cree. I didn't start speaking English until I went to school. I can only tell you what I know, but it is in the context of my experiences and it does not make sense to talk about anything else (Field note, May 2018)

Miss Moore explained that I was thinking about what she was trying to teach me in, what she recognized as, a colonial mindset. I took this to mean that I was trying to impose Western ideologies, such as generalization and abstraction, onto a lesson in which she was simply trying to teach us how, as a Cree woman, she experienced the processes of *combining*, *removing*, *doubling*, *tripling*, and *quadrupling*. She also pointed out the naivety of me asking when she learned these words, and asked me when I learned the same words in English. The take-away of our interaction and of the follow up interviews was that when Miss Moore was sharing her linguistic knowledge, my responses of how she could generalize strayed away from her experiences. My attempt at generalizing moved away from her experience by imposing Western ideologies that do not make sense to her and have no place or meaning in her linguistic experiences.

Inquiring narratively into the tensions of the experience with Miss Moore and Miss Scribe made way for an educative experience for me (Dewey, 1938/1997)) since it allowed for further growth. For me, this educative experience was understanding the ideologies surrounding Western mathematics that were in conflict with the experiences of the Cree teachers. It was important for me to recognize the way I moved away from the lived experiences of Miss Moore and Miss Scribe in their mathematics classroom.

As I reflected, I was reminded of an article by Doolittle and Glanfield (2007), who discussed the conflicts they faced situating mathematics and culture. Florence Glanfield commented on her work with pre-service teachers whom she believed had "not had a chance to explore the way that they think about mathematical ideas; that their ideas and notion of mathematical relationships have been silenced over their years in formal schooling." (p. 28). In the context of my experience, my formal schooling prompted me to overshadow the sharing of

Miss Moore's mathematical relationship for the purpose of abstracting her Cree knowledge. Ed Doolittle explained that he wanted to integrate two aspects of his being: Mohawk and a mathematician, which he felt were incompatible. He spoke about the potential of school mathematics in displacing the "innate mathematical understandings" (p. 28) within Indigenous cultures:

> I don't think the question is merely academic: I believe the fear of loss may be keeping some of our people from succeeding at mathematics. Do we need to give up our natural, innate mathematical understandings when we take in school mathematics? Worse, do we lose our culture to some extent? Indigenous culture has ancient, powerful ways of understanding the world, ways that are sophisticated and strong enough to have enabled the people to survive since creation. But those ways of understanding may actually be supplanted by mathematics education, which is not just mere knowledge, but a Trojan horse full of Greek philosophers wielding *Logos*. (p. 28)

This excerpt struck me when I reflected upon my experience with Miss Moore and Miss Scribe. Miss Moore was sharing Cree words she learned, passed down to her from her relatives—words that expressed ways of living and being. I was, unfortunately, the Greek coming into her classroom and displacing her sharing with my indoctrinated ideologies of generalization and abstraction. Doolittle said he thought many Indigenous people see their understanding of relationships devalued at the promoting of discourses in mathematics. This was an educative experience that taught me to be mindful of the ways that mathematics can smother the sharing of experience.

I remember learning my multiplication tables in the third grade—I started on my 2x tables, then 3x, then struggled until I reached the 6x tables. I did not get further, although I remember most students were where I was. A few got to the end (9x tables) and a few never went beyond 3x. How did I learn it? I sat there and memorized it. In retrospect, I already knew how to double, triple, and quadruple at least a grade prior. When kids play together, they double, triple, and quadruple things like candies, cards, points in board games, and so on. The words *double*, *triple*, and *quadruple* did not seem mathematical to me, but when it came to drilling 2x, 3x, 4x, and other multiplication facts into my mind in third grade, it seemed much more difficult.

What comes after *quadruple*? I guess *quintuple*, but I've never used that word. I don't think about *quintupling* something. Once, twice, thrice, but what comes after thrice? Frice? Does it matter? I can say four times. I would not want someone asking me how I could say words beyond thrice, and distracting me from explaining the useful words I know that I learned growing up playing games, baking, and so on.

6.4 Concluding Remarks

Cree and other Indigenous ways of knowing do not separate knowledge into abstracted categories. Indigenous knowledge is derived through lived experiences that are interactional, interrelated, and cyclical (Michell, 2005; Kovach, 2010), and are understood and conveyed through languages derived within evolving, interconnected ecologies (Battiste, 2013). In too many cases, what we learn in Euro-Western school mathematics (and how we learn it), is not based on experience or contextual situations. This results in mis-educative experiences that do not acknowledge the life of the learner.

Inquiring into the tensions of this experience with Miss Moore and Miss Scribe also brought forth assumptions I had in regards to Cree and mathematics. I now understand that we

know mathematics through our everyday language and experience. Our interview discussions helped me distinguish between the colloquial mathematics practiced in our daily lives and the school mathematics that is produced and taught in ways that are disjoint from our lived experiences. Often, school mathematics content is incongruently imposed on our lives by its contrived hypothetical situations. Miss Moore and Miss Scribe explained that the words they knew came from their lived experiences and the necessity of using these words in context. Indigenous knowing is not separated into subjects with mathematical distinctions. Mathematics is simply enacted, discussed, and embodied through living—not through categorical processes and words.

CHAPTER 7: SCHOOL MATHEMATICS AND *miyō-pimōhtēwin*

The fourth thread that constitutes this chapter explores my learning of *miyō-pimōhtēwin* (walking in a good way) as a way of being in relation in the mathematics classroom. My understanding of Indigenous mathematics education and the promising practices of Indigenization I learned alongside Miss Moore, Miss Scribe, and Miss Mitchel continued to take shape. In this chapter I share my experiences coming to know of *kohtawān* principles (ways of being and processes that balance the physical, emotional, mental, and spiritual dimensions of humans) that made curriculum into a relational space. I saw the principles enacted in stories to live by in which school mathematics was taught in a way that foregrounded self-awareness, doing things properly, learning new ways, being thankful, being humble, leaving problems behind, helping oneself, and keeping on trying.

By providing contextual classroom experiences in which my participants and I co-taught school mathematics in relational ways showed the narrative commonplaces of *temporality*, *sociality*, and *place*. I attended to the *inward*, *outward*, *forward*, and *backward* dimensions of a narrative inquiry by sharing my successes and failures while coming to know of the *kohtawān* principles throughout my time working alongside my participants. Through the relationality of *miyō-pimōhtēwin*, my participants and I demonstrated a promising practice of Indigenization in the mathematics classroom.

7.1 Introduction

This chapter highlights Miss Moore and Miss Scribe who taught me the *kohtawān* principles that balance the spiritual being (the physical, emotional, mental, and spiritual dimensions of humans), and make curriculum into a relational space. The principles were enacted in stories to live by in which school mathematics was learned and taught in a way that foregrounded self-awareness,

doing things properly, learning new ways, being thankful, being humble, leaving problems behind, helping oneself, and keeping on trying. These principles are Cree ways of being that provided learning supports in the mathematics classroom for the students, the teachers, and me.

Returning to my research wonder: *What are my experiences as a White Euro-Western mathematician working alongside Cree educators as we co-teach school mathematics to predominantly Cree children?* I learned that by embodying the *kohtawān* principles, we made mathematics a place of loving kindness by situating the learning of mathematical content in ways that privileged relationships so that we were always *miyō-pimōhtēwin*.

7.2 Situating the Inquiry

This inquiry occurred in Miss Moore and Miss Scribe's sixth-grade mathematics classroom. Miss Moore and Miss Scribe's teaching practice provided better understandings of Indigenization in school mathematics by being in relation. Indigenizing school mathematics does not necessarily involve mathematical content, rather it considers how we might engage with the content and each other.

Being in relationship while doing school mathematics demonstrated that effective classroom teaching was more than just emphasizing curriculum content. Miss Moore and Miss Scribe taught the curriculum content in ways that demonstrated *miyō-pimōhtēwin*, which is Cree for *walking in a good way*. Walking in a good way means we are mindful of our spiritual being through eight *kohtawān* principles, which I describe in the next section. Attending to the physical, emotional, mental, and spiritual aspects of our being facilitates learning by holistically teaching the life of a student.

7.3 *Kohtawān* **Principles: Mathematical Learning Support**

There are a number of broad mathematical tools that facilitate learning in a mathematics classroom. Bruner (1966) explained that mathematical tools are "amplifiers of human capacities" (p. 81), and generally includes oral language, written symbols, materials and manipulatives, and acquired skills of students (Hiebert et al., 1997). As an extension of this, language as a mathematical facilitator (tool) is meant to make learning easier by providing a way to communicate ideas verbally and through written symbols. Materials and manipulatives can be used to represent abstract concepts in concrete ways by giving mathematical meaning to physical objects. Building on skills that students already possess is a pedagogical practice that acknowledges their unique experiences.

A prominent feature of Miss Moore and Miss Scribe's mathematics classroom is the way they taught through Cree ways of being while doing Euro-Western school mathematics. The students were called upon to solve problems, explain their reasoning to the class, and reflect upon their strategies with an understanding that, as participants in the classroom, we were always mindful of the spiritual being that guides our interactions so that we were *miyō-pimōhtēwin*. The teachers explained that we walk in a good way by embodying eight *kohtawān* principles. An image of the *kohtawān* principles is in the following field note.

Do Things Properly
Kwēyask Itōhta

Be Aware
Of Yourself
Nākatēyimiso

Learn
New Ways
Oskititēyita

Kohtawān Principles
The Spiritual Being

Keep Trying
Ākamēyimo

Be Thankful
Nanāskomo
Hāy-hāy

Miyō-Pimōhtēwin
Walk in a Good Way

Wīcihiso
Help
Yourself

Āstēhiyihta
Leave Problems
Behind You

Tapāhtēyimiso
Be Humble
All are Equal
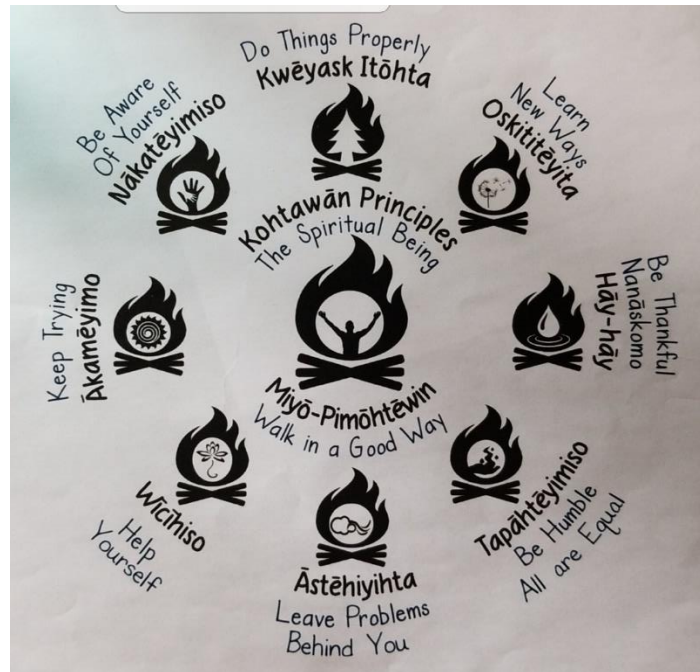
(Classroom handout, December 2017)

I saw that the *kohtawān* principles amplified human capacities and supported learning in Miss

Moore and Miss Scribe's mathematics classroom. They created a relational space by

exemplifying the Cree norm *miyō-pimōhtēwin* so that mathematical learning was not just about

teaching the content through written symbols, discussing problems, and using manipulatives—it

was about learning the content *in a good way*.

7.3.1 *Kohtawān* Principles and Cree Ways of Being

Indigenous ways of knowing and being are rooted in collective histories, experiences, values,

and knowledges of distinct and diverse Indigenous cultures (Deer, 2013). Indigenous

epistemologies and ontologies are narrated through Indigenous languages, situated in specific

geographic contexts, and are enacted through Elder-guided ceremonial traditions and other social

interactions (Battiste, 2013; Mitchell, 2005). Indigenous ways of knowing and being are shared

through oral traditions of storytelling and protocols that foreground community practices of doing things in a good way (Kovach, 2010b).

Cree ways of being were linguistically described by Miss Moore and Miss Scribe through the phrase *miyō-pimōhtēwin*. This was embodied by Miss Moore and Miss Scribe through *kohtawān* principles. Following one particular class in December of 2017, I had an interview with Miss Moore and Miss Scribe. They explained how we *are* the principles because we embody them. They said this state of being allowed them to feel balanced and *nākatēyimiso* (being aware of yourself). Miss Scribe brought up a lesson in which she asked her students to share a story that used multiplication in some way. She explained that one student, Jasmine (pseudonym), told a story about baking with her *kokohm* (grandma): They baked 24 cookies and subtracted the amount she and her brothers ate. A classmate interrupted her story because he thought that talking about subtraction is 'too easy'. Miss Scribe saw that the comment broke Jasmine's confidence, and used that experience as a learning opportunity to remind everyone that no one's ideas and stories are better than others'. She used the word *tapāhtēyimiso*—all are equal. (Summary of interview conversation, December 2017).

The *kohtawān* principles represented a way of being that nourished the spiritual self through self-awareness, doing things properly, learning new ways, being thankful, being humble, leaving problems behind you, helping yourself, and keeping on trying. Being mindful of these processes was how we walked in a good way, and made spaces like their classrooms a place of loving kindness.

7.3.2 The Role of a Teacher
The ways Miss Moore and Miss Scribe related with their students spoke to their perception of what their roles were as teachers. When the students gather in the classroom for mathematics,

Miss Moore and Miss Scribe attended to how the students are interacting with each other. Recess disagreements between students were settled and everyone was reminded to transition from their recess behavior to their classroom behavior, which they understood to mean walking and speaking quietly instead of running and shouting. For the teachers and students, this was part of getting ready to do mathematics and any other school work. Miss Moore and Miss Scribe continued to attend to how the students interacted with each other and the content during the lesson.

During a week in December before the holiday break, I visited Miss Moore and Miss Scribe. They wanted to cover multiplying a two-digit whole number with another two-digit whole number (such as 12 x 48). They already introduced the students to the stacking method, in which the numbers being multiplied are written on top of each other so that the digits line up based on their place value. Miss Moore and Miss Scribe asked me to present other methods the students could use to multiply. I asked the students to sit in partners and gave each pair dry erase markers and a laminated paper to write their answers on. As I was distributing supplies, a few students started drawing pictures and scribbling on the paper and each other. Miss Scribe guided the students to stop 'fooling around and wait for instructions' using the phrase *kwēyask itōhta*— do things correctly.

After I demonstrated on the board a few examples of multiplication using the grid method, I provided an exercise for the students to work out on their laminated papers. Miss Moore, Miss Scribe, and I walked around the room as the students worked in partners. A student named Patrick (pseudonym) raised his hand because he was unsure of how to get started. He was frustrated as he rewrote his problem several times, until eventually he looked over at the groups working beside him to confirm if he was on the right track. Miss Moore commended him for

seeking guidance from his classmates by *learning from watching*, which she called *kiskinowâpahkêw*. As the students worked through the problems they were reminded to keep trying—*ākamēyimo*. At the end of the lesson, I walked around to collect my supplies. The students began chatting and getting their lunch. Miss Moore and Miss Scribe reminded the students to thank me: "*Hāy-hāy*! *Nanāskomowin*, we are thankful to Mr. Stavrou for coming to share with us. When he shares his math knowledge with us we learn new ways together. *Oskititētiya.*" (Field note, December 2017)

The roles of Miss Moore and Miss Scribe were to create a classroom in which students were doing things in a good way. As the students engaged in the mathematics lesson for the day, there were tensions from the students as they learned the concepts. As in every classroom, some students struggled more than others, and so it was the role of the teacher to provide tools that facilitate learning. This was achieved by enacting the *kohtawān* principles which ensured *miyō-pimōhtēwin*, so that the mathematics classroom remained a place of loving kindness. In the example of Patrick looking over at his classmates' work to help get himself on track, Miss Moore did not call this cheating. Rather, she applauded his efforts to learn from what his classmates were doing, showing that learning with the support of classroom community is also an act of kindness.

7.3.3 Tensions When the *Kohtawān* Principles are not Practiced

Educators face tensions as they interact with their students throughout the day. Attending to the varied needs of the students is necessary but demanding work. There are times when educators may feel like their cup is only half full. The *kohtawān* principles are a way of being wakeful to our mental and spiritual needs by attending to self-awareness, doing things properly, learning

new ways, being thankful and humble, leaving problems behind, helping yourself, and perseverance by trying again.

In the following field note, I retold a lesson filled with tensions that arose from work stresses. Prior to attending Miss Moore and Miss Scribe's classroom, I was teaching an undergraduate calculus course that had 300 students registered in the course. On the particular day described in the field note below, I left the lecture feeling worn out because my calculus students were chattier than usual, likely because it was Friday before the midterm break. My experience with Miss Moore, Miss Scribe, and their students became an educative experience (Dewey, 1938/1997) as I learned new ways of being during times of tension.

> When I arrived at Miss Moore and Miss Scribe's classroom, some students were not their usual excited selves. I turned on the SMART board at the front of the room and loaded a math game related to working with fractions. After I demonstrated the activity, Miss Moore and Miss Scribe passed around tablets for the students to play the fraction game on. Normally, the students require almost no prompting when it comes to activities using the tablets, but today was different. I observed a few students either not using their tablets or going to websites other than the one they were told. Admittedly, after a long week and coming from a noisy university lecture, I did not have much patience. Miss Scribe caught on to this right away and interjected to get the students on track. The students whom I observed looking down vacantly at their desks continued to do this. I was surprised to see their mood unchanged after being given tablets to play with. Miss Moore discretely explained that a few of the

students had an argument during recess. I caught myself rolling my eyes. I

was annoyed at their disinterest in my activity. Coming from my loud

lecture, the chattiness from some of the grade six students was also feeding

my negative mood. I looked at the clock wishing lunch time would come

sooner. (Field note, February 2018)

As I reflected on the tensions of that particular day, it was obvious the experience was mis-educative because I did not pause to reflect the feeling of imbalance I was facing as I transitioned from my university lecture to the grade six classroom. Certainly some of the students were also facing this, and it was a failure on my part not to slow down and check in on myself. I was not mindful of *āstēhiyihta*—leaving my problems behind. I came into Miss Moore and Miss Scribe's classroom feeling the stress from the calculus lecture I was coming from. I knew I was feeling imbalanced as I walked in the sixth-grade classroom, but did not attend to that, and it resulted in a sub-par lesson with some of the students. The students who were feeling upset from their recess argument would have also benefited from *āstēhiyihta*.

The following week, I used the driving time between my university lecture and classroom session to practice *āstēhiyihta*. While my day had been going smoothly, there are always things that tumble around my mind throughout the day, and so practicing *āstēhiyihta* involved leaving even the smallest issues behind.

As I drove to my lesson, I recalled how poorly the previous week went. I

felt empowered to do better as I reminded myself to be aware—

nākatēyimiso. I always hope I bring something valuable for Miss Moore,

Miss Scribe, and their grade six students when I come to our sessions. I am

learning new tools to teach mathematics. *Oskititēyita* is to learn new ways

of being that centre our spiritual selves.

　　When I walked into the classroom, the students were excited to see me

and asked me what activities I brought. As I passed out supplies, Jake

(pseudonym) asked, "Are you going on a date later?" To which I curiously

replied, "No, what makes you ask that?" Jake giggled, "You're wearing

cologne. My older brother always wears cologne when he's going to

smooch his girlfriend!" The class erupted in laughter, and the lesson

proceeded from there. (Field note, February 2018).

I learned that it takes everyone—myself, the teachers, and the students—to make a classroom a

place of loving kindness through *miyō-pimōhtēwin*. Walking in a good way required nourishing

our whole selves through the *kohtawān* principles, and demonstrated how the mathematics

classroom could be a place of loving kindness.

7.4 Moving Forward

In my experiences working with teachers, administrators, school boards, and content-developers

for the curriculum, Euro-Western perspectives of Indigenization privileges content. Since Euro-

Western mathematics is produced as an experience-devoid, value-free, and acultural discipline

(Iseke-Barnes, 2000), it is not surprising that considerations of ways of being are lacking. In this

direction, I learned that the Indigenization of school mathematics could be taken up as centring

ways of being so that school mathematics is not just about the content, but about the

relationships involved in learning and doing mathematics *in a good way*.

CHAPTER 8: NEGOTIATING THE FINAL RESEARCH TEXT

8.1 Introduction

At the start of my doctoral studies it was decided that the final research text—this dissertation—would include four chapters that would also serve as journal manuscripts. These chapters were shaped by the sharing of my experiences working alongside Miss Moore, Miss Scribe, and Miss Mitchel during my doctoral studies. Negotiating entry into the field included disclosing this intention with the teachers so that they could make informed decisions of how they wanted their stories told. This was particularly important for Miss Moore, who said there were certain stories she would only want shared orally because a written text would not adequately capture her voice and intention.

As the school year progressed and field texts shifted to interim texts, I thought about how these interim texts would be represented in the final research texts. From the field notes, interview discussions, and word images co-composed with the teachers, the chapters took shape. My work in the field included sharing these interim texts with the teachers to ensure my representation of their stories were both respectful and accurate. The back and forth negotiations of these field and interim texts created more field texts from our discussions. This process is the embodiment of the forward and backward movement along the social and temporal dimensions of a narrative inquiry.

Narrative inquiry "comes from a view of human experience in which humans, individually and socially, lead storied lives. People shape their daily lives by stories of who they and others are and as they interpret their past in terms of these stories" (Connelly & Clandinin, 2006, p. 477). The chapters of this dissertation personify the laughter, fears, tears, triumphs, and tensions of our lived experiences as we engaged in the research. The stories in this dissertation

live in our relationships, and are now part of you, the reader, as you considered your story alongside ours.

8.2 Narrative Threads

I have presented my experiences working alongside Miss Moore, Miss Scribe, and Miss Mitchel. Our voices represented unique dimensions that created multiple sub-plotlines as we told many stories (Clandinin & Connelly, 2000). The intersecting of our stories created four narrative threads, which formed "resonances or echoes that reverberated across accounts" (Clandinin, 2013, p. 132). These four threads of collective stories that constituted the previous four chapters were a consequence of us living out our experiences. As the inquirer, I thought *with* the stories and the ways they shaped and became part of my own—rather than thinking *about* stories, which relegates narrative as a static object that is disjointed from the researcher (Morris, 2001).

As I composed this final research text, I considered the narrative threads in the context of my research wonder: *What are my experiences as a White Euro-Western mathematician working alongside Cree educators as we co-teach school mathematics to predominantly Cree children?* The inquiry came from my lived experiences of teaching school mathematics while considering the meaning and application of Indigenization.

I developed four threads of experience while I worked alongside Miss Moore, Miss Scribe, and Miss Mitchel. These threads showed our experiences through the narrative commonplaces of *temporality*, *sociality*, and *place*. By sharing the ways I directed my *inward* feelings and hopes *outward* in the classroom is how I attended to the two personal-social dimensions of the *sociality* commonplace. My reflections *backward* to earlier experiences, and my *forward* thinking of how my work, research, and practice will be reshaped is how I attended to the two dimensions of the temporal commonplace.

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The first thread emerged as I attended to the methodological commitments of narrative inquiry, critical race theory, and anti-racist education as my interpretive frames of Indigenization. The second thread explains my conceptualizing of Cree mathematizing as a partial representation of identity-making and Indigenization. The third thread developed from tensions when I disrupted experiences of the Cree teachers through my Euro-Western ideologies of generalization in mathematics. The fourth thread explains my learning of *miyō-pimōhtēwin* (walking in a good way) as a way of being in relation in the mathematics classroom. These threads of experience showed the *inward* internal conditions of my feelings, hopes, and wonders, which were directed *outward* toward the existential conditions of the classroom environment (Clandinin & Connelly, 2000).

8.2.1 First Thread: Methodological Commitments of Narrative Inquiry alongside CRT and ARE

As I negotiated the field texts, interim texts, and final research texts with participants, I experienced tensions—many within myself—throughout the research process because I had not clearly located my own analytical frames. Miss Moore, Miss Scribe, Miss Mitchell, and I shared our storied lives through the methodological features of a narrative inquiry. As all narrative inquirers do, I filtered and made sense of stories through my own interpretive lens throughout the inquiry. My research and practice was influenced by critical race theory and anti-racist education. Tensions arose for me when I had not yet located these frameworks in my inquiry.

As Clandinin (2013) explained, a narrative inquiry includes narrative beginnings that invite researchers to position themselves in the inquiry in order to provide a personal justification of their research wonder. I determined that critical race theory and anti-racist education were foremost a way for me to make sense of Indigenization and mathematics education. The analytical frames of critical race theory and anti-racist education were significant to my research

and practice because it allowed me to see that mathematics education is not an acultural and apolitical practice. These frames helped me describe and problematize Indigenization discourses of multiculturalism and inclusiveness. I cannot remove an interpretive lens, so it was important to make explicit the influence of critical race theory and anti-racist education in my research.

As I directed my experiences *inward* and reflected on these tensions, I more broadly examined the methodological tenets of narrative inquiry and how narrative inquirers locate their research within and amongst other forms of scholarship. I determined the philosophical boundaries of narrative inquiry, critical race theory, and anti-racist education. As Clandinin and Rosiek (2006) explained, a narrative inquiry includes an exploration of how stories are steeped in larger social, cultural, and institutional narratives. Stories play a role in a narrative inquiry methodology, and it is the filters of critical race theory and anti-racist education that influenced some of the stories chosen to be shared. Therefore, inquirers like myself must be mindful as our research intersects other forms of scholarship (Clandinin, Orr, & Pushor, 2007). During my mindfulness, I thought of design elements that helped me describe the overlap of my inquiry with critical race theory and anti-racist scholarship.

The first design element was that an inquiry begins in the experience of the researcher. This meant justifying that my research was born from my experiences co-teaching school mathematics with Cree teachers. During the process of negotiating entry into the field with participants, the second design element was to articulate the theoretical frameworks inherent in the research. The third design element is a consequence of the second—that scholarships such as critical race theory and anti-racism can expand an understanding of experience across the narrative commonplaces of time, sociality, and place. These theories expanded an understanding of my experiences researching Indigenization and co-teaching school mathematics. During

discussions with Miss Moore, Miss Scribe and Miss Mitchel, these theories also helped make sense of the complexities around discourses of Indigenous student success in school mathematics. There were also instances when stories were shared, without it being framed in theory. For example, Miss Mitchel shared stories of racism she encountered by her White and Indigenous peers.

Their and my stories were contextualized in larger social, cultural, and institutional narratives, which became an opportunity for using theory to understand the macrosocial influence on stories. However, we always returned back to individual stories of lived experience. The final design element was just that—to return to individual lived experience.

8.2.2 Second Thread: Identity-Making through *Cree Mathematizing*

This thread became the title of the fourth chapter. It connected my narrative beginnings of working with Cree school teachers in their mathematics classrooms with my research wonder of how my experiences alongside the Cree teachers' experiences shaped the teaching of school mathematics as we co-taught Cree children. In searching for the meaning and purpose of Indigenization, I happened upon literature discussing Indigenization in regards to social justice. To make sense of the many ways these ideas were taken up, I began my doctoral work conducting a literature review to sort through the multitude of perspectives. My resulting conceptualization is that social justice is the umbrella encompassing decolonizing education, anti-oppressive education, and Indigenization and cultural revitalization interact. However, this review did not help me understand *how* to Indigenize school mathematics. The starting place was to provide a local context to this enigma by working with Indigenous educators to see how interpretations might be imagined.

As I hoped, the experiences of co-teaching with Miss Moore, Miss Scribe, and Miss Mitchel gave insight into their conceptualization of Indigenization in their respective classrooms. This conceptualization took the form of Cree mathematizing school mathematics. This was a practice in which mathematical terms were translated between English and Cree, shared through stories situated in time, place, and relationships, and contextualized by the experiences of the students and teachers. Since Cree educators and students understand themselves as producing mathematics through their unique experiences and stories, Cree mathematizing was a partial representation of identity. Identity-making through Cree mathematizing demonstrated that Indigenization was a process that began and grew with students and the teachers in the classroom.

8.2.3 Third Thread: "What Comes After *Nēwāw*?" Disrupting Experience
For Miss Moore, Miss Scribe, and Miss Mitchel, Cree mathematizing included the process of translating concepts in school mathematics between English and Cree. This practice which was very standard in their classrooms continued throughout our research together. However, one particular classroom lesson showed how the experiences of Miss Moore and Miss Scribe were disrupted by my experiences as a White Euro-Western mathematician. Tensions arose when I attempted to generalize the Cree words they were teaching me and their students. This became the thread of which the fifth chapter built upon.

In a mathematical context, generalization is a process in which specific examples are used to create an abstract pattern or formula that often includes variables. In a sense, specific examples become a means to an end. In this lesson, Miss Moore and Miss Scribe were teaching the Cree words for doubling and tripling quantities, and my experiences as a mathematician with a Euro-Western educational background resulted in me attempting to abstract these terms by

generalizing. While generalization is a conventional practice in the mathematics discipline, my imposition of generalization did not align with the Cree perspectives these teachers were representing, and disrupted the sharing of their experiences. The tensions surrounding this event became an educative experience that helped me understand the ways Euro-Western mathematics sidelines narratives of experience, and how these experiences shaped our teaching of school mathematics.

8.2.4 Fourth Thread: School Mathematics and *miyō-pimōhtēwin*

As my research with Miss Moore, Miss Scribe, and Miss Mitchel continued, our understandings of how our experiences shaped the teaching of school mathematics became a concrete practice that supported Indigenization through these teachers' Cree perspectives. During this time I reflected back to my earlier notions of Indigenization described in my narrative beginnings. I reflected on these past experiences in which I worked with teachers, administrators, school boards, and curriculum content-developers to make sense of Indigenizing school mathematics. I saw the progress from the problematic ways I first took this up to the more nuanced understanding that developed during my research with Miss Moore, Miss Scribe, and Miss Mitchel.

During my reflections, I recalled the ways I supported the Euro-Western ideologies of mathematics being an experience-devoid, value-free, apolitical, and acultural discipline (Iseke-Barnes, 2000). Miss Moore and Miss Scribe taught in ways that were subversive to these ideologies by demonstrating the importance of Cree *kohtawān* principles that keep the spiritual being balanced and make curriculum into a relational space. These Cree principles gave a conceptualization of teaching mathematics in a good way, *miyō-pimōhtēwin.* They enacted the *kohtawān* principles through stories to live by in which school mathematics was taught in a way

that foregrounded self-awareness, doing things properly, learning new ways, being thankful and humble, leaving problems behind, and perseverance in learning with community.

More pieces of the Indigenization puzzle were fitting together as I was being mindful of the experiences the teachers and I brought to the classroom as we co-taught school mathematics to the Cree students. The thread of school mathematics and *miyō-pimōhtēwin* became the sixth chapter in my dissertation, emphasizing that school mathematics was not just about the content— it was about the relationships involved in learning and doing mathematics *in a good way*.

8.3 Justifying the Inquiry and Negotiating Exits

Clandinin (2013) explained that a methodological commitment of researchers is to justify the inquiry of our studies in three ways:

> [P]ersonally, in terms of why this narrative inquiry matters to us as
>
> individuals; practically, in terms of what difference this research might
>
> make to practice, and socially or theoretically, in terms of what
>
> difference this research might make to theoretical understandings or to
>
> make situations more socially just. (p. 35)

My research was a personal effort to understand the experiences that have shaped my work, practice, and living of teaching mathematics. From the boy storied as being smart in mathematics to the man who was tasked to find ways to Indigenize school mathematics, I have composed stories to live by that share the tensions, conflicting stories, and mis-educative experiences that have shaped who I am as a White Euro-Western mathematician in a Canadian prairie province.

My research wonder served a practical justification as I "attend to the importance of considering the possibility of shifting, or changing practice" (Clandinin, 2013, p. 36). Much of the research around Indigenous mathematics education is shaped by misconceptions of Indigenization and inconsistent practices of how this is taken up by practitioners—something I outlined extensively in my literature review. Through this inquiry, I hoped to achieve a nuanced understanding of how the experiences of diverse lives shaped the teaching of school mathematics.

I see the four threads that developed from this inquiry as shifting and changing practice. Learning critical race theory and anti-racist education helped me make sense of the complexities of Indigenization as I inquired into my experiences. The threads of identity-making through Cree mathematizing, the disruption of experience through Euro-Western mathematics ideologies, and teaching mathematics through *miyō-pimōhtēwin* demonstrated how practitioners could make meaning of Indigenization in their specific spatial, social, and cultural contexts through the living of their experiences.

The social justification of my work came from the telling of stories from three Cree teachers—Miss Moore, Miss Scribe, and Miss Mitchel. These stories helped me make sense of the confusion and uncertainties of Indigenizing mathematics education. Our stories invited other stories of identity-making around the teaching and learning of school mathematics, which continued to disrupt the problematic discourses around Indigenization research and practice. The theoretical justification came from the thread of navigating the methodological interplay of narrative inquiry, critical race theory, and anti-racism. It was my intention that this thread provide insight into the theory surrounding these forms of scholarship, which I hope will guide future narrative inquirers in their academic journeys.

8.4 There are No Final Stories Lived or Told

After our years together in a research relationship, negotiating exits from the research (e.g. the interview process, and the co-composing of the interim and research texts) felt natural as this occurred alongside the closing of the school year. The closing of the school year ended a chapter in our lives, but lives continue to unfold over the summer vacation in different places, and then we come back the next school year and the stories of these teachers and their students continue. Space is made for more inquiry into Miss Moore, Miss Scribe, and Miss Mitchel's narratives as the relational aspects of our work have already been planted, and their growth fostered throughout the process.

Negotiating exits followed the co-composing of the final research text (this dissertation) with Miss Moore, Miss Scribe, and Miss Mitchel. As the final meetings approached, we went through the stories shared to ensure their narratives were captured in the ways they imagined. Even though we reached the closing of the school year, there are no final stories. As a narrative inquirer, I recognize the relationships that developed between me, Miss Moore, Miss Scribe, and Miss Mitchel. Without the foregrounding of these relationships, the inquiry could not take place. The relationships we shared gave us the privilege of experiencing each other's stories, and required a responsibility of protecting these stories as they were retold in this dissertation. *Ekosi*.

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