ABSTRACT

The math curriculum that Indigenous students receive is not culturally adequate, and there is no research to help understand the experiences of people that take the path to creating culturally relevant math lessons. Hence, this study researches the experiences of a collaborative group that developed culturally-based math lessons through a case study approach within an action research methodology. The literature explored is in the area of culturally responsive education (CRE) and models of curriculum development informed by Schwab, Freire and Cajete. The data was gathered through interview-conversations with participants, and the analysis results were developed through mind maps and diagrams that coded each interview-conversation, and also intertwined the dialogues. The analysis results contain the story of each participant’s experience and through these stories the discussions and conclusions were assembled. The findings and implications involve Elders and teachers when creating CRE lessons, develop a relational dimension of CRE curriculum/lesson development, find cultural catalyst content from which diverse lessons can be developed, and include philosophical underpinnings in CRE lessons.
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TERMS

Throughout this thesis I use two terms that I want to clarify in this section:

*Indigenous:* In this thesis I use the term Indigenous to talk about Aboriginal and Indigenous people that were the original inhabitants of the country now called Canada. Since I come from the Mexican context, I use the word Indigenous, because it is the word they use to refer to themselves, and I feel more responsive and reciprocal using such a term, since in Mexico the word Aboriginal has negative connotations. I recognize that there are tensions associated with each of these words, and I do not wish to be disrespectful, so I use the word Indigenous, which I feel dignifies more who they are and their associated culture.

*Curriculum:* The definition of curriculum used in this research involves the content, learning experience, attitudes, and skills planned in order to achieve goals developed through experience, theory and research, and acknowledge the past, present, and future of the society.

The term curriculum carries with it several definitions that are sometimes unrelated. Some scholars mention the Latin roots of curriculum “currier” (Pinar, 1996; Parkay, Hass & Anctil, 2010; Weenie, 2008; McKernan, 2008), which means “career” or “race-course”. According to Parkay, Hass and Anctil (2010) among the definitions used are:

1. A course of study at school or university level
2. Course content, the information or knowledge that students are to learn
3. Planned learning experiences
4. Intended learning outcomes; the results of instruction as distinguished from the means (activities, materials, etc.) of instructions
5. All the experiences that students have while at school (Parkay & Stanford, 2007)” (p.2).
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DEDICATION

I dedicate this work to all the people that believe that utopia is possible and work to make it reality, to you and to all the unknown challenges you struggle through that no one recognizes. In particular I want to dedicate this work to all the people that believe that human relationships can be respectful and dignifying, to all the people that strive to create learning experiences based on respect and mutual transformation of Indigenous and non-Indigenous encounters. This work is dedicated to all the people we might never hear from, but whose work is so fundamental that without it hope would not be incarnated in any human being. To all of you, and to all of those people who have already crossed my path, thanks for nurturing in me hope and utopia, thanks for making me a dreamer building realities. In particular I dedicate this work to some of my family members who have profoundly impacted my journey: My grandparents Horacio and Carlos, you are my real dreamer-warrior idols! To my parents, who are still inventing towns that offer shelter to everyone in need, and to my mom, who has grown in me the possibility of a world in which we all work together as family. To many of my family members like Juan Athie Martinez, Neto, Lilia, Ana Paula, Lai, Xavier, Rin, Marilu, Marcela, Fiona, Maria (Mariluz), Roxana, Karla, Nena, Horacio, Lulu, Samantha, Pedro, Miguel, Melu, Yaya, Yolanda, Enrique, Sando, Rocio, Mario, Sylvia, Carlos, I dedicate this to all of you too, thanks for working to build a better world for everyone!
CHAPTER ONE

INTRODUCTION TO THE STUDY

Introduction

Along my life journey I have encountered Indigenous friends with whom I have walked for many days that sometimes turn into months. During these joint hikes we have learned and grown together; at times we have also worked in the curriculum development process. While our pathways continue, I have never understood the experience of others involved in the curriculum planning processes, in particular of the Indigenous people who have the cultural background and knowledge. Since I want to continue this journey with Indigenous people, and hope to contribute to the dignity of Indigenous education, I consider it essential to understand the experience of the developers while working together to create culturally responsive educational projects.

Since the beginning of my masters I have being searching for these voices and perspectives. This research project offered me the opportunity to learn about the experiences of the people engaged in the CRE curriculum development process.

Thus, I invite you to join me in venturing into these stories and learning from all the teaching they share. I also invite you to discover and understand the experiences of those you happen to work within any curriculum development process, especially the stories of minority groups.

The problem

Canadian and Indigenous scholars have criticized the Eurocentric-framed curricula that do not adequately represent Indigenous language and cultures (Battiste, 2008; Ledoux, 2006). This lack creates an educational system that does not attend to Indigenous students’
cultural backgrounds and places them at a disadvantage (Battiste, 2002; Ledoux, 2006). As a consequence of an inadequate educational system, Indigenous students’ achievement is lower than that of their non-Indigenous peers (British Columbia Ministry of Education, 2003; Ignas 2004; Ledoux, 2006). In general, there is a disconnect between indigenous cultural content and the curriculum content in terms of the needs, interests, previous experiences, and knowledge of Indigenous students. “For most students, true engagement in learning requires a curriculum that is relevant and personally meaningful and that affirms the student’s own identity and experiences” (Ball, 2004, p.472). Acknowledging that the curriculum includes the materials used in the classroom and the educational content, Indigenous schooling is absent of their own culture in a way that affects their daily learning experience.

The need for culturally responsive curriculum has been addressed since 1972 with the Indian control of Indian education. However, there have been restraints for Indigenous communities and schools to develop their own curriculum (Bell, 2004). The Royal Commission on Indigenous People in 1996 suggested that the lack of culturally based curriculum was one of the four primary limitations in Indigenous education improvement (Bell, 2004).

Further undermining the actual curriculum situation, the research has found that students’ academic performance is improved when the curricula supports the culture of the local community (Demmert, 2001; Gay 2002; Lipka, 2009). For this reason, and for reasons of self-determination, some communities have achieved control of their education and attempted to develop culturally responsive education curriculum, such as the Dene Kene initiative or the Nisga’a 92 school district. However, as noted by Castango and Brayboy (2008), “much more work is needed in this area” (p.965) (Ledoux; 2006). There is still an
urgent need to develop curriculum that meets the needs of Indigenous people and communities (Evans, McDonald, & Nyce, 1999).

In addition to the necessity to develop more CRE curricula, there is also an absence of research based upon the experience of the participants involved in curriculum development. In particular, there is little research on the experience of Elders, teachers, mathematicians and math educators working together in the development of such a curriculum. Moreover, Indigenous curriculum theory in Canada is in development (Weenie, 2008), thus there are few studies in this area (Evans, McDonald & Nyce, 1999) and especially, on the perspective of the participants involved. Learning and understanding about the developers’ experience in a curriculum development process involving cultural knowledge can provide a basis for developing a more culturally responsive curriculum that will make schooling meaningful to Indigenous students.

The field of mathematics is one of the areas that needs reinforcing or transformation, since it is a field where Indigenous students are least represented. The lack of culturally responsive content in mathematics curricula is considered one of the reasons for Indigenous students’ underachievement. According to the Foundation Skills Assessments 2007-2008 results, published by the British Columbia Ministry of Education, aboriginal students achieved lower outcomes than non-Aboriginal students. In writing and reading comprehension more than half of the seventh grade Indigenous students are meeting the performance level; in numeracy, 44% of the Indigenous students are meeting the performance level, in comparison to 60% of non-Indigenous students (Ministry of Education, 2009). This underperformance is a grave educational concern as it affects Indigenous people’s participation in the critical arguments of social, environmental, and political issues.
The study

The intent of this research is to elucidate the need for culturally responsive math curriculum in First Nations education through the perspective of the developers involved in designing culturally responsive education (CRE) lessons.

Two questions guide this inquiry:

1. What do Elders, mathematicians, math educators and teachers say about their experiences co-developing mathematics’ CRE curriculum materials?
2. What can we learn from Elders’, teachers’, math educators’ and mathematicians’ experience of developing culturally responsive math lessons based on a tipi story that could be applied for further CRE curriculum development?

To answer these questions, this research utilizes a collaborative action research approach in which the four R’s (respect, relevance, reciprocity, and responsibility) of Kirkness and Barnhardt (1991) guide the relationship of researchers and participants. Through a case study approach, the experience of a group using the tipi story to develop curriculum will be explored. Qualitative methods were employed to collect and analyze the data.

This inquiry used interview-conversations with participants, followed by a collaborative revision of the transcriptions. As learning is a social process, the ideas were created by both participants and researcher.

This case study is focused on math lesson plans based on a tipi story, which Indigenous Elders, mathematicians, math educators, and teachers are developing. The participants have been working together since November 2009, after their involvement in the Indigenous Math Education workshop organized by the Pacific Institute for the
Mathematical Sciences (PIMS) at the Banff International Research Station (BIRS). During this workshop, the participants formed sub-groups in which they created math lessons based on Indigenous cultural knowledge. This research is exploring the experience of the people involved in this particular sub-group (the tipi group) that is developing such lessons.

I was one of the tipi group members, therefore I am also exploring my experience while we are working on the development of lessons in this research. This research is founded on the assumption that people understand their reality and needs, and by sharing their experiences they can act upon their acts more efficiently and responsively (Maiter, Simich, Jacobson & Wise, 2008, p.306). Hence, the suggestions emerging from this study will help inform our work as a group.

Before continuing I want to frame this research with the perspective, worldview and ideas of the author. Therefore, I will make my background explicit.

**Author’s background**

My grandfathers taught me to be proud of my Mexican heritage, and to fight every day to make this world a better place for all. Both of my grandfathers chose a fight that moved their heart, in medicine or law, and they tried their best to leave a more just place for the coming generations. I decided to follow my path in education. While studying and working in this area, my path has allowed me to share experiences with Indigenous people who have made me understand the particularities of my own heritage.

Mexican people are different from those of other Latin-American countries for many historical reasons, but, in my experience, we are different because our heritage is based on the Indigenous groups that lived in Mexico before colonization. While living with the Purepechas for two months and trying to understand their worldview, I discovered that
many of the things that I do are the same as for them, like the importance of sharing, emotions, or spirituality. I discovered that we all have areas in common as humanity. These experiences and the teachings received from my family have pushed me to work with Indigenous people in an effort to create projects in which education recognizes their cultures and knowledge.

Two years ago I came to Vancouver to study for my master’s. Living in Canada and becoming a newcomer and immigrant has positioned me in a particular place in society, and not as member of the hegemony (as I was in Mexico). As part of a minority group I have struggled in academic areas; one of these areas is that the authors that I read and learned from in Mexico were barely mentioned in Canada. My theoretical framework was useless and I had to readjust it to a new context. In terms of language, my limited possibilities of expressing what I think or want to argue continues to be a constant challenge. And finally, my Bachelor’s degree in Education which is a four year degree is not recognized here, and since there is not such a degree in this country, only few people understand what I studied back home.

Before moving to Canada, I was already working with a critical perspective on how to make education more relevant and meaningful for minority groups, but after this experience these concerns have become personal. Every day I am more critical and worried about the elements that are missing that would respect and dignify minority groups in their schooling.

I have learned many things by living in Canada, and after one year I feel more comfortable and successful in this context, but there are still many things that could be improved and many things that separate me from the majority. Moreover, during this time I have worked with First Nations peers and learned about their experiences in an education
system that is not based on their culture. I have read and seen that the First Nations experience is tougher than that of immigrants (Barnnerji, 2000), and since they have been living in Canada from time immemorial and have been colonized through their education, the power, political, and social limitations they encounter are higher. The journeys of the Indigenous people that I know, and the lack of recognition of their own heritage, has impacted me and has increased my desire to work further with First Nations people in order to try and find more culturally responsive education projects. On this path, I acknowledge that my role is that of walking with Indigenous people, side by side (Silver et al., 2006).

The experience that I will analyze in this research comes from an effort to develop lessons based on the cultural knowledge of Indigenous people. This research offers an opportunity to reflect on how to make these processes a more common and successful practice. It is also an invitation to work towards transformative Indigenous Education. However, as English is my third language, I want the reader to understand this thesis with this perspective, because my ability to express all the interesting thoughts that participants had and the analysis and findings you will find on this work is to some degree limited.

**Organization of the thesis**

This thesis comprises six chapters. Chapter one introduces the study, including the research questions and the organization of the thesis. Chapter two contains the review of the literature associated with culturally responsive education and curriculum development models by three theorists applicable to culturally responsive education. Chapter three includes the methodology and methods employed in this research. I also include the context of the investigation and the participants involved. Chapter four contains the analysis of representative stories of the experience of each participant. Chapter five offers the
discussion created while inquiring into the experience of all participants and analyzed in a manner consistent with the literature in the field. The discussion covers participants’ comments in relation to math education for Indigenous students, people involved in CRE curriculum development, the process followed by the tipi group; it also covers their suggestions on how to use the tipi lessons. Chapter six, the last, presents the topics that have future implications on CRE curriculum development projects in relation to the four areas explored: the importance of including Elders and teachers in this kind of projects, the relational dimension that CRE planning processes have, and the need for developing catalyst content for CRE with a living curriculum perspective including the philosophical underpinnings of the cultural group.
CHAPTER TWO

REVIEW OF THE RELATED LITERATURE

While working in Indigenous Education in Mexico, I defined my theoretical position in Intercultural Education, a perspective developed within the Latin American context, which refers directly to the respectful relationships created through dialogue between Indigenous and non-Indigenous people. After coming to Canada and realizing that there was no English literature that existed within the context of what is termed in Spanish as Intercultural Education I searched for a framework that I felt comfortable working within. In spite of the support and criticism made in reference to Culturally Responsive Education (CRE), I have aligned my ideology with it, a perspective within the multicultural approach. However, my own definition of CRE incorporates elements of other approaches.

In addition, since this study is researching the experience that participants had while developing math lessons based on Indigenous content, I am also including literature on the area of curriculum development. The scholars I refer to in the planning process are the ones that relate the most to the CRE perspective.

In this chapter I will introduce CRE literature with some aspects of Indigenous Knowledge that I consider foundational in Indigenous education. Afterwards, I will present literature on curriculum development and the planning process described by Schwab, Freire and Cajete.

Culturally responsive education

Culturally responsive education (CRE) is a perspective of education that is based on the students’ culture, language, and traditions, validating who they are and at the same time offering solid basis for further education. CRE supports the idea that the use of local
knowledge, local ways of communicating and relating with each other will result in an improvement of academic performance (Burns, Keyes & Kusimo, 2005; Demmert & Towner, 2003; Gay, 2002; Lipka, Yanez, Andrew-Ihke & Adam, 2009). Inspired by Lipka et al. (2009), this research aims to create a curriculum based on students’ indigenous experiences, stories, and worldviews.

CRE brings students’ culture into the center of education, and recognizes that culture is a key element through which people develop their worldviews, and is also the way they understand life, and relationships. Gutstein, Lipman, Hernandez, and de los Reyes (1997) state that culture is an important aspect to consider in education. They define culture as “the ways in which a group of people make meaning of their experiences through language, beliefs, social practices, and the use and creation of material objects” (p.712). Culture is redefined constantly through a social construction, and since “individual identities are constructed through the intersection of racial, ethnic, class, gender, and other experiences, it cannot be reduced to static characteristics or essences” (Gutstein et al., 1997, p. 712).

CRE has been used with different terms and definitions. Each definition endeavours to give perspective to the relation of culture and education, however, the literature is so vast that it is hard to offer a general definition (Castango & Brayboy, 2008) or to give singularity to each term. For the purpose of this research I use elements of culturally based education, culturally relevant education, culturally responsive education, culturally sensitive education, cultural based education, culturally relevant mathematics, and mathematics for social justice. In the next part of this paper I will narrow CRE math, and then will define some elements of CRE.
Culturally responsive mathematics offers the possibility of joining together two areas that have been often considered unrelated. In this perspective, the mathematical and cultural knowledges are considered equally important and complement each different knowledge system and different worldviews. The curriculum content is based upon cultural knowledge that presents vast mathematical challenges.

While narrowing CRE to the mathematical field, Ezeife (2002) mentions that mathematics is not typically related to students’ culture and real life, which makes it difficult to engage with. However, Averill et al. (2009) mention that “Tate (1997) and others have argued that ignorance of the cultural diversity of students has contributed to the underachievement of some minority groups in mathematics” (p.159). Mathematics is not a cultural-free area (Averill et al., 2009). Some research studies have shown that using language and cultural content in mathematics support students’ knowledge and academic success (Averill et al., 2009; Lipka, 2007). This type of mathematics includes the general math academic content and cultural knowledge (Adam, Alangui, & Barton, 2003).

In attempting to define CRE and CRE math, I found common themes that overlapped, and for this reason I will present them together. Using this approach, scholars have typically defined the relationship between teachers and students, but at the same time they have understood that curriculum should be planned through community members and based on cultural knowledge, and that education should develop critical awareness and social transformation.

**Relationship between teachers and students**

In a CRE perspective, teachers should develop a continued learning and understanding of who the students are, as it is not only important to know their cultural...
background, but also to discover whom the students identify with and what is important to them. Culture does not manifest the same way in each individual belonging to that culture, rather, there are differences among members of cultural groups (Gay, 2000). In addition, Delpit (1995) argues that teachers must have knowledge of students’ lives outside of school, and should know their strengths.

Teachers acknowledge that identity is built upon an intersection of ethnicity, race, SES, gender, sexual orientation, age, etc. Wlodkowski and Ginsberg (1995) define culturally responsive teaching as an approach that “accommodates the dynamic of mix race, ethnicity, class, gender, religion, and family that contributes to every student’s cultural identity” (p.17). The CRE teacher endeavours to know the students and to be responsive to such unfixed and changing identities. The teacher will also provide a safe space/environment for students to be who they are, and at the same time will support the development and discovery of students’ identity.

In addition, a CRE teacher that understands the different dynamics of identity will try to bridge students’ cultural system with education (Gay, 2000). Teachers should consider students’ home cultures and languages as strengths from which they can build upon, and not limitations of education (Gutstein & Peterson, 2006). “Culturally relevant teachers utilize students’ culture as a vehicle for learning” (Ladson-Billings, 1995, p.161).

The CRE teacher believes in the skills, abilities, and capacities of all students. Teachers respect the students’ previous experiences and acknowledge that all learners possess cultural knowledge that can be built upon (Villegas & Lucas, 2002a) and learned from. Teachers expect students to achieve high standards, and in order to do so they will encourage and support students constantly while building upon their personal and cultural background (Delpit, 1995; Villegas & Lucas, 2002a). According to Ladson-Billings
no matter the social inequities that impact students’ lives, students must develop academic skills. She also states that “culturally relevant teaching requires that students maintain some cultural integrity as well as academic excellence” (Ladson-Billings, 1995a, p.160). For Ladson-Billings (1995) academic competence is at the base of the student-teacher relationship. Students need to learn the skills and rules in order to be part of the culture in power (Delpit, 1995).

In order for teachers to understand and learn from students, teachers would have to pass through a personal process of learning who they are, to which culture and/or identities they belong, and to which oppressor or oppression they represent. As mentioned by Villegas and Lucas (2002a), prospective teachers have to “engage in an autobiographical exploration, reflection, and critical self-analysis” (p.22) in order to develop the sense of who they are and what their socio-cultural identities are (Villegas & Lucas, 2002a). The teacher should know that working with different groups is not about knowing the other, but is rather about knowing him or herself and exploring the groups to which they belong and their attachments to those groups (Villegas & Lucas, 2002a). Delpit (1995) states that it is vital for teachers to “explore their own beliefs and attitudes about non-white and non-middle-class people” (p.179); in other words, they should understand their own prejudices.

As mentioned previously, teacher and student relationships are open, caring, and reciprocal. In this relationship the students and the teacher can communicate what they are thinking, and how they are feeling without being criticized or judged. At the same time the power is shared in this relationship (Bishop, 2008), both learn from each other and define general guidance rules for education. In this kind of relationship both care for each other, the teacher cares about students in a personal and academic way, but it is also a caring that prompts high achievements in education (Gay, 2002b).
Developing a critical awareness of society and social transformation

Gutstein (2003) states that students should address questions meaningful to them when they start to understand how power forces and institution delineate the world. This is what Freire called conscientizacion. Students need to understand with a critical perspective what the social issues in their context are. “Students must develop a broader sociopolitical consciousness that allows them to critique the cultural norms, values, mores and institutions that produce and maintain social inequities” (Ladson-Billings, 1995a, p.162). Students should be aware of the power relations in society. Delpit (1995) argues that a society’s power differences should be discussed in education if the improvements in the education of poor and minority children is to be sought. According to Ladson-Billings (1995a), critical awareness is intimately related to social transformation.

Along with awareness students must develop a sense of agency. Students need to know that they can make a change in their reality, in social issues, in the world (Gustein, 2003). Delpit (1995) states that teachers should help students to develop their own voice so that they can be heard in society, in order to change society. Gutstein and Peterson (2006) argue that while students are in the process of understanding social issues related to their surroundings, they at the same time “often recognize the importance of acting on their beliefs”(p.4). Gutstein (2003) also states that a key principle in education “is that students themselves are ultimately part of the solution to injustice, both as youth and as they grow into adulthood” (p.39).

Curriculum developed through community members and based on cultural knowledge

Delpit (1995) argues that one of the main educational issues to be overcome is the curriculum provided to teachers. At the same time, according to Gay (2002a),
Common sense, professional experiences, and research findings tell us that students learn better content that is familiar, has high interest appeal, is challenging, and is presented in ways that are linked directly to their prior knowledge and ways of knowing (p. 624).

Research has shown that culturally responsive curricula helps students to outperform academically. Therefore, culturally responsive curriculum is a path to use for culturally appropriate content and to overcome a Western perspective dominance in education. Gutstein and Peterson (2006) argue that rethinking the curriculum involves using cultural content that is based on students’ experiences and knowledge. Their perspective involves teaching themes that are more accessible, familiar, and meaningful for students. As Delpit (1995) suggests:

Appropriate education for poor children and children of color can only be devised in consultation with adults who share their culture. Black parents, teachers of color, and members of poor communities must be allowed to participate fully in the discussion of what kind of instruction is in their children’s best interest (p.45).

Even when the literature is not as extensive in curriculum as it is in teaching or in the relationship between students and teachers, I suggest that some of these areas can be applied to curriculum development. Curriculum developers should pass through a process of self reflection about the groups to which they belong, represent or identify with. Curriculum developers should also know who the students are, and if they are planning for a broader level of education (regional or national) they should leave space for local content and knowledge to be integrated by the teacher. Curriculum developers should also consider and include in the content key elements or rules for being part of the culture of power, which includes Western knowledge. Additionally, developers should create a respectful relationship among themselves and with the students, teachers, and community members of
the particular context, so that they can all be involved in the planning process within a responsive approach.

Curriculum development should involve community members, Indigenous people in particular, and should include Indigenous Knowledge (IK) systems in education. In their literature review on CRE, Castango and Brayboy (2008) state that one of the areas that has to be developed in CRE for Indigenous students is the involvement of Indigenous epistemologies into education.

According to Villebrun (2006):

To decolonize education is to retrench and retrieve our traditions in the classrooms in our communities. We need to shore up the cultural and spiritual teachings of our peoples in urban centers where they have moved. Whenever possible we need to teach others about who we are as Indigenous Peoples, to share in all schools our stories of who we are in the lesson plans teachers follow so that our stories are told respectfully and responsibly (p.18).

**Indigenous knowledge**

Indigenous Knowledge (IK), as defined by Settee (2008), “is not a singular body of knowledge but reflects many layers of being, knowing, and methods of expression” (Settee, 2008, p.47). Indigenous Knowledge is an evolving and dynamic definition that is in constant construction. Armstrong (2000) states that the intellect, spirit, body, and emotions are elements of Indigenous Knowledge, and these elements cannot be separated.

According to Castellano (2000), the sources of Indigenous Knowledge are derived from: traditional, empirical, and revealed knowledge. Traditional knowledge has been passed down from countless generations. This knowledge involves stories about the nation’s past, such as the creation of the earth and the clan, and the heritage rights to territories or heroic tales. Traditional knowledge also entails the customs that each group
has on their ceremonies, festivals or community gatherings. It is passed from generation to
generation through the teachings of Elders.

Empirical knowledge is gained from observations by many people who have lived
on the land over extended periods of time. It includes a close relationship with the land and
all the beings that live on it. The information that people obtain from observation is in
constant revision for it is based on the actual natural phenomenon, and in this way
knowledge is a continual process of re-examination and actualization. This knowledge is
built from different people’s perspectives and is accrued throughout history. In addition,
Cajete (2000) states that children learn through the experience of working with the land, as
they spend time gathering, collecting, observing, playing or hunting. Empirical knowledge
is transmitted through experiential activities on the land.

The third source is revealed knowledge that is obtained through visions, intuitions,
and dreams that are considered to be spiritually derived. Holmes (2000) defines this type of
knowledge as heart knowledge because it involves emotions, dreams, and continues the
relationship between beings (alive or dead).

Some of the characteristics of Indigenous Knowledge are “personal, oral,
experiential, and conveyed in a metaphorical language” (Castellano, 2000, p.25). The
knowledge is personal, so the views can be contradictory and both will be valid since each
person experiences life differently. Each person expresses his truth, his own perspective. In
an Indigenous approach, because all viewpoints are valid, the community corroborates the
evidence of each experience. So the personal knowledge of each individual is only weighed
according to what he has said and done before. However, there is a difference between
perceptions that are considered personal and wise. Instead, wisdom is validated by the
society “through collective analysis and consensus building” (Castellano, 2000, p.28).
Hulan and Eigenbrod (2008) state that when Elders spoke among themselves, they knew that other Elders would be listening and reviewing what they were saying, invoking caution in what is shared. Therefore, people that listen to stories or the oral language can provide a piece of truth to the story and develop knowledge collaboratively (Hulan & Eigenbrod, 2008).

Having an experiential connection with the physical world involves a process of inner and outer learning. “Reality is experienced by entering deeply into the inner being of the mind” (Couture, 1991, p.61 in Castellano, 2000 p.28), by going beyond the outer world. This puts an Indigenous person in an intimate relationship with the living reality of all things. The communion is the experience of the ideas while being part of reality. Then, learning comes from the deep relationship that one experiences with something. Indigenous people have a particular relationship with nature, with their land, it is there that such a deep relationship is initiated (Meyer, 2008). Indigenous Knowledge is intimately related to the land, to each particular place that every Indigenous community has lived for time immemorial. The relationship with the land is permeated through the words, sounds, and ceremonies that Indigenous people have. For example, Haisla people from Kitselas in northwest British Columbia, Canada celebrate the festivals, activities, and ceremonies that surround Oolichan fishing (Kundoque Green, 2008). The land is not a thing, but is rather a living being generally referred to as mother (Meyer, 2008), which indicates that the relationship between a person and the land goes beyond the physical to a spiritual connection. As stated by Aunty Lau in Holmes (2000) research:

Cause Hawaiians...don’t separate themselves from the environment. We are one, one and the same, and we need each other, and depend on each other, and have this interrelationship with our environment (Holmes, 2000, p.41).
Indigenous Knowledge is wholistic, meaning that all the disciplines and all things are related. As in nature, everything is related and all things form a sort of communion through which there is reciprocity (Cajete, 2000) and a direct influence of one another (Castellano, 2008). Indigenous Knowledge understands things in completeness and in relationship with others. The medicine wheel is an example of wholism. As Castellano (2000) states, “[t]he circle, representing the circle of life, contains all experiences, everything in the biosphere—animal, vegetable, mineral, human, spirit-past, present and future” (p.30). Indigenous Knowledge is experienced through all the senses. Trying to understand reality apart from its context will only generate frustration, which is due to the interconnectedness that exists among things. However, in Indigenous Knowledge there is also the analysis of parts, but it is in balance with the overall perspective. In other words, analysis should be complemented with synthesis.

Indigenous knowledge is often passed through oral transmission. This strategy has learning purposes, because you cannot teach something to everyone, since knowledge involves power and that power has to be passed on when the person is ready and through a personal relationship (Castellano, 2000). Therefore, sharing knowledge through oral tradition implies a responsibility for knowing who to share stories with, when to share them, and how that will impact the other person. Oral tradition involves a relationship between two or more people, if there is only one person then oral tradition will not make sense. The importance of oral traditions includes an acknowledgement of the people and the need to develop relationships in order to share and learn together.

Oral tradition implies a particular way of listening. Listening to stories includes the involvement of all senses, the emotions, mind, and patience (Archibald, 2008). It is a participatory action of listening with three ears, two on the head and one in the heart.
(Archibald, 2008). Usually the person gives meaning to the story, but in order to do so they will need to connect the mind and the heart.

Along with oral tradition, stories are another element of Indigenous Knowledge. Stories can help to bring dignity back to the people, through their humorous components (McLeod, 2007) or through the metaphoric language that can give comfort to Indigenous people. Stories can also help individuals find a place in the world (McLeod, 2007, Whittles & Patterson, 2009), for many stories talk about places, the creation of those places, or attempt to make sense of the current state of those places. Whittles and Patterson (2009) argue that Indigenous trickster stories help in the process of adaptation to a hostile environment, such as the city. Learning is passed through stories, from one generation to the next. Part of the teachings involve the traditional and cultural transmission; “[t]here are many levels to the stories, and many functions to them: they link the past to the present and allow the possibility of cultural transmission, and of coming home in an ideological sense” (McLeod, 2007, p.68). McLeod (2007) refers to stories as anchors to the culture and to who he/she is as an Indigenous person; in that perspective stories are a path to home in a spiritual and physical way. Stories also give voice and hope to Indigenous people.

Storytellers are the ones that join past, present, and future. They remember the language, the past, and the stories of the ancestors. But “storytellers also have responsibility to the future. They have a responsibility to imagine a different world, where the Cree stories will thrive, but also wherein the social space will be just” (McLeod, 2007, p.100).

Indigenous Knowledge systems have sources and characteristics that position it as a knowledge system that is distinct from Western knowledge. Both knowledge systems are important, the suggestion here is to include both in CRE curriculum.
CRE curriculum have been criticized for expecting change in minority students’ education by using only cultural elements, but since it does not consider a systemic modification to society then the outcomes can be limited (Delpit, 1995; Ladson-Billings, 1995a). I agree with Delpit (1995) and Ladson-Billings (1995a) arguments, and try to include aspects of students’ agency and critical consciousness within my perspective. Although, the journey for improving Indigenous’ education is long and will require more than curriculum transformation, there is urgency to begin and to consider how CRE might improve this path.

**Curriculum development**

Curriculum development is one aspect of curriculum studies that has had more research and support before the 1970’s. After curriculum re-conceptualization took place in the 1970’s-80’s, there was a shift in curriculum studies where the emphasis turned to the theories or paradigms on which curriculum is founded instead of being focused on the process of planning and design. A shift to what Pinar (1996) refers as understanding curriculum. Currently, although curriculum is primarily explored from those theories, in the practice educators continue developing curricula.

This shift was related to critiques regarding curricula that followed a strict recipe as a guide for developing programs. Some argue that this perspective limits curriculum studies to a technical approach (Pinar, Reynolds, Slattery, & Taubman, 1996). In addition, many argue that it is impossible to try and accomplish a process according to particular stages, when in reality it is more of a reflective and continuous method (Hunkins & Hammill, 1994; Print, 1993).
This project agrees from which this thesis has been carved is framed in Hunkins and Hammill (1994) terms, and argue that the creation of a contemporary curriculum development process involves the consideration of previous theorists such as Tyler. This process includes both technical and theoretical perspectives as opposed to either. There is need to bring both together and create something new. Therefore, the goal of this research is to use the theory regarding culturally responsive education, the experience of lesson planning, and the analysis of curriculum development models to create a perspective that embodies all of these.

Accordingly, the process of curriculum development involves the use of models that guide the CRE perspective, analysis, and understanding of the lessons planning explored in this thesis. Identifying and comparing the diverse methods of planning offers the possibility to recognize the approach used by the people involved in this project and the areas that might need further work and emphasis.

Although there are numerous models of curriculum development, this research explores three authors that are more aligned to the CRE perspective: Schwab, Freire, and Cajete. The reasons to include these three models is because they take into consideration: the numerous stakeholders involved in lessons planning, making community members part of the development process, including a dialogical process for defining curriculum content, and putting into dialogue the Indigenous and Western Knowledge. Additionally, the goal of Freire’s model is to liberate the oppressed from oppression. These reasons are related to what CRE mentions about curriculum development for Indigenous students. The next section will present these three models of the curriculum planning process. Each model includes a description of the process and the people involved in it.
It is important to mention the work of Ralph W. Tyler in the area of curriculum development (Hankins & Hammill, 1994; Pinar, Reynolds, Slattery, & Taubman, 1996) since he has been the basis of all other contemporary curriculum models. Tyler’s four key questions for developing curricula are the basis for the work done in this area:

1.- What educational purposes should the school seek to attain?
2.- What educational/learning experiences can be provided that are likely to attain these purposes?
3.- How can these educational experiences be effectively organized?
4.- How can we determine whether these purposes are being attained?” (Tyler, 1949, p.1)

These questions are followed by a series of considerations in each of the four areas that define the process of curriculum development. Besides the criticism that Tyler has received for having a technical approach, his work has had profound influence on the curriculum planning process.

**Joseph Jackson Schwab**

Schwab had a practical perspective of education covered through his numerous theoretical and practical essays. He states the importance of practice and the teacher as curriculum developer in different charts of his essays. Tyler and Schwab worked together, and some of Tyler’s influence is found in Schwab’s perspectives especially in the role of curriculum and the sources of curriculum objectives.

**People involved in curriculum development**

In his essay “The Practical Translation to Curriculum,” Schwab (1978) describes the people involved in curriculum development and the stages of this planning process as
deliberation. More than people in particular, Schwab argues that a person representing each of the five following groups should be part of curriculum development: students, milieu, subject matter, teachers, and curriculum specialists.

The learner knowledge is about the students for whom the curriculum is planned, their age needs, characteristics, previous knowledge, academic difficulties, and challenges. It should be a person that possesses intimate knowledge of the students. Besides, this knowledge includes the possibilities of students’ future economic status, the activities that they enjoy, their aspirations, and the role they play in the family, among others.

Knowledge of learner’s milieu is knowledge of the environment in which the learning will take place: including the school, classroom, and social community. On the level of the school and classroom, is knowledge about the relationship that the teacher and students have. This includes understanding of the community, religious groups, socioeconomic class, and ethnic groups found within the students’ milieu. In addition, knowledge of learner milieu is about family and parents’ attitudes and aspirations in relation to education.

Knowledge of subject matter is about familiarity with the subject matter to be involved in the curriculum. This is about field knowledge needed for that particular discipline.

Knowledge of teachers’ is knowledge about the educators, which includes what they know and how flexible they are to learn something new. This includes recognition of the relationship between teachers and students, the educational direction of the school, how teachers feel about themselves— their personalities, characters, and attitudes. In addition, it would be desirable to know about teachers’ backgrounds and biases.
Finally, curriculum developer should be a person that knows about the curriculum making process—a curriculum specialist. The curriculum specialist acts as a mediator between the different interests and forces of the representatives, acknowledging the importance of the participants’ perspectives in the program. The curriculum specialist has the role of a chair person and monitors the procedure: reports on the course of deliberation, what the current stage is, what has not been considered, and what could affect the process. The curriculum specialist writes the reasons and meanings for certain curriculum decisions defined in the deliberation process. He instigates, administers, encourages, monitors, and is chair in the process of realization of the curriculum.

Persons with all or any of these knowledge must be involved in curriculum development. No representative of any knowledge aspect should dominate the curriculum-making process. If this process emphasizes one area more than others it will be imbalanced. If one of the representatives is missing, the curriculum will acquire the perspective of a representative aspect.

**Curriculum development model**

Schwab (1978) argues that the first stage for defining curriculum elements is through a process in which the planning group learns about the effects that the actual or previous curriculum had on students. Then, in the second stage, planners introduce scholarly materials that could potentially be used for the curriculum. The planners, and sometimes a diverse group of subject matter specialists, generate alternative curriculum materials that might be used as curriculum bits. The scholarly material is examined in three areas, which are its curriculum potentials: its statements, “its originating discipline, and its access to disciplines” (Schwab, 1978, p.381). After selecting the materials and the
particular areas to change, the curriculum modifications will be tested before the curriculum is distributed. The evaluation is done in collaboration with the teacher using the proposed curriculum, and its purpose is to improve the curriculum proposition.

According to Print (1993) this is a more realistic approach to curriculum development, for it reflects the complexity and confusion of the planning process. This model offers flexibility from one stage to the other. This model addresses the failure of the previous curricula used, and considers the need to start from there during the planning process. Testing the program proposed in classrooms offers an accurate idea of how it will work in the practical sphere. This aspect also gives the possibility for modifying the curriculum before implementation.

Bringing in different voices and participants as part of the planning team offers the possibility of attending to a variety of societal needs. It also addresses some of the variables that impact education, but at the same time addresses areas in which school has had an influence.

**Paulo Freire**

Freire is best known for his pedagogy for liberation, in which he argues that through a dialogical process students and teachers redefine their world and become aware and critical of it. As part of his pedagogy Freire describes the process of curriculum development.

**People involved in curriculum development**

Freire (1970) considers that searching and selecting educational program themes is derived from a research process. The people involved include a researcher and research assistants, who are volunteers from the area of study (community). They are part of the
research team and are also involved in circles for reviewing the themes. In addition, subject specialists work with the researcher/teacher. The teacher and the students will also assist the researcher or will provide important information to create and modify the program before its full implementation.

**Process of curriculum development**

In order to find the educational program content, Freire argues that a “thematic universe” of investigation should be followed. It is a process of continuous dialogue, in which there is the discovery of generative themes that at the same time stimulate people’s awareness of those themes. The thematic universe of themes is found within the men world and its relationships (among world-men, and men-men). Men are confronted by the themes, which might work against or in favour of them.

Generative themes are realised when man interacts with his reality, or as Freire called it, within the “men-world relationship” (Freire, 1970, p.97). Therefore, the methodology for investigating the generative themes has to involve the investigator and the local people as co-researchers. This investigation has to be reciprocal, and even when themes are found within the interaction of world-men, it is important not to turn the investigation into the people, because they will become the objects of the investigation and that is not the desired perspective for developing the program.

The investigation on education has to be sympathetic, for there must be a process of communication in which the experience of reality is constructed in interaction (Freire, 1970). Thematic investigation and education are two stages of the same process. The former is divided in the three phases described below.
The researcher arrives to a community and speaks about his purpose there, explaining the importance of community participation in the study. With the community’s approval to participate in this project, the investigator will invite people to volunteer and work as research assistants. The active participation of research assistants is key to this work. Researchers start their visits to the community with an attitude of creating together, not of imposing perspectives. They start gathering information about life in the area and at the end of each observation/visit the researcher and local assistants discuss their findings.

The second phase of the research begins with “the apprehension of the complexity of contradictions” (Freire, 1970, p.106). The investigation team will pick some contradictions to be codified for their use in the thematic investigation. The interdisciplinary group will then prepare and study all the thematic possibilities of each codification.

During third stage, the research team brings the codifications back to the area “to initiate decoding dialogues in the ‘thematic investigation circles’” (Freire, 1970, p.110). During the circles, participants discuss and decode the material prepared based on the contradictory themes of the community.

After the decoding process has been completed through the circles, the investigator will listen to the recorded discussions and search for themes. Those themes will be categorized by disciplines; however, not in a rigid method, but instead will be explored through all the disciplines that are related to it. Then the specialist will work on each theme, breaking it down and finding its fundamental nuclei (containing learning units and a sequence) in order to offer a general perspective of the theme. These will be used as contents but could also be utilized to write essays.
During the discussion, themes that were not considered previously will come out. But also during the learning process, the teachers and students will find themes that were not suggested. Therefore, this is a continued process of themes definition. After breaking down the themes a codification process begins. Codification involves selecting the best channel to represent the theme.

Finally, the first activity of educators will be to present the general program of education to the people. They will identify themselves in it because they have worked on its development. The educator through a dialogical process will explain the presence of themes in the program and their significance. Students and educators will also review and discuss the program in order to modify it according to students’ suggestions.

The most important aspect of this process is to make people feel like masters of their thinking and perspectives by discussing and thinking about the views of the world suggested by themselves or their colleagues. People (students) have to be involved in curriculum development, and the beginning stage of liberation is related with the finding of the themes. “Because this view of education starts with the conviction that it cannot present its own program but must search for this program, dialogically with the people, it serves to introduce the pedagogy of the oppressed” (Freire, 1970, p.118)

Freires curriculum development process is based on peoples’ interests and reality, in other words, on students’ needs and meaningful themes. Freire’s model includes a constant and close involvement of people from that area. This approach involves a reflective process and awareness of reality from the initial stage of curriculum development.

The research and definition of themes are developed in a process that is based on reciprocity. Researchers contribute to the topic selection and with the investigator they define the area’s themes. Reviewing and selecting themes takes place in a dialogical
method between research participants, teachers and students. The investigation is returned to the people so that they can use the data. It is a learning and sharing process between researcher/teacher and participants.

**Gregory Cajete**

Gregory Cajete is a Indigenous American scientist who has written about Indigenous science, and bases his work on Indigenous cultures and perspectives. His approach to curriculum development is guided through his First Nation worldview and his belief that it can come into dialogue with the Western approach.

**People involved in curriculum development**

He proposes a change at the school level, therefore the teacher is the one that will make the curriculum modifications and developments. Cajete (1999) states that parents and principals have to agree with the curriculum and pedagogy proposed by the teacher. So this curriculum development is realized mainly from the teacher who has the support of parents and principals. In addition, this curriculum is designed for schools in which First Nation students from the same or different cultures predominate.

**Curriculum development model**

Cajete (1999) pursues to present a science education model for Indigenous students that can be technically usable, but also aesthetically balanced. A model based on the socio-cultural characteristics of Native American students. According to Cajete (1999):

“Two very simple ideas were utilized to guide the designing process of this curriculum: first, that culture is intimately involved in the nature and expression of the scientific thought process, and second, that science is a creative process of thought and action and, as such, is highly interrelated with other cultural systems such as art” (Cajete, 1999, p.102).
So this curriculum is based on a cultural perspective for teaching science to Native American students.

Cajete (1999) uses the analogy of a mandala to express the process of curriculum development, which utilises the image of concentric circles to describe a process, indicating that something happened in the past or in the present moment. Each ring is unique and whole and leaves a mark because it represents an aspect of nature, but at the same time each joins to the other and commonalities are shared in the overlaps.

The mandala symbol is similar to the medicine wheel, and both show an interrelation process. “A mandala (relationship circle) shows the relationship and significance of the courses of study in a curriculum” (Cajete, 1999, p.103). It is an illustration of how science is symbolically related to all the other disciplines, such as art, philosophy, creativity, spirituality, psychology, well-being, healing, and the natural world of Indigenous cultures.

The processes in nature can also be illustrated by the concentric rings. The mandala exemplifies how every process has an impact on other processes, or in other words, it shows the interrelationship between natural phenomena. The mandala guides the perspective and thought of Indigenous science, demonstrating that the processes are interconnected and everything is interrelated even though they are also unique and particular.

The mandala also represents the learning process, its growth and development. Based on the above foundations, Cajete’s strategy of curriculum modeling is to present the basic principles of general science. The first phase is to teach the ways in which science principles are understood, developed, exemplified, and utilized in Native American cultures. Then the same content will be explored through Western science. The aim is to
show that both perspectives are the result of different cultures and their different thinking processes.

After presenting the Western and the Indigenous paradigms, students will explore and discuss what they have learned. The group will compare both paradigms, and a partial synthesis and summary of the paradigms, perceptions, and components of Western and Indigenous science will conclude this stage.

Students will develop ways to understand and link both Indigenous and Western science. It is a process of restructuring what they have learned in order to integrate the two systems, while at the same time acknowledging and identifying the differences.

The ideal final goal of this curriculum is to produce a Native American student who is basically science literate, who understands and appreciates both Native American and Western approaches to science, and who has, in the process, become aware of his own creative thinking abilities (Cajete, 1999, p.144).

Cajete’s curriculum model is founded upon the cultural science of the attending students. The entire model is based on Indigenous American culture and science. Cajete (1999) argues the need to bridge Native American and Western science. He states that both agree in some areas and disagree in others, but developing both increases understanding and perspectives. He brings into a dialogue Indigenous and Western knowledge, and then lets students identify and create their new learning.

This is the only curriculum development model presented in this chapter that has an explicitly culturally responsive approach. Some of the elements of this model are mentioned by CRE authors.
Finally, if the goal is to have a CRE impact in the educational system, the ideal would be to discuss for all grades the educational system’s objectives based on a CRE perspective. In such a discussion, students, community members, teachers, and subject specialists should participate. This research pursues to include the voice of those people, who in this particular case were part of the developer group. Additionally, it strives to involve the experience of community members, teachers, field specialists, and discipline educators who are not usually brought into the discussion of CRE curriculum development. Therefore, we are going to understand from a developer perspective what aspects are important in this process and which aspects reinforce what was stated by the scholars.
CHAPTER THREE

METHODOLOGY

This thesis uses an educational case study approach with an action research methodology. According to Stenhouse (1985), this form of case study is used by researchers concerned with understanding educational action; that is, those concerned with enriching the thought and discourse of educators, either by the development of educational theory through the systematic and reflective documentation of evidence. This method also offers the possibility of promoting deeper understanding (Gerring, 2007), for the exploration of a particular phenomenon affords the researcher the opportunity to learn with profundity about it, because it is focused on one experience from which diverse and exhaustive data is gathered. Understanding a phenomenon in depth guides the researcher to acquire insights on the study.

Reflexivity is a key element of this method; Stake (2005) argues that a main component of the case study is reflexivity. This reflection is expressed by learning enough about a case that it can be compressed into a finite report without disrespecting participants’ comments, and without taking away what is of main concern to them. In addition, reflection is what keeps the action research work going.

Of particular interest in this case is the participants’ perspective about the process of curriculum development. As argued by Merriam (1998), case studies are a good design for investigating processes. This approach also presents different points of view (Merriam, 1998) that can be found in each participant’s perception. In addition, Merriam states that
the defining characteristics of case studies are its boundaries, and this particular research presents clear borders.

Case study, as with other qualitative research, has an intensive interest in personal perspectives and circumstances (Stake, 2005). This case study endeavours to explore the individual perceptions from each participant. These points of view are the main data to be analyzed in this study. As argued by Stake, case studies rely on the different interpretations or subjective data.

**Methodology**

When starting work on the methodology section I, the researcher, could not stop thinking about how to work with Indigenous people in this research collaboratively, respectfully, and without imposition. How can I, as a non-Indigenous person, work with Indigenous people on a research project without Western-dominant approaches? More specifically, how could I perform research while acknowledging the colonized damage caused to this group? And finally, how to make this a collaborative and participatory project when I am the one in need of this study?

In an effort to find a perspective that could guide my work in a responsive, respectful, and reciprocal way, I searched for direction from Indigenous scholars about Indigenous research methodologies, and although I found some guidelines, I still could not understand my role as a beginner non-Indigenous scholar. So, I turned to people without Indigenous heritage, those who have worked within a critical perspective with Indigenous scholars in ways that seem respectful, scholars such as Haig-Brown.

However, I learned that each person has to define their own path, and although this journey has been walked by others I have to do a critical analysis of who I am and define
the elements with which I want to create my path. This is the beginning of my journey, but as with many other learning experiences it requires constant reflection, development, and re-creation.

Through the readings of Smith (1999), Steinhauer (2002) and Willson (2001), I understand that beyond a research method an attitude towards research and education must be developed (Steinhauer, 2002), and within a perspective that respects people and their cultural background. According to Wilson (2001), it is all about relationships. Therefore, the relationships developed in this study between researcher and participant are the key element that guide the investigation.

The relationship and ethics developed during this project are guided by the four R’s of Kirkness and Barnhardt (1991). The four R’s are as follows: respect, relevance, reciprocity, and responsibility. The development of relationships between those involved in this study is my main concern as researcher, and the four R’s lead the characteristics of the rapport.

In this investigation, respect is understood as regard with honour to the individual and to his/her cultural background. Respect should be shown to who the person is, their experiences, knowledge, and ideas. It can be shown in different ways, but it should be clearly identified in the relationship developed between the people involved, by listening and learning with the participant. Respect is a foundational characteristic of the relationships built between those involved, and has been expressed from the first contact with the participants. A constant search for respectful space is needed for the creation of transformative research (Haig-Brown & Archibald, 1996).

Respect is shown by sharing the research control and power. The participants along with the researcher give meaning to the study, for both review, re-create, and modify the
analysis results. All participants of the study work together in a shared-power relationship, in which they are all respected as guides of the investigation. In this study the researcher is not superior, on the contrary, the researcher is a learner and the participants the experts (Haig-Brown & Archibald, 1996), for they are the ones with the expertise and knowledge needed for the creation of lessons.

Relevance is understood as significant to this research and to the tipi lessons planning group. The research project is relevant and of interest to the people involved because they are working in areas of Indigenous education and their findings and reflections can be used to inform their work. Likewise, the areas to be explored and analyzed are based on what they define as important.

In terms of reciprocity, the participants and the researcher are working together to develop lessons and create a community of learners. Through mutual reflection they constantly learn from each other. Reciprocity is developed by involving the participants in the research, sharing the power and creating a relationship similar to that of mutual collaboration. Reciprocity infers power shared among equals (Maiter et al., 2008). The people involved in the study research the experience as co-researchers. With the researcher they create understanding and knowledge together, which leads to “new levels of understanding for everyone” (Kirkness & Barnhardt, 1991, p.7).

This research has the responsibility of using the data in the best interests of the participants. There exists an obligation to share, review, and modify the research with the participants what has been written as the result of their interview-conversations. Furthermore, in relation to the participants, the researcher is committed to informing and considering what is done with the study or where it is published. Finally, the experience must be shared and discussed with the participants in a responsive way.
Embedded in an action research project is that the participants together with the researcher reflect on the current process of curriculum development in which they currently work. The reflection on the work done is relevant for the improvement of the forthcoming activities that arise from the planning, and could guide us in further lesson design. Participants and researchers had the same opportunity to reflect by acting both upon resulting insights. Following Atewh, Christensen, and Dornan (1998), the focus of the research is on listening to the voices that are seldom considered in educational research and learning from their experiences and suggestions.

This is an action research project because I, the researcher, am part of the tipi group and am investigating my own and my team’s experiences while we undergo and improve the actual process of this project. Therefore, the tipi group is in constant communication as we continue to work on the development of the lessons.

Moreover, this is an action research project because it investigates the work that the tipi group does as they continue to work and develop the lessons. However, it only looks at the tipi group as they try to learn from their past and present experiences of developing CRE lessons through interviews. This project is not using as data the drafts of the lessons or the discussions we had had as a group, instead I am only analyzing participants’ interviews to gain insight into the process of developing CRE curricula.

**Research context**

Merriam (1998) states that the defining characteristic of a case study is the boundary that it has. Accordingly, Gerring (2007) argues that “the case connotes a spatially delimited phenomenon” (p.19). The delimitations of the case make it specific and at the same time easy to identify. This research looks at a specific group that worked together
developing lessons in a workshop at the Banff International Research Station (BIRS). The workshop per se has its own limits, however the group to be explored explicitly has clear boundaries that involve only those engaged in the development of the tipi lessons.

This case study is focused on the development of math lessons, which were worked on by Indigenous Elders, mathematicians, math educators, and teachers. The participants are the group of people involved in the development of adaptable and culture-focused math and science lessons called, Tipi Application on Math and Science. This was one of the outcomes of the 2009 First Nations Math Education workshop organized by the Pacific Institute for the Mathematical Sciences (PIMS) at the Banff International Research Station (BIRS) held in November 2009.

For this workshop participants were invited to attend according to their previous work and interest in Indigenous education. The people attending were selected and included with care, according to the focus of the meeting, which was “to create lessons that could be used in the current mathematics curriculum, which would reflect Indigenous knowledge” (Banff International Research Station, 2010). Most of the people participating in the workshop had assisted in two previous meetings of this kind. Therefore, some people knew each other and had already worked together. The people participating for the first time were recommended by participants attending the previous meetings. Thus, all participants had a genuine interest in being part of the workshop because their work relates with what was going to be discussed or developed within the meeting.

During the workshop all participants met in the morning and viewed a presentation on the work one of them was doing in the area of Indigenous math education. The first presentation was about an action research project on culturally responsive math education in an Aboriginal community in British Columbia, Canada. In the afternoon participants
worked in sub-groups developing math lessons based on a cultural content. In the afternoons, participants would meet to play games, chat or go into town. All the meals were served and included in the workshop at BIRS, so the participants spent all five days together.

This research explores the experience of one of the sub-groups of the workshop who decided to create lessons based on a tipi story shared by the elder. This group collaboratively selected the tipi story because of its math and cultural potentials and because it was powerful for them, as you will read in the analysis section. The tipi story is:

**Figure 3.1 Tipi story**

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**The little tipi story**

**By Mary Ruth MacDougall**

One year, in the late 60’s there was an Indian Day Encampment. The people invited our family to camp there. We accepted the invitation; however, we had no tipi, so we borrowed our parents’ tipi which was a medium size tipi. We also had to borrow the tipi poles from the village. The only tipi poles we could borrow were tipi poles meant for a large tipi.

We are from the Blackfoot tribe, it so happened there was a Blackfoot Elder at the encampment so we asked him to help us set the tipi up at the west end of the encampment. We proceeded to set up the tipi. We thought it looked pretty good, even though the tipi poles were too long.

One of the Elders from other tribe, stood outside his tipi and hollered “Hoho hwayyyy!! Look at the Blackfoot tipi. The Blackfoot people claim they are experts in setting up tipis. Look at their tipi. The poles are so long that you could put another tipi upside down”. It was the joke of that particular moment. In our tradition we often make fun of what people do, but we never retaliate. We just laugh it off and wait for an opportune time to lash back. Our opportunity came sooner than we expected.
There were many other sub-groups that developed math lessons based on cultural knowledge, for example one group created a math lesson on building sweat-lodges. The people of these sub-groups were assigned to work together. The organizers tried to put at least an elder, mathematician, and teacher in each group and with this premise they designated people to each group. Sub-groups were asked to create math lessons based on Indigenous cultural knowledge, so first they were invited to select and identify the cultural area they wanted to work on, and then to create a math lesson based on such an area. At the end of the workshop each sub-group presented their math lesson to all the participants.

This case study is on one of these sub-groups and the work they developed and still continue to develop. The research explores mainly this curriculum development experience while working at Banff, however, it is informed by the participants’ previous and continuous work, not only on the tipi lessons, but also on diverse projects involving math and Indigenous’ culture.
Even though the work was initiated while all the participants were assembled at Banff, this research has been realized afterwards. Therefore, the communication and data collection has been through telephone and email correspondences. The study discussions, clarifications, and interview-conversations have all taken place through distant communication. There is only one participant who lives within the Vancouver vicinity, and who I have worked on a face-to-face basis.

As one of the participants of this group, I can attest that a relationship exists between the group members. The participants know of my interest regarding this research and they have agreed to share the tipi group experience and their personal perspectives. This research is based on the assumption that people have a better understanding of their reality and needs, hence they can act upon them more efficiently and responsively (Maiter, Simich, Jacobson & Wise, 2008, p.306). Therefore, the comments and reflections of the participants are the key input for further research and analysis (Genat, 2009).

**Study participants**

This research pursues to surpass the separation of researcher and participant in an attempt to go further than the colonized and imposed research previously done on Indigenous people. This is an effort to surpass colonization, and instead endeavors to create a relationship in which participants share the power of research by being part of the inquiry project in all the aspects possible. However, the researcher acknowledges the unequal power relations and the consequences Indigenous people suffer from research developed from a non-collaborative approach. According to Narayan (1993), instead of emphasizing an outsider-insider perspective, the goal is to work on the quality of relations with the people that we will work with during the research.
In this study, both the participants and the researcher are developers of the same lessons, and together they give meaning to their experiences and to the process of curriculum development. They are people participating in the common reflection of planning design. The goal is to achieve a participatory consciousness, which “is the awareness of a deeper level of kinship between the knower and the known” (Heshusius, 1994, p.16). Therefore, the knowledge or the learning experience achieved from this investigation is the result of that close relationship between the participants and researcher, in which they become unified in the creation of meaning and knowledge.

In other words, the relationship of the people involved in this study is key for its development. Beyond physical distance between the researcher and the participants, the purpose is to develop a close and open interaction through which each person can learn and recreate with each other.

The people participating in this research are a defined sub-group that were involved in the development of lessons based on a tipi story. The participants are the people involved in the particular case study to be investigated.

The people involved in the Tipi Application for Math and Science and in this study include: an elder, a mathematician, math educator, teacher, workshop organizer, and myself.

Figure 3.2 Participants diagram
Mary Ruth, an elder who works in Indigenous education, is Blackfoot and works on different projects with her own community as well as others, while collaborating with Elders and guiding diverse educational and governmental projects.

Robert Megginson, a Sioux mathematician, works in the university level and participates in a range of different research projects that range from the geometry of Banch space to Indigenous American math education.

Kathleen is a math educator who teaches at the university level, but who also works in participatory action research projects with teachers who work with First Nations students in two communities in Alberta.

Linda is a teacher who has worked for 14 years within First Nations education, both on and off Indigenous reserves, and has worked with a high percentage of Indigenous students in both cases. She has worked in all levels, from junior high to adult education.

Melania, the organizer of the Banff workshop, was one of the people who initiated and guided the workshop and from which the idea of developing lessons emerged.

And myself, Maria Jose Athie Martinez, a graduate student in curriculum studies who attended to the Banff workshop and collaborated with the tipi group on the development of the math lessons.

Each participant has been treated as co-researcher, they have all been asked to include, change or make suggestions on the investigation, interviews, and transcripts. They have reviewed their own stories with the invitation to modify them, so that their voices are heard and taken into consideration during the study.

Participants had the option to have their identity remain confidential or to share it with the audience and some decided to have their real name and identification. They also were invited to write or describe the way they wanted to be presented, the background that
they wanted mentioned for this investigation, and the areas that they are currently working on.

I felt that using the real names of those that are sharing their experiences here was more respectful, for this way the audience could match the efforts and ideas to a real person that could be contacted for further information and/or for starting a relationship with.

**Method**

The research was explored through the voices of the participants, their opinions on the process of this curriculum development and culturally responsive education, and their further considerations and recommendations for these lessons. Their point of view was gathered through interviews in the form of open conversation. There were semi-structured interviews with the curriculum developers and the organizer of the workshop. The semi-structured questions were guided by the themes that emerged within the first questions, and from there the themes were explored according to the areas mentioned afterwards.

Semi-structured interviews were used to continue the dialogue with the participants. The goal was to create an open conversation in which participant and researcher express their interests and concerns about the lessons development, and to promote free interaction. Following Bishop and Glynn (1999), semi-structured interviews give the possibility of developing dialogical and reciprocal relationships founded on mutual engagement, trust, and sincerity. The suggested themes to be explored during this conversation were on the experience of developing the tipi lessons, on the experience of working with Elders, mathematicians, and educators, their description of the process of developing lessons, and on the use of the lessons in the classroom. To further understand the applicability of this experience, some of the questions considered the aspects of the curriculum development
process that would be reapplied or reproduced by the participants. Finally, a conversation on culturally responsive curriculum concluded the interview.

In order for the participants to be part of the research, a process was started even before the research protocol was created. Participants were contacted via email for obtaining their agreement or rejection on the goals and scope of this investigation. With their authorization, the protocol was created and the research ethics submitted. After obtaining the ethics approval I contacted the participants for their formal consent for their involvement in this project, and from there we scheduled the interview-conversation.

**Interview process**

The general process of the interview-conversation used was the following: after the participants signed the consent form and sent it through email, we scheduled a date for the interview-conversation. Until then each participant provided their house or office phone number so that they could be contacted according to the arranged meeting. I called them and after having a short personal conversation about their job, home, or the tipi project, I introduced the research. During this introduction I informed them that I would begin recording, but they were invited to stop such recording whenever they felt like it. They were also told that they did not have to answer any questions that they felt were inappropriate. Finally, as part of the introduction, I made clear that the interest of the research was to learn about their experience and perspective, and even though I could answer all those questions myself, the goal was to understand their point of view.

After the introduction, the first question from the semi-structured interview guide was asked and I followed the conversation and the emerging topics while covering all the areas of the guide. In some cases there were questions that were not asked because they
were already covered in the conversation; however, I asked them if they wanted to add anything else on that topic.

The interview ended when all topics were covered or when I felt that the participants made comments that indicated that the interview needed finishing. Examples of such comments were, “well, let me know if you need something else,” “thank you, I have to leave,” or “okay, is that all”. Once the conversation ended, participants were invited to include any missing questions or to add to any area they felt could be covered. Finally, they were invited to add any aspect that I did not consider or had missed. The interviews ranged between forty-five minutes to an hour and twenty minutes.

Then the interviews were transcribed so that they could be discussed and reflected upon again with the participants. The transcriptions were completed within three days following the interview, were reread and modified to reflect the actual verbatim conversation (as in the audio-record). The process of transcribing was a journey of discovering the subjectivity of the data. I was amazed by how the sense of the interview transcribed could change when punctuation marks were included. While creating the transcriptions I was captivated by Kvale and Brinkmann (2009), whose argument is in relation to the differences among the transcript documents created by two people. Examining the interview transcriptions with the audio-records reinforced the importance of sending the transcriptions to each participant for their review, modifications, and approval.

In order to create a common understanding of the themes talked about during the interview (Bishop & Glynn, 1999), the transcription was sent to the participant. The participants and I reviewed individually the written version of the interview. Generally, participants sent back the transcriptions with their modifications within five days after they were received. The goal of giving the opportunity to review what each person said was
followed by a commitment to hear, respect, and understand each other’s voice. Each interviewee had the opportunity to clarify and make more coherent the written version of the interview, to acknowledge the differences between the oral and written version, and to provide the time and effort necessary to create knowledge and learn together.

The transcript was sent back to me before the follow-up interview took place. For the follow-up interview a phone call was scheduled. The semi-structured interview guide was developed according to the questions that emerged from the first interview and to the topics that all participants addressed. Again the questions asked were in terms of the areas covered in the follow-up conversation and to the time left for the meeting.

In general, participants would make comments about the termination of the second phone call after twenty minutes of starting the follow-up interview. Again, comments were made that indicated the end of the conversation, such as, “is that all?”, “okay, thank you very much,” or “I expect to hear from you later”. There was only one follow-up interview that lasted up to forty minutes, all the others took approximately thirty minutes. The follow-up transcriptions were also sent to participants for their review, modifications, and approval. With the two transcripts from each participant, the stories about their experiences and perspectives on this project were transcribed for analysis results.

The workshop organizer was one of those interviewed in order to learn about the background of the conference, the reasons for bringing those people together, and the goal of asking them to work on such project. This information gave context to the work realized by the participants during the workshop, and provided support to what participants commented upon. The interview was also semi-structured. The transcribed interviews and findings were sent to the organizer as a means of continuing with a common reflection and understanding of each other’s perspectives. The themes explored included the goal of the
workshops, the development of the relationship between the participants, the expectations on the tipi group, and the way they kept people interested and in contact.

Finally, my role within this study has been as a researcher but also as a participant. As one of the tipi members, I have worked with the group developing lessons ideas, arranging meetings, and encouraging the group work. As a result, I was interviewed by a graduate student at UBC who followed the same semi-structured guide I used for the interview-conversations with the participants. This interview was re-heard, and with it my own story was written down.

However, the idea and goals of this study, the interview and analysis process, and the development of this thesis is my work as researcher. As researcher I found that the participants’ comments informed my own experience, so my own reflections guided my analysis. I also wrote down my own ideas during this research, keeping track of my doubts, questions, and concerns. Thus, I acknowledge that my perspective is involved in this study because I am the researcher, nevertheless I wanted to put my story together with the other stories, as a participant, because I feel I am more responsive to participants by presenting myself as one of them. I also consider that making explicit my own viewpoint within this experience would be a more coherent way to be respectful and reciprocal with participants and with you, my reader.

Differences among interviews
When getting ready for the interview, I would set up everything: the computer and the audio recorder, ensure that the recorder had enough batteries, and would make a test call to test that everything was working properly. I would also review the interview guide,
close any other windows open on the computer, and checked that there was no noise outside or inside that could potentially interrupt the conversation or interfere with the audio.

Usually setting everything up would take me approximately half an hour, and from there the interview would start. The first interview I felt was the least conversational, because while listening to the audio I realized that I was not following what the participant was saying. Instead, I was so worried and focused on not forgetting any questions, that I disrupted the dialogue between us. It was in this first interview that I felt that the answers were shorter, as I tried to prompt questions that followed what the participant had said, or tried to understand her perspective more deeply, but the participant would not respond further. There was another limitation in this first interview, and it was that at times the participant could not understand the questions and I had to repeat them or try to clarify them. In this interview I felt that my ESL language barrier was not letting me get a clear and comprehensive conversation with the participant. I always hesitated on whether the lack of long and profound answers with the first interview was because I was getting used to the interview and a whole new script, or if it reflected the participant’s personality and the way she usually answers.

The second interview was smoother, the conversation was easier and the information was vast. However, the answers were not as deep as I imagined. It was after the second interview, that I discussed this issue with a graduate student and expressed to her my concerns about the language barrier and the prompted questions. The graduate student at UBC told me that even though English is her first language, when she hears the audio record of her interviews she feels that she is not expressing herself properly, so she suggested that I pause to think and elaborate the idea that I want to pursue on the conversation. She explained that everyone can have language problems, but that I should
stop thinking about that limitation, which is at times a barrier to everyone. Since then I felt more confident with my English, and have tried to think more about the dialogue during the interview than the ESL limitations.

The third interview went so smoothly and gave so much deep information that I felt I had finally managed the interview script and was able to have an open and clear conversation. The fourth interview went also smoothly, and so I felt that I was ready for the fifth interview. For the last interview I prepared myself as with the previous conversations, but as soon as I started I realized that this interview was going to take a different path. I was interviewing the elder, and as soon as she started talking the Archibald (2008) readings on working with First Nations Elders in “interview”-conversations came to my mind. I felt ashamed for not remembering them earlier so that I could prepare for the interview to be more of an open conversation guided by the elder’s stories, and by being ready to listen to what she felt it was important in relation to this project, more so than what I had prepared on the script. I had my Western mindset ready, but had forgotten the importance of the CRE approach and the difference of working with a respected elder. Archibald (2008) says that it took her some time to obtain the trust when working with Elders, and that they would not answer in a direct way but more metaphorically and in different moments, not only during the interview. My time was constrained to two conversations, and also to my narrow Western vision. I wonder what would have happened with this interview if I had remembered those readings ahead of time.

**Data analysis**

During the interviews I kept track of the themes that emerged and wrote some notes that helped me follow the interview and cover all topics. The interviews were transcribed
and reviewed with each participant. While reviewing the interview transcription we also
discussed the apparent emergent themes across the data sets. This was a dialogical process,
through which I hoped we would reflect further on the research and learn more from one
another. After reviewing the topics discussed previously, I created a mind map for each
participant. I read the transcriptions of each person more than five times in order to learn
better the significance and the ideas covered by the participants. As each topic emerged and
was developed, I created a small mind map for it. If a participant addressed again the same
topic, then I would continue enlarging the small mind map on that particular theme. I
worked on one participant’s comments at a time, and wrote the story of that experience
after completing the individual mind map. The mind map contained quotes from the
transcriptions, so while writing I used the ideas and quotes accordingly. On the
methodology I have the mind maps sorted by participant. Those mind maps were a way of
coding all of the information per person, and the topics that the ideas evolved from were the
main themes from which I created the subtitles of each story.

The work of each participant was done separately so that the ideas and stories would
not get mixed up. I worked on the next participant’s story after the previous story was
finished. Focusing only on one participant’s perspective allowed me to concentrate on that
particular person and helped me understand more coherently his/her ideas.

After writing each story, and having part of the analysis results created, I developed
a concept map that contained the comments of all the participants. When reviewing the
individual concept map I created ‘post-it’/notes of different colors according to each
participant. Therefore, I could identify who made the comments by observing the color of
the idea. So, each idea/topic of the particular concept map was passed on to a small,
colourful post it. After creating ‘post-it’/notes for each idea, an enlarged concept map was
developed. This concept map was one meter by one meter and half in diameter. A picture of the assembled concept map is found on the methodology appendix b, as well as each individual concept map; the ideas were located by topic and the group of those themes evolved through the development of a conclusion’s theme.

The ideas were relocated on the assembled concept map, and each topic was developed in the written version by itself. With those intertwined perspectives grouped by theme, the summary of the analysis results and the conclusions were developed.

Participants’ perspectives were contrasted and complemented among one another, and with that, the results written. While developing the assembled ideas I included literature relevant to that particular theme. Therefore, the connected ideas and comparison with the literature review was simultaneously developed. In addition, further research and suggestions on these areas were proposed. Finally, the participants reviewed the findings, and in a reflective discussion they suggested whether the research needed further work or modifications.

**Limitations of the study**

This action research study only uses interviews as the data collected for the analysis, which implies limitations in terms of the method used, since usually action research investigations also involve field notes, observations, and/or discussions among participants.

One of the biggest limitations of this investigation is that even when the goal was to make it as participatory as possible, so that participants could be involved in all aspects, the thesis is mine alone; therefore, the timing for finishing and the authorship was narrowed because this is a requirement for graduation. I wonder how responsive and respectful this research is when one person decides the goals, objectives, limitations, and time frame of the
study. However, I tried to develop a close relationship with each one of them, and endeavoured to involve them and to hear their voice as much as possible.

I consider that writing the researcher’s story among the participants’ stories reflects the goal of disrupting the common separation that exists between researcher and participant. I definitely admire and feel a deep respect for each person that I have worked with, therefore, I never felt superior to them, on the contrary, I acknowledge all the knowledge and experience they have had, from which I was always eager to learn.

This investigation is also restrained in terms of scope, because it is researching the experience of one particular group while developing CRE lessons. It would be extremely difficult to generalize results based on one case study. However, there are some ideas in terms of the relationships built while developing CRE curriculums that can provide basic guidelines for any co-developing and collaborative project.

Validity

Bishop (2005) states that validity should not be defined by outsiders nor by the researcher as an authoritative person that objectively identifies whether what it is said by the participants is valid or not. That is the perspective of a positivistic approach. Instead, validity should come from within the participants of the study. They had experienced the process of lessons planning, and at the same time have collaborated in the creation of the meaning of the data and the analysis. Therefore, validity is defined by the people involved in the research, and they did so by reviewing and modifying each one of their stories and then intertwining them.

In Kaupapa Maori research the community defines what is valid and what is not, in respect to their culture and knowledge. In this particular research, in which we are not
exploring the cultural knowledge but rather the experience of the people involved in the curriculum design, the validity is given by the participants. The validity of what is said is given by the community, and the participants are part of that community.

Finally, in an attempt to achieve the internal validity of a qualitative study, Merrian (1998) recommends that the researcher clarifies her “assumptions, world view and theoretical orientations” (p.205). Therefore, the authors’ background was presented in the introduction of this work.
CHAPTER FOUR

ANALYSIS RESULTS: SHARING EACH STORY

During the course of this research I had the good fortune of interviewing people with diverse perspectives, backgrounds, heritages, and areas of expertise. Each interview-conversation is unique because of the differences among the participants, which can be observed through variations in emphasis, areas of interest, and previous experience, all of which are of interest and are worth mentioning separately. In this chapter I strive to present the richness of each participant’s unique perspective. Compiling summaries that concentrate on what is important for each participant and why it is important to them had its own challenges. The conversations ranged from 1 to 1.5 hours, and I am presenting here a five-page blurb. I tried to be fair with each person and hope to have adequately expressed the respect I have for all who participated.

As mentioned in the methodology, in this research I had the opportunity to work with an Elder, a teacher, a mathematician, a math educator, and an organizer of the workshop. This chapter will describe the conversations, interests, and experiences of each in the order presented above, followed by larger themes that were found to be embedded across all of the interviews. My story as a member of the tipi group will be presented also in this chapter. Before continuing I would like to thank each participant for their time, interest, and support, without their input none of these interesting ideas would have been shared.
Elder: Mary Ruth
The tipi group was blessed to work with Mary Ruth. Although retired, she is still very actively involved in many projects that strive to improve Native education and government. During the time that I interviewed her, she commented: “I am involved mostly with the Elders, I am involved with the math, involved with the cross-cultural program, then I am doing my genealogy and my craft jewellery”.

Mary Ruth’s extensive experience comes from working as a lab technician with a science background on Blackfoot curriculum studies from the University of Lethbridge. She studied education and worked with adult teaching skills. She also worked as coordinator in adult education. Nowadays, Mary Ruth is committed to working with Elders from her community and she encourages them to participate in all aspects of the community life, in particular, in all educational matters. As she mentioned, her main interest is “helping our Native people on going to further education”.

Including Native culture in the actual curriculum
Mary Ruth’s focus in the First Nations math workshops is on how to improve Native education and how to get Aboriginal students excited about math. For Mary Ruth, including Indigenous content into the actual curriculum is very important, and that is where the tipi project comes into play. Painting the curriculum with Native content will be beneficial to everyone. As noted:

[Banff] was a chance for Elders, mathematicians and Native teachers to get together to share some issues regarding First Nations students and to encode the Native culture into the existing English curriculum, the Alberta curriculum or Canadian curriculum. Because I think in all the math workbooks and the other subject areas there is so much that could be taught from European, or mainstream society and if we have Native content in there our students would, hopefully, get more interested in the work because there is something they can identify with. And also our
students, our Native students, they will also learn the way we lived before the Europeans came.

As she explains, it will be favourable for First Nations students because bringing Aboriginal knowledge into the curriculum will spark interest in education, make them feel proud of their Aboriginal culture, and help them to better understand and identify with the official curriculum. At the same time, this is valuable to non-Indigenous students because it will offer a more positive picture of Native people than the common stereotypes (poor and drunks).

Encoding Native culture into the actual curriculum is a concern Mary Ruth confronted superficially in a previous experience. She mentioned that while working in a post-secondary school she encountered the challenge of bringing First Nations culture into math courses, and at the time the only connection she found between these two areas were poverty and population percentages. However, after attending the Banff workshops and thinking deeper on how to bring Native culture into the curriculum, she sees a lot more areas to develop and work on. In addition, Mary Ruth acknowledges that Native culture had development in all disciplines and areas, and she considers the importance of teaching that in schools. Therefore, the Aboriginal content can be embedded in all educational fields.

Acknowledging the active concern of Mary Ruth towards improving Native education, and considering all the work she does in this area, I want to share Mary Ruth’s blurb with a quote from our interview:

“So we have to explore what it is that would encourage our students to be more interested in education, to be more interested in learning.”

Mary Ruth enjoyed and appreciated participating and sharing ideas with Elders, mathematicians, and Native teachers at the Banff workshop. For her, being in a group with
these people offered her room for expansion and further learning, but also the opportunity to think on how to encode Native culture into the actual curriculum. In particular, Mary Ruth enjoyed listening to mathematicians because it renewed her math interest and curiosity.

_Elders involved in all levels of education_

Involving Elders in education is a big concern for Mary Ruth. As she commented on the activities Elders do for Native Students’ schooling, she expressed how Elders on her reserve are part of the education process on all the different levels. Elders participate every week in the head start program, but also in the early childhood education, elementary, and with the youth. They are very actively involved in all the different grades provided on the reserve. According to Mary Ruth, Elders have a need to participate in education because their stories can help teachers and mathematicians. But there is also a personal need for Elders to be dynamic, because if they do not feel useful they will just wait for the end of their journey.

“Because in my view you have to have a purpose, you have to be involved in something, if you do not you just sit and you rot, you have to keep your mind active, your body active.”

The practical need of Elders to be involved in different projects, guided with the importance of involving Elders in all educational levels, brought Mary Ruth to the workshop and to facilitate the tipi group. In Mary Ruth’s reserve the Elders are the advisors and consultants for her people and for the younger generation in particular.

_The tipi story had math possibilities_

In terms of the Banff workshop and the tipi group experience, the tipi story is an anecdote that Mary Ruth shared with the group which details her own experience setting up
a tipi. When I asked her why she chose that story, she said that in the first workshop she attended the Elders were sharing stories and, although she does not know many legends and stories, she continued to think about the math and science content involved in her experience of setting up the tipi. She told that story because of its mathematical potentiality and because of the unique structure of the tipi. As soon as she shared the story the mathematicians and people in the workshop got excited and started asking many questions and/or drawing solutions. And, according to Mary Ruth, the tipi story just “got things going”.

The tipi is an interesting area to explore in education, in particular because of its unique conical shape, which responded to the need to have shelter that could be set up and taken down quickly and easily in order to move and follow the buffalo (as the Blackfoot culture did).

Some of the mathematical content that Mary Ruth thought could be used with the story is geometry, parabolas, and velocity, but “there is a lot more” according to her. She stated that the lessons could set good math and cultural foundations from which students/teachers could expand upon. Mary Ruth believes that teachers could start using the tipi lesson with the younger grades and expand to the older grades, all the while getting more sophisticated and complicated.

Now that we started to do the lessons plans for the younger grades, it can expand more to the higher grades and get more sophisticated, like when they are talking about binominals, that is for the higher grades. So that can be expanded as we go along, yes start from the bottom and work our way up.

As articulated, students can learn basic content in the first grades and later go into higher levels and more complex content. Finally, the lessons can help the teaching of First Nations and non-First Nations teachers.
**Guiding the tipi group process**

Mary Ruth had a key role in this development process and guided us with her leadership skills, therefore the results of the tipi story happened not only because she shared the story. Robert in his interview mentioned that the open-ended discussions worked because we always had a facilitator, and in the tipi group Robert considered Mary Ruth the facilitator (Robert interview transcription, April 27\(^{th}\) 2010). From my own perspective as a participant of the tipi group, Mary Ruth definitely kept us going, she helped us focus and cultivated in me the excitement and will to work on this project. Melania also commented that Mary Ruth was making everyone move and work (Melania interview transcription, April 21\(^{st}\) 2010).

The above statements concord with what Mary Ruth articulated; she commented that when groups were assigned, Melania (one of the organizers) told Mary Ruth that she counted on her to develop something from the experience. As articulates:

> Well in the small group I was very excited about the work and all the discussions that we did, and I was excited that they chose that particular thing for everybody to work on. And what got me going too is that Melania kind of whispered to me Mary Ruth I am counting on you to get something out of this getting together, to develop something. I forgot exactly how she said it, but to me that gave me an honour, and also it gave me a challenge to do that.

As noted, Mary Ruth considered Melania’s comment an honour, but she also took it as a personal challenge.

**Continuing this project**

Mary Ruth’s role in the tipi group is crucial. Nowadays she is organizing a meeting for June or July in a Blackfoot interpretive center, in which the tipi group members, workshop participants, and students from different schools can experience setting up a tipi
through the guidance of a Blackfoot elder who is an expert in raising tipis. This meeting will give the participants practical experience, or in Mary Ruth words, “a whole total experience,” which will provide good insight for those unfamiliar with setting up a tipi and will offer a better understanding of the tipi. It will give more action to the participants. This field trip experience will make the group more productive and provide action to the discussions that have been ongoing in the group.

Mary Ruth’s comments summary
Mary Ruth’s concerns around including First Nations content in the official curriculum and involving Elders in all levels of education are two key elements that guide her practice. She is intellectually and emotionally invested in projects that can improve the education that Aboriginal students receive. Her enthusiasm, passion, and energy are contagious to all the tipi group members, but also to all the workshop participants. Mary Ruth is an example of fighting proactively for the betterment of Aboriginal education founded on Indigenous knowledge, history, and culture. It was an amazing opportunity to work with such a proactive elder in the tipi process.

Mary Ruth’s appreciation of First Nations knowledge is very important, she argues that Aboriginal people were developed in all areas of society, in all disciplines and fields. However, the way Western education describes Native knowledge seems limited and does not involve all the knowledge that such cultures had. For Mary Ruth, teaching all the areas in which Aboriginal cultures had development is important, because it positions Indigenous knowledge (IK) at the same level and value as Western knowledge (WK), even though Mary Ruth does not use the labels of IK or WK. Presenting both knowledges with the same
importance and the same value is key for Mary Ruth, and it guides her enthusiasm and her role within the tipi group.

For her, involving Elders in education and maintaining their active role are some of the areas that guide her own actions within her reserve, the tipi group, and the Banff workshop. She is involved in all levels of education, and she is extremely active for being retired and for her age. Her involvement in so many projects and areas of Aboriginal education are aspects that motivated me and all the tipi participants.

Mary Ruth envisioned the broad use that her experiential story had within the math field. That is why she decided to share it, and she as other participants were amazed by the reaction generated to the people listening to it. Therefore, she believes the story is what has kept the people going.

She has guided the tipi group to continue developing math lessons. But her concerns go further, for her the tipi group should continue and finish this project which would include lessons for all grades. Thus, there is need to bring a practical perspective which Mary Ruth believes it can be achieved through a field trip. Her current efforts as a key member of this group is to continue meeting, discussions together and having more experiences that will offer a basic input to this project.

It is unfortunate to not have the opportunity to involve her more in this research and to be able to include her more in the tipi lessons’ development process. The input of the Elders at Banff, but in particular her input in the tipi group, has been of great impact for all of us. Unconsciously she has cultivated in the tipi group her vitality and interest in this project.
Teacher: Linda

Linda has been a great help and an enthusiastic participant of this research and the tipi lessons development project. Her optimism and good wishes have encouraged me to continue this journey, but also to find ways to accomplish the completion of these lessons.

Linda’s fourteen years of teaching experience spans from grade 6 to 12, and during those fourteen years she has worked on a reserve for all but one year. She has a Bachelor of Science and a Bachelor of Education. Linda explains that even though her practicum was in elementary classes (grades 1, 2, 4, and 6), she has only worked in secondary and post-secondary education. Nowadays she works with adults in a college. She has been working there for a year and as a result of her efforts she has received a full-time contract a few months ago.

Linda is a teacher that tries to find different methods of getting the lessons across to her students. She says that when teaching adults she gives approximately four different explanations so that all types of learners will be engaged. Linda is very proactive in her teaching style and is always in search of teaching strategies. Through her job and her curiosity on how to improve her methods is what brought her to the Banff workshop.

Linda attended the workshop expecting to encounter different ways to teach math to First Nations students. As a science teacher she has also taught math, and she believes that there is a clear relationship between these two fields.

Linda commented that what stood out from the workshop was the importance of using a story as the basis for facilitating learning. She thinks that stories are a basic aspect of Aboriginal education, and she wrote “use a story” several times in her workshop notes.
Bringing culture into the official curriculum

Linda emphasized that every culture has math and uses math in different ways, but they need someone to point out how math is used in that particular culture. Math is a big portion of all the things we do on a daily basis, and thus makes up a portion of every culture.

The tipi lessons are an example of how math is embedded in culture. Setting up the tipi and the campsite involves a lot of math, even when the cultural group does not talk about it or use math terms. Here are some examples: the campsite is accommodated in a circle figure; three or four poles are used for the tipis main structural base. Linda stated the importance of highlighting the math involved in the tipi and the story, which will be good for students to explore and understand.

According to Linda, the government assigns the official curriculum, but barely refers to First Nations culture, and often does not include any cultural aspects. Linda says that First Nations people should put the culture in the curriculum and if that is not possible then the teacher should take that endeavour. In particular, having Elders helping to bring culture into the curriculum is highly appreciated and valuable because of their cultural knowledge.

Linda noted the importance of bringing culture into the curriculum, and has brought culture into her teaching practice by involving Elders in the classroom or receiving their advice on cultural content. However, she commented on how some cultural elements could be misinterpreted. An example she mentioned:

Sometimes the culture is very lost, for instance I have a grade ten textbook that I used to use and it had water as a topic, and the importance for water to the Native culture is
one of the fundamentals. And in this textbook they had a picture of an Indian in braids that was playing tennis, was dressed in traditional white tennis clothes and dripping wet. And that was the textbooks Native input into water.

Maria: oh,
Which is so sad because it is nothing to do with the Native culture around water, but they had met their FNMI (First Nations, Metis and Inuit) content because they had a picture of an Indian.

Maria: So what would you do then or what would you suggest?
Well, in class we did laughs about it. It is not too many that play tennis (on the reserve I was at) and we talked about the importance of water culturally. So it lets us laugh at how ridiculous the picture is. And the ideas that they (the pictures) are supposed to be promoted is not promoted but you can pull it in yourself and promote.

Maria: Yeah. And the way you usually do it in your class, could you give me an example of how you have done it?
Well, I had an elder that is involved with the water keepers in the reserve come in before and talk to the class. How have I done it… talk about the importance of water culturally and that we all contain it and the basic elements of it...

Maria: Ok, and where do you get the information from? The cultural knowledge?
The elder brings it in him/herself. The other culturally relevant topics are brought in usually through your resource person at your school. Or stuff that you have learned along the way as you had experience in the culture. Sometimes there are professional development opportunities that come up that you apply in it. I know one year they were looking for a poster for, I forget what the organization is, but it is a water related organization and you had to draw a poster and come up with a theme that you wanted to use, or they had their own themes they made promotion for it. And that was tied into, so that we could do the activity and do the poster for the contest at the same time. And one year one of the students from our school won for the Alberta region!

In this excerpt, Linda emphasizes how cultural elements can be misinterpreted, but also how those cultural limitations are surpassed with the guidance of an elder, the cultural resource people in schools, or the experience of the teacher within the community.
Finally, Linda commented that it is good for all students to learn about different cultures. When learning from different cultures, people do not have prejudices so long as they continue learning the subject matter. At Banff, the tipi group had several cultural backgrounds involved: Blackfoot, Sioux, Cree. All the members of the group learned from the Blackfoot story and found many mathematical possibilities to teach students from all educational levels.

**Collaboration was an exceptional opportunity**

For Linda, what was more relevant about the Banff workshop was the exceptional opportunity to co-develop lessons between Elders, mathematicians, teachers, and math educators. Linda articulated that having all these people ready to work and create together was a luxury. Including all of them in the planning process provides additional concepts to the idea that the group will work on. In addition, having a whole week for developing lessons with such knowledge and support is something that no teacher has during their teaching practice.

Linda stated that working with a group of people in lessons development is better than doing it by herself, which is what she usually does (and what most teachers do). She noted that it would be wonderful to work with this group of people for every curriculum development; however, she considers the difficulties implied in terms of logistics and resources. It is impossible to go away for a week for every lesson plan, and it is impossible in terms of the time that co-developing lessons involves in order to include everyone’s voice.

Linda acknowledges the challenge of involving a diverse group of people, among which are Elders. She emphasized that working with Elders is very important because they
have cultural knowledge that is not accessible in textbooks. For her, Elders possess the knowledge that needs to be passed along. Linda had worked with Elders previously, and the Elders’ role was focused on providing cultural knowledge that guides the learning experience. In contrast, at Banff the Elders, and in particular Mary Ruth, not only guided, but were also involved in developing the lessons. In addition, Mary Ruth’s educational background facilitates the success of this kind of work. Linda explains that it was good that the Elders wanted to participate in the whole discussion, and were focused and open to a free exchange of knowledge (cultural, mathematical, and educational). In her own words:

Because you do not usually get people together that they want to work on lessons plans. A lot of the time there is the elder there to guide you in the way of the knowledge, but not for taking in and doing lesson plans with you and discussing the subjects. They might come in and say the story but they do not go into how can you teach the lessons from here, this would be tied in…

As noted, Linda appreciates working with Elders and involving them in the process of developing lessons.

When teachers and mathematicians meet, Linda thinks that they keep it safe and those groups have a lot to share. She would be interested in meeting again in a summer camp for the purpose of continuing this work.

In terms of the group dynamic, Linda mentioned that everyone in the group related well. They were all open and ready to hear each other through questions, comments, and answers.

**Involving students in the lesson development**

Linda stated that working with the group assembled was an exceptional opportunity, however, when asked whether she would include another group in this process, she immediately said ‘the students’. In her opinion, students from high school or university
students doing a teaching degree could be really interested and motivated to participate in this kind of project. The students included should have a basic interest in the field of teaching and learning, so that their reasons to attend and their motivations to participate would be in tune with the goal of the workshop.

If you involve students they could guide teachers, mathematicians, and Elders on the path of creating more interesting, relevant, and significant education for the target audience (students). As Linda said:

“And you are not sure how to teach it in a different way, so if they are there when you are making the lessons, they could say, ‘what if we did this?’”

As noted, including students in the curriculum development process could imply creating activities and lessons based on their interests and needs, and would facilitate their motivation for learning.

*Developing math ideas from the “rich” tipi story*

According to Linda, after the tipi group was assembled and the story told, we all started to pull out all the math ideas we could think of. Through this process we created web-ideas with all the math concepts expressed. From there we commented in more detail (but still in a broad sense) on each one of those concepts for creating lessons. As articulated:

Maria: Could you tell me more about how we went about developing the lessons based on the story.

So the story was told to us and then we pull out all of the ideas that came to us about math. And used that as… kind of a web ideas, so we got all of the ideas of what could possible go from each and different concept. And then we looked at each individual concept and said what connects to each concept and how can we build it into lessons. And we are at the point of building lessons.
Linda articulated that the tipi story was chosen among other cultural topics because the mathematician in the group pushed for that concept, but also because Mary Ruth was interested in working on the tipi story. However, Linda considered it a good story with many possibilities and that can cross the curriculum in different ways. Linda stated:

I think we choose the story because our mathematician really wanted to do that concept, and push to have it go through. And I also believe that Mary Ruth wanted that to happen as well which was fine, it is a good story, it is a good concept. And it has a lot of learning potentials; it can cross the curriculum in many different ways.

**Using the tipi lessons across the curriculum**

Ideally, Linda envisions that the tipi lessons will be used across the curriculum. Although teachers usually isolate themselves in the classroom and are only concerned about their own subject, they should start to work with other subject teachers in order for the tipi lessons to be more useful. The teacher should apply it to more than just the math and sciences; the tipi story should work in social sciences, language, and history.

You can cross the curriculum and that is the basic idea that we got to, that you could do more than just the math and the science in it. You should do the language that is attached to the story and added in. The history of, going to the history of the location that is a lot, a lot really tied curriculum that you can’t bring to the social studies unless you look at the specifics.

In other words, teaching with only one subject area in mind “is not the way to go”.

For Linda the lessons should be used, and could be used, in all educational levels, starting with the head start program and bringing the story back over the years in all levels. Linda commented how the tipi lessons are not tied to any particular provincial or official curriculum and how that opens the possibilities for the lessons to be used in any context; to cross the curriculum through many subject areas. Moreover, since the teachers involved in the tipi group teach four different levels, we were creating lessons for different grades in many different places.
Internet access to the lessons and developers

Linda suggested having the tipi lessons available on a website, in particular the University of Regina website, although others could be utilised.

[I]t would be interesting to tie the website idea with the University of Regina’s website. And having Mary Ruth saying her story so that they hear the way she says [it], the way she recollects it, and her mannerism(s) when telling her story. Add that dimension so that students remember and you can use that when you are teaching and pull things out of it.

As noted, she thinks that having Mary Ruth tell the story on the website would be highly valuable because the teacher would be able to use the video instead of reading an oral story; since hearing the story from the elder has more meaning. She also articulated that an interactive site on which the developers could be contacted with questions and answers would provide better support for the teachers willing to use them. As expressed:

If we do it with the website idea, then it could be something that people are checking on regularly and questions and answers could be put in. So it could be supported a lot more.

However, the group should acknowledge that this sort of website may be geared towards First Nations instead of only for Native people themselves. It is a site for teachers’ to use as a resource in teaching curriculum concepts.

Suggestions to improve this experience and about finishing the lessons

Besides suggesting the importance of having the lessons on a website, Linda provided other recommendations that not only could have improved our experience at Banff, but could also improve our current work. Linda would have liked focus on one concept or lesson while at Banff, so that the whole group had a better idea of what it is we are doing on our own following the meeting. An example of this could be the development of a lesson in different educational levels.
She also commented that she enjoyed the workshop agenda, which had both structured and un-structured activities. But she would have liked more group time for working more on lesson development.

Linda noted that the experience of implementing one lesson in a classroom at Banff would have had benefited us all. For her, implementing the lesson provides valuable feedback that will improve the lesson plan.

Well, it would have been interesting if we would have made a full lesson plan. If that was the intent of the workshop to create lesson plans and we were going to do that. Then it would have been interesting to say ‘this is how we are going to teach it to a grade three classroom,’ and actually go into a grade three classroom at Banff and give the presentation/lesson. Have Mary Ruth tell the story and then pull out the different math out of the story with them and try whatever works, or notes or activity or all three that we had planned to be with other students.

Maria: And how would we have benefit from that? What would have been interesting about that?

Well, every time you run a lesson then you learn from it; you learn the good and you learn the bad, so you say ‘ok, before we did the activity we have to have a lot more talk about the math,’ but we would have had a whole math lesson into whatever making structures, or whatever problems came up. And when you are teaching you do it and you may have to re-teach it or say, ‘yeah, they basically got it, I will change that for next year.’ So it depends on how you do it. But if you can run through it once without having... an example with the sweat lodge that we did. Those teachers had obviously taught that before. Because they knew what problems were going to come up, even teaching the adults, they knew the things that kids did wrong and they were waiting for us to do the same things wrong. So when you can run through it once then you can get a better lesson out of it.

As articulated, implementing the lessons planned would have provided better lessons, because they would have been tested and modified according to students’ needs.
**Linda’s comment summary**

For Linda, it is the job of the community members and/or the teacher to add the culture to the official curriculum. Since, every culture uses math, then there are many examples that can be brought out into the math lessons.

Linda appreciated the collaboration among the group, and in particular liked developing lessons with them. She labelled it as an exceptional opportunity or a luxury. She does not think it is possible to assemble a group like this for her daily practice of planning lessons, mainly because of the implications and difficulties in having all those people assembled. Nevertheless, it would be interesting to understand when she would consider it important to have a group for developing lessons. It is meaningful too that she never mentions the importance of having a varied group assembled for curriculum development at the provincial level.

Moreover, Linda praised the experience of working with Elders in the lessons planning. However, she did not articulate whether it would be important to include Elders in the provincial curriculum development or in the Aboriginal perspective for resources such as textbooks or mandated curriculum.

Linda stated about the importance of working with Elders and mathematicians, but rarely refers to the importance of the work of the teachers, her own work. I wonder how she values her work as a teacher, and how much importance she places on her work as a teacher for curriculum/lessons development. She suggested including students in the co-developing process, so that the learning experiences would be significant for them.

She has a practical concern about the lessons. She wants it to happen, and many of her comments and statements surround how to improve the work as a team or make the lessons better and more quickly. She also gave suggestions on how to improve the
discussion and communication among the tipi group and between the developers and the teachers implementing the lessons. Her recommendation of having lessons on a website was one strategy for continuing the communication among developers and implementers. Also, her advice on implementing the lessons developed and modifying them through that process is a very important suggestion that could improve the work of the tipi group.

Linda’s vision of having the tipi lessons used in collaboration with all teachers is an indication of Linda’s holistic perspective of the tipi lessons. She acknowledges the holistic dimension of the lessons because she hopes that teachers from all subjects will use them.

**Mathematician: Robert**

The mathematician participating in the tipi group is Robert. He is a Professor of mathematics at the University level, and has been trained as a functional analyst specializing in the geometry of Banach spaces. Robert has assisted the two previous First Nations Math Workshops, and as a result he is a participant that has already cultivated relationships with many of the mathematicians and Elders that attended the other two workshops. Robert is also Native American, “a Sioux guy” in his own words (Robert interview transcription, April 27th, 2010).

Robert has a lot of experience in work that aims to increase the participation of underrepresented minorities in mathematics and other sciences, technology, engineering and mathematics (STEM) fields, some of which have included the highest awards for professional service of the MAA and the American Indian Science and Engineering Society, the Quality Education for Minorities Network’s Etta Zuber Falconer Award, and the U.S. Presidential Award for Excellence in Science, Mathematics, and Engineering Mentoring. He has been named on the Native American Science and Engineering Wall of
Fame at Southwestern Indian Polytechnic Institute, and was selected for inclusion in *100 Native Americans Who Shaped American History* (Bonnie Juettner, Bluewood Books, 2002).

For a decade he has worked with the Chippewa Nation in North Dakota where he works in summer camps and participated in different projects that aim to increase Indigenous American Indians’ interest in pursuing post-secondary education in science or math related areas. Robert also participated in the development of math lessons for this Nation; the result of that curriculum development was a book for the teacher.

Another experience similar to the Banff workshop was one where Robert worked with mathematicians, among whom he represented the only Native American with an elder. Robert stated that in such a venture each participant represented an organization and the evolving project tried to accommodate each organization’s needs. In comparison, the Banff workshop’s primary focus was the students, leaving aside the interests of the organization that had sent him or her there.

*There was magic within the group*

For Robert the group was “just right,” because those gathered cared for students from different points of view. But also these people learned from each other, from their diverse world views and had magic among them because they all showed respect between them. The group assembled at the workshop positively impressed Robert, and his first comment about the experience of co-developing lessons was in relation to the group. He asserted that the group assembled “was just right”. Robert’s opinion is based on the great mix of people represented, for mathematicians (First Nations heritage and not), Elders, and
math educators all were in attendance. Each of these groups offered their expertise, which was very important.

For Robert the group was significant because they all cared for the students and had a genuine interest in students’ education from a range of perspectives.

There were people who cared for students from different points of view. The educators cared about them as people to be educated, the mathematicians cared about students because they thought that everybody needed to know more mathematics at a younger age, and of course Native people care about their students because they are their people and want them to succeed.

As articulated in the excerpt, Robert expressed how each group cared about students from different perspectives, emphasizing the attention that each group has for students.

During the conversation with Robert he mentioned his deep respect for all the groups assembled at the Banff workshop. He mentioned the friendships he developed and how he learned from everyone. He feels that the opportunity to be in a room with Elders from different nations is a gift and he really appreciates the chance to share ideas with them and listen to their stories. At the same time, Robert has learned from the mathematicians and has worked collaboratively with them on the topics discussed during the workshops.

According to him, the experiment of bringing this group together was one that worked very well. He noted that there was magic in the group based on mutual respect between one another.

It was magic because everybody respected what everybody else was doing and thinking about... the Elders recognized that the mathematicians and mathematics educators respected what they had to contribute, and that really helped the dialogue across the groups, there was just a lot of respect. The magic occurred because of the respect between the people. It is hard to define, I think we could have put together a different group that might look like it had the same sort of people but they just would not work together so well. (Robert follow-up interview transcription, May 19th 2010)
In this quote Robert comments that each participant of the workshop respected what the other was doing and saying. In his opinion, one example of respect was in how everyone listened to one another.

According to Robert, the positive atmosphere and the magic among the group was derived from the relationships that the participants started to build in previous workshops. Some of the participants had attended all three workshops and had created relationships that in some cases went beyond two years. Robert mentioned that during the previous workshops, each group realized that they had much to contribute; for example, the Elders realized that they had many things to add to the math.

Even though Robert explained that he would keep the group the same, he mentioned the importance of having administrators or superintendents involved in the process of co-developing the lessons. For Robert, the teacher is the one that advocates for change, such as culturally responsive changes in education. However, if the administrators or superintendent are part of the lessons development, then they will be enthusiastic about promoting the changes and the teacher will not need to convince them in order to gain their support.

*The process was guided by participants’ decisions*

In terms of the curriculum development process, Robert articulated that it is hard to define the path we followed because it was flexible and left people to decide the project and goals to follow. Hence, the main decision made by the tipi group was the use of the story as cultural knowledge through which the math lessons were to be developed.

It was an “open-ended” course with “free ranging discussions” guided by the evolving journey that emerged. At Banff the people met because they wanted to create
something of value to everyone (Indigenous and non-Indigenous students) and to find a way to improve the success of Native students in comparison to the other curriculum development processes he has participated in previously. In the previous developments he has been involved in, the developers met with the particular goal of creating certain lessons, and since its creation the group was restricted just to developing lessons. In the third workshop at Banff, after a variety of conversations, discussions, and sharing of ideas on First Nations math education, one activity was the development of resources. But the lessons were not limited to a particular mathematical or cultural theme, nor a particular grade or province. Each group defined their own cultural content to work from and the way they wanted to work with it.

[At Banff,] what we did, instead, we are going to get together we are going to think about how can we make students more successful. And so it was a bit more open-ended, and some of the other projects that I been involved in, would happen like this: people will come and say ok we are going to develop this collection of culturally relevant materials that can be used for example with the Standing Rock Sioux tribe in the Dakotas. And when you do that, I think you are narrowing yourself; there is certainly a need for that. But if I start by saying that is what I am going to do, I wouldn’t have, I wouldn’t end up in a group having a kind of free ranging discussions. These were very open-ended we end up converging to this notion, we are going to do something like develop lessons centered around this idea of the Mary Ruth problem, but we didn’t start there, and I think it was very helpful because we didn’t restrict ourselves right since the beginning. (Robert interview transcription, April 27th 2010).

Through a decision developed through dialogue, the group selected which path to follow and this process empowered the participants and made them feel that it was not a project imposed upon them by others.

The process of choosing the tipi story had its own journey. The story was shared with all the workshop participants in the previous meeting, two years ago. Since then, Robert shared the story with math colleagues because he was really interested in it (Maria
workshop notes, February 1\textsuperscript{st} 2010). Whenever the story was told people immediately started to ask questions and they all saw different things.

[The process] just kind of evolved because everybody started seeing other things that you could do with the problem. And I think that was one of the things that kind of made this free ranging discussion. Because people didn’t say now we are only going to talk about surface area, ok. I think people said things like, Mary Ruth said there isn’t something here like cones, like cutting cones, and I said like parabolas and oh gosh what a wonderful opportunity to introduce cutting sections. People would see things and people see different things there… So there were just so many different things that you could explore, so it just became a nice problem as the centerpiece of a lot of our discussions.

As commented by Robert, the tipi or Mary Ruth problem has mathematical richness, from it there are many mathematical concepts that can be explored and taught to students. Therefore, the story provides a variety of math possibilities offered by every participant through their own unique perspective.

\textit{Teachers collaboratively work with tipi lessons}

For Robert, the potential of the tipi lessons are that they can be used in all subjects and with all students, but they can also teach more than the superficial cultural content. In Robert’s terms he envisions the lessons being used collaboratively and with hands-on activities. He argues that teachers of all different fields can get involved and teach diverse content related to the tipi story. So, collaboration would occur among teachers of different disciplines. For example, there could be science fairs answering why the tipi fell, and at the same time a writing teacher could ask students to write about the experience of working with the tipi problem, or the history teacher could discuss with students why some Native cultures used tipis and others did not. In addition, the lessons will be used mainly in experiential activities, not only in pencil and paper exercises.

Well, I think they are going to use it [the tipi lessons] collaboratively. My vision would be, my own vision would be that there would be a collaborative process
because for example, teacher of mathematics could use part of the problem...I wouldn’t necessarily want the student just to sit down with paper and pencil and do only this. Because there is also the opportunity for the culture teacher to say lets bring in somebody who raises tipis. We talk about this, so they will, in collaboration with such a person they can bring in somebody who raises tipis and that person could show them the culture involved, but besides the culture you can also see some of the geometry that would be involved. So I think that these are projects that I see them using collaboratively and I see as much as possible using them as some kind of hands on lesson.

This excerpt expresses the different possibilities that Robert envisioned for working collaboratively with the tipi lessons and also his emphasis for utilizing them with hands-on activities.

**Teaching deeper cultural knowledge**

Robert believes that these kind of lessons could strive to teach more than the superficial cultural and math content. If the teacher develops curiosity in the students, with the teacher as guide students will start to ask the question “why,” which will lead them to learn and appreciate more deeply Native culture. Therefore, the goal would be to go beyond the surface and learn what First Nations cultures can teach to the West.

Robert stated that the emerging lesson based on the tipi story will be of use to every student, whether they are First Nations or not. As noted:

Well, I think there are a couple of reasons for doing this. One of them, one of the reasons, I would love if every student in the United States, somewhere in their K-12 career, elementary and secondary education career, if they had learned the Mayan numbers, and I want them all to learn that. And there is just one reason why, it is a nice exercise about base, there are a whole lot of interesting things there. But they need to understand that there were people in this hemisphere before European contact that did very very good mathematics and that anything that they hear about Native people not making it into mathematics is wrong. And also, I think that the introduction of this idea for instance this problem, what we are talking about with the Mary Ruth problem because so many Native people, particularly in the United States and Canada, do now have tipis or have used tipis there are all seeing as something, all those folks are going to see it as something relevant to their culture.
But Native people, first of all would learn a lot of geometry from it, and from the stories that go along they will learn a lot of stuff about Native culture, and that is just good, because they can understand that Native culture isn’t just showing people things such as dancing and costumes, which are important, certainly, but also showing people how we gathered and used scientific knowledge, including applications of mathematics.

It will help students learn math and will also teach students about Native American culture, which Robert believes could help students develop a tolerance for other cultures. It would be particularly good for Indigenous students to learn themes that are relevant to their own culture, and at the same time will help them learn more about First Nations cultures. In addition it will teach good and interesting math to non-Indigenous students, and they will learn the math and science development of Native cultures.

**The tipi lessons are closer to CRE than all of what I have seen**

Robert’s first answer about the tipi lessons being Culturally Responsive (CRE) was that only the people belonging to that particular Native group (Blackfoot) could define the lessons as CRE or not. For Robert however, they were definitely culturally informative and closer to CRE than almost anything he has seen.

[T]he First Nations people, in particular the Blackfoot people would have to be the ones to say whether or not this was culturally relevant for them. But I will have to say, it is certainly very culturally informative for me and I hope also for the students that they would be the ones that would have a chance to judge that. But I certainly believe that whatever culturally relevant really means this is closer to than almost anything else I’ve seen.

He mentioned that defining CRE is not an easy endeavour, in particular because defining culture is not an easy task. However, for Robert culture is not only history, but also “[c]ulture is a living breathing thing,” and a combination of the way people live, the value system, and people’s viewpoint based on experience, which comes from the history,
background, and community, among others. For him, a CRE project would reflect the
community and culture of a group.

I think that when you see that something is culturally relevant to me it means that it
has value, that if you look inside what it is you are doing you see stuff that came from
the life of the community and that uses things that the community would recognize as
being of value to them as a community and as a culture. (Robert interview
transcription, April 27th 2010)

Therefore, CRE would be anything that communicates what the culture and the community
value, and will also be based on who they are (who the people/group are).

**CRE development is a collaborative endeavour**

According to Robert, developing CRE lessons is not a one-person job; an individual
developer writing lessons from his desk cannot do it. In addition, there is no one formula to
follow, this experience can provide guidelines and could work with other groups, but it is
not a procedure to follow. Instead, it is a combination of elements: a problem rich in culture
and in math, and a group of people with different viewpoints. The tipi problem used for
these lessons is very rich in both cultural content and mathematical knowledge. It makes
people excited and immediately they start to ask a variety of questions. Moreover, creating
CRE lessons should involve a group of people with different perspectives; in this particular
case there was a collection of mathematicians, Elders, and math educators that shared their
perspectives.

It also requires a collection of people who can look at it from different viewpoints,
the mathematicians that can look at things from a mathematical viewpoint and see the
mathematical richness, the Elders who can see the cultural richness, the math
educators who can see the pedagogical richness. It requires all of those people and if
you can do that, then I think you have a chance to actually develop culturally relevant
materials.

Robert argues that “this whole thing is a very good project, and I really think that we should
try to find great ways to continue”. One option that he offers is to try to continue the work
by meeting again and sharing ideas in the same room. Meeting this way will be more traditional, and would give a clearer expression of respect among the participants and lead to fewer misunderstandings than continuing through Internet or online communication.

**Robert’s comments summary**

It is interesting the affinity that Robert feels for the group assembled, which was for him, not only right, but also “magical”. The magic he mentioned was based in the respect for each other but it was also developed through previous meetings, through which some participants came to know each other. Robert expresses a deep respect for the people assembled, and for the Elders in particular. He states that being around Elders from different Nations is a blessing, and he enjoys listening to them and learning from them. Robert shows deep admiration and praise for Elders, and his comments expressed how he felt humble in the presence of Elders.

Robert showed respect to the participants, in particular for their interests and the care they had for students. He emphasized the respect he has for the mathematicians present in the workshop, for their work and enthusiasm. However, in relation to the teachers, besides mentioning the important role of the teacher in education, he did not emphasize why it was important to involve them in these kinds of projects.

Robert stated the peculiarity of having an open-ended curriculum development process guided by participants’ decisions. However, he was not sure that this is a formula to follow or something that will always work. Robert argued that it needed different elements to come into play in order for it to work. But would this really work with another group? Is this perspective contradictory? Is there anything we should strive for or any guidelines to follow for culturally responsive curriculum development?
It is interesting how he considers the process very open-ended and without a set goal in terms of curriculum development, even though the Banff participants were divided into groups for a reason. The tipi group started discussing the possibilities of cultural content to be used for the lessons developed. So there was a reason why we came together, and in my opinion, we were supposed to pick a cultural element from which to work/develop lessons.

For Robert, developing curiosity in students and promoting learning beyond a superficial aspect is key. However, it is an area that he developed toughly after I followed up on his short comment in the first interview when he noted that maybe from the tipi lessons some people would ask questions why. Nevertheless, Robert had not mentioned nor made clear the need/importance of raising the questions why with the tipi group. This area that he emphasized afterwards will hopefully be raised in the tipi lessons, because that is the only way in which these add-on lessons will surpass the limitations of multicultural education. In other words, it is the only way to surpass the superficial way First Nations content and culture is addressed in only a small section of the whole curriculum.

Finally, Robert expressed the importance of having a group of people to develop lessons with for a CRE perspective. This work should be collaborative among people caring about students from different perspectives.

**Math educator: Kathleen**

Kathleen is a math educator working in the university level in Alberta, Canada. Kathleen’s extensive teaching experience comes from 17 years of teaching at the junior-high and elementary levels, as well as seven or eight years experience teaching post-secondary education that began during her post-graduate studies.
Besides teaching math to students earning their bachelor of education, she has worked collaboratively with First Nations teachers from two different communities. Her community work goes back to five years ago, when she was asked to provide math education support to a colleague’s daughter who taught on a reserve. Since then Kathleen has been actively involved in projects with teachers when culture is brought into the math classroom. Her involvement in the community and school is ongoing; she has built long-term relationships by attending the communities every two weeks for more than two years, until a strong, comfortable, and trusting relationship had been created.

She says that the needs, interests, and agenda of the teachers drive the projects in which she is involved. She works collaboratively, but she does not define the goal and direction of the project, the teachers are the ones who decide that.

**Long-term project collaboration based on relationships**

Kathleen has worked with her teacher colleagues from between three and five years. She mentioned that those projects are based on long-term relationships built upon trust and confidence with each other. Those kinds of relations were created in a long-term process in which the teachers and Kathleen meet regularly every two weeks for the first few years. Thus, in these projects the relationships are developed through continuous meetings until everyone finds their voice and is confident of sharing what they know and think. During the first years of those two projects Kathleen mentions that she was focused on knowing and understanding everybody involved, to the point where everyone felt confident asking the difficult questions that emerged while working with different cultural groups.

Kathleen believes it is important to listen and acknowledge the expertise of participants while developing long-term relationships. The project’s participants should
have good listening skills and they should be open to hearing each other. In addition, there is a need to acknowledge the expertise of each participant, which in the case of Kathleen means to acknowledge the expertise of the teachers. Therefore, the ideas, goals, and direction of the project are defined by the teachers that will implement the lessons. Thus, the projects follow the teacher’s agenda, not the researcher’s interest.

Kathleen’s projects involve co-developing lessons with teachers; however, she noted that those experiences are different from the one done at Banff. Some of the differences among those projects are the regularity of meetings during the school year, having a common context, and having collaborative participation, not only during the co-development, but also in the implementation and modification of those projects. The long-term relationships and constant meetings are aspects that Kathleen mentioned continuously. In addition, Kathleen says that those projects have the common context of the classroom that the teachers are teaching in. Therefore, they know the children that they are planning the lessons for, their particular characteristics, needs, challenges, and skills. According to Kathleen, this makes it easier for her to develop lessons for them, because she knows them and does not have to imagine an ideal classroom or group to design lessons for. In addition, the lessons that are developed are authentic and based on the needs of the teachers, so it is useful for the teachers that plan and implement the lessons.

The teachers she works with are involved in the whole process from the beginning; together they plan the lessons, but also they meet in the same classroom to implement the lessons and make the modifications needed. She mentioned that after the implementation of the lessons all the participants gave feedback based on their observations, and together they modified the lesson plan accordingly. As Kathleen stated:
We are starting a three-week unit that we designed and I am going in, plus the other three teachers, two of the other teachers that I am working with are getting people to cover their classes so that all four of us can go into the person’s classroom while she teaches the first lesson. So that is where it is different, because we can then talk about what we saw, how the kids responded, what we thought worked well, what we need to do to prepare better, what kinds of ideas the children had. With the work with PIMS, we are doing it without children and that makes a huge difference.

Hence, the people involved are also working for a particular classroom and students, facilitating the curriculum development process. Therefore, based on long-term relationships, any project takes on a life on its own; thus, developing lessons based on a story is so much easier with a group that not only has confidence and trust among each other, but also a group that has the common context of a particular classroom and the ability to experience the implementation of those lessons and make the modifications needed.

**The importance of having a common context**

Kathleen considers that when she works with teachers, they work for a particular context. The context in Kathleen’s terms is the classroom, the students, and the community. As articulated:

Maria: What do you think about the way we are doing it with this group?

I think is disconnected a bit, and necessarily so because we don’t have a common context of a classroom and geographically we are very much spread out, so I think those things kind of limits how things seem connected or how they seem to relate to one another.

Maria: yeas, and do you think those things are very important for culturally responsive education or math?

I think is pretty essential when developing a culturally responsive curriculum to have relationships that are long term. And I think the kind of work that is derived necessarily involves the classroom context. And I have seen projects where you actually are on sites, and some of the reasons why we visit sacred sites is to help
students understand the place and when we were working at Banff I don’t know that we understood the place until we actually went out and look at the tipi.

According to the excerpt having a common context works, for it gives a practical and experiential component in which teachers work and are experts on. With a common context the lessons created can be more meaningful. At Banff there was no common context, so the range of ages and grades considered was very broad. Therefore the context was abstract and ideal, not real. For Kathleen it is easier to work with teachers that have a particular classroom that they are developing the lessons for, because it is real.

**When working with First Nations, Kathleen is concerned with tokenism**

Due to Kathleen’s experiences with some websites and some efforts to bring Aboriginal perspectives into the curriculum, she is very concerned with not perpetuate any “token” projects. According to Kathleen, a token project is one that does not have a philosophical background or community connections. Therefore, a token project will provide a superficial connection to a token symbol (or a common/stereotypical cultural symbol).

During the work with the tipi story the group should acknowledge that it is basing the cultural content on an Aboriginal token symbol. However, the tipi group work is not token because it is based on an experiential story of a Native community member (Mary Ruth, the elder). The story means something to the community member, and the lessons that are developed from it are consistent with the problem and the questions that emerged from the story. As noted:

The other thing, I am often very concern about the tokenism of enacting a culturally relevant curriculum. And so that was another reason why I needed to really pay attention and listen when I was with the Elders in this setting and the Banff setting, with elder and people in the community who might just know, who could really talk
about their experience and what they thought was important in mathematics education.

As expressed, the tipi lessons are not tokenism because they are based on Elders and community members experience with whom the important math is discussed and defined. Thus, the tipi group is not making the story up instead is using a known symbol suggested by an elder as the base of the cultural knowledge.

In the case of the Banff workshop, the participants meet every one to two years. They have really interesting conversations that occasionally continue through the years, but the constant long-term relationship is missing. According to Kathleen, when co-developing lessons all the participants should have something to share, and they should all have an area of expertise. At the Banff conference all the participants had expertise and something to share, but because some of them were new to the meetings and some barely knew each other, only few participated proactively during the lessons co-development. For Kathleen, the long-term is very important and can provide voice, trust, and confidence between one another. As mentioned:

I think what is challenging when you are working, when you are co-developing something, is making sure everyone has an opportunity to share and to be part of it. And I think for the first couple days, I could be wrong about this, but it seem to me that there were one or two people that were really strongly involved, and there were some people that were very quiet. And I think that is why the timing is very important, sometimes it takes a bit of time for the quiet people to feel they can talk, and that is why sometimes working over a long period of time is a richer experience just because everybody seems to find their voice and find their comfort level to be able to talk.

As noted, maybe with more time than the week that we had, all the members of the tipi group would have been able to participate.
**Listening as part of the group process**

For Kathleen, participating in the development of the tipi lesson was a listening experience. It was important for her to hear what other people said and thought, because people already knew each other from previous meetings and had already worked on Mary Ruth’s tipi story. So she needed to learn the journey of this group and search for a way to collaborate or participate in that process. As expressed by Kathleen:

> Part of that experience for me was just listening to other people in the community and to people that had thought about this more than I had. So my experience of being there was a little bit different, because I didn’t know a lot of people and I had not attended before this year, and I wasn’t really aware of how it will be organized and how things will unfold. And I wasn’t really sure how the groups were organized. When I was put into the group that I was I didn’t know anybody in that group.

As articulated, Kathleen was new to the First Nations math workshops she did not know the participants, the agenda of the meeting or how everything worked. Thus, she felt that she needed to listen and understand the decisions taken previously by some members of the group. Kathleen has worked in projects that strive to have a culturally relational perspective; therefore, she wanted to learn how the tipi participants understood this work, and how the cultural element was brought into the mathematics.

During the first days of the tipi group work she was listening and learning about the project, but by the third day (when she was leaving the workshop) the group went for a hike to see the tipi poles exhibited at BIRS. According to Kathleen, that day and that walk accompanied by Mary Ruth’s explanation (the elder) helped the group focus their work on developing lessons.
Because Kathleen stayed in the workshop only for the first three days she felt that her participation and involvement was limited. Thus, the relationships created among the tipi group were also limited.

**Enjoying Mary Ruth’s story**

Kathleen really liked Mary Ruth’s story because it is based on her experience and it has cultural elements that make it special, such as the humour in the culture and the way people interact with each other. According to Kathleen, such elements make the story an engaging piece. Kathleen also liked that Mary Ruth shared the story and that the tipi group tried to mathematize it. The story is significant to Mary Ruth, but is also really interesting for everyone.

In addition to the experiential aspect of the story, Kathleen says that walking to the tipi exhibition and having Mary Ruth explain how to set up the tipi made everything clear. I really, really appreciated being able to walk outside and have Mary Ruth explained how the tipi was put up. That to me was really important, we could actually stand outside and see how large the tipi poles were, how big the tipi would have been if it had the outer cover. That made it seem very much more real to me. And it helped enrich what they were talking about. The other thing I really liked was Mary Ruth’s story.

As noted in the quote, for Kathleen, having the experiential and practical connection of what the tipi group had discussed was key, and helped her to feel comfortable in the group and find the practical application of it and her own collaboration efforts.

**Developers’ involvement depends on the purpose of the meeting**

When talking about the people involved in the Banff workshop, Kathleen explained that depending on the purpose of the meeting, there should be different expertises. If the purpose is to explore cultural connections in math lessons, then there should be Elders and mathematicians involved. Elders would be included because they offer the cultural
knowledge and background, and mathematicians because they provide the math content and elements from which the culture can be supported/founded. However, if the purpose is to develop lessons, then the people involved should know how to write lessons and at the same time how to read, write, and interpret lessons based on the official curriculum. In this kind of project, Elders and teachers or math educators should participate.

According to Kathleen, the expertise of both the mathematicians and the math educators/teachers “are extremely important”. But the group of people that would be included depends on the purpose. Kathleen believes that the differences between mathematicians and math educators are that mathematicians know about the math discipline, but the math educator knows about the kind of math taught in schools.

I wonder if the focus of the work was actually developing lessons or was just to talk about the mathematics. And I think for me there is a difference between talking about the mathematics and developing lessons to teach mathematics. And I think that was a tension for me in the group, that the mathematics that we were exploring was at quite a higher level than what our children would be able to do. And in a short period of a week, or for me three days, there seemed to be quite a disconnect between the discussion about the mathematics and the discussions about what children could learn about the mathematics.

Maria: Ok, and the difference between those two are mainly? Or how would you define it?

I think the difference between those two is understanding school mathematics as opposed to the discipline of mathematics. So when we have mathematicians in our group who have only taught in a university or college level, I think is difficult for them to understand what kind of mathematical process we would have to use in the classroom.

According to Kathleen, most of the mathematicians participating at the Banff workshop do not have experience teaching children. Their educational experience is at the higher level, which makes creating lessons for lower levels difficult.
Finally, as observed above, Kathleen explains that there were not as many math educators as there were mathematicians. In addition, the teachers participating in the tipi group have experience in the secondary and post-secondary levels; however, at Banff the group was creating lessons for elementary and junior-high classrooms. Thus, for these two reasons: having more mathematicians than math educators, and having teachers with secondary and post-secondary classrooms, could have been some of the limitations of the tipi group which developed lessons at the elementary and junior high levels.

**CRE curriculum is a living curriculum and a starting point**

Kathleen is working with three teachers developing a geometry unit based on the tipi. The grade five teacher that will implement the lesson in her classroom was at Banff, and when Kathleen proposed to develop lessons around Mary Ruth’s tipi story she agreed immediately because she remembered the tipi group’s presentation at the workshop and had liked it.

However, when the idea was based on what the tipi group proposed, these teachers decided not to use Mary Ruth’s story, but rather tried to find stories from their own community. So, now they are working with community members trying to learn other tipi stories from their own community in order to make it more meaningful. It is worth mentioning that the teachers work in a Blackfoot context, but still they felt the need to use local or community content.

Therefore, Kathleen suggests that the tipi story and the math lessons are starting points, and it is the work of the particular teacher to infuse meaning and local context. As articulated:

I think how teacher would use it, is exactly how these teachers I am working are using it. Have a starting of point with it and then they are finding how to make
meaning out of it themselves. So I think the things are developed well and I think it is important that people can see possibilities. But I think it is a jumping off point, I think it is a starting piece. And every teacher that thinks about the idea will use it in their own unique way.

Kathleen denotes that using the tipi lessons to create ideas from and to find the local knowledge related to it is the strategy that teachers implementing this lesson should follow. This is largely because every teacher/person experiences culture differently and knows diverse elements of it. For example, even though these three teachers are originally from the same community, they all know different stories or a distinct variation of the same story. This is an example of the importance of using the tipi story and lessons as a starting point, and how they should be built upon by the teacher.

In addition, the tipi story and problems could be used with a broad range of students’ ages and grades, and should be modified according to the particular group, community, and culture that will be used for the lessons.

So that again points to the idea that knowledge and the ideas from the stories are very unique and contextual and local. And how stories are told is quite different between different communities. And so we can’t just use a story and say this is for all Aboriginal groups, that is not useful. And so it is a starting place, and the stories are a starting place. But you work with those; it is a living curriculum, a working curriculum, a developing curriculum, an emerging curriculum. It is not fixed.

As stated, Kathleen argues that it is a living curriculum because the teacher using the tipi story and lessons will work on them before using them, providing local knowledge that makes it more meaningful.

Finally, creating a working curriculum involves a relational approach. In other words, in order to have a living curriculum there should be a relationship between the developers and the teachers implementing the lessons. This way, if teachers have questions or want to discuss a particular area with the developers they can do so. Only through a
relational perspective between the developers and the teachers that use the lessons can the cultural and philosophical basis be emphasized and passed on.

Thus, the lessons developed by Kathleen and the teachers that she works with will be shared with non-First Nations teachers and will also be presented at a conference. The idea here is to offer an example of developing lessons based on Aboriginal perspectives, an emphasis that the provincial government is promoting/mandating. Kathleen believes that if during the presentation and sharing of this work the teachers think about the philosophical underpinnings of their work (by explaining the traditions and protocols), are able to share the basis of it, and create and maintain a relationship with the teachers, their work will surpass tokenism and strive to be culturally relational.

**CRE based on cultural philosophical underpinnings**

When I asked Kathleen how she understood culturally responsive, she answered by saying that she does not label it that way, she refers to it as culturally relational. For her it is not a process of “action and the reaction” as the word responsive suggests, but is instead a process of unfolding together along sides. As the name suggests, relational is based in comfortable relationships built upon trust, and in creating long-term relationships where together everyone decides what to work on and how to approach the work.

But the most important part of a culturally relational approach is that it is based on a philosophical foundation, which means that the people involved in the projects have the confidence to ask the hard questions that come when asking why: why do we teach math the way we do? Why is it important to teach about the tipi? Why are tipis important for the Blackfoot culture? And so on. In Kathleen’ words:

I think, how I define it, how I think about it is based on a philosophical stance. I think it is not on the artefacts or on the things themselves, I think it resides in language and
story, I think it depends on embracing the philosophies of the culture and that is a tough work, because that is a discussion most of us don’t even think about having.

Maria: Could you tell me a little bit more about that, like embracing the philosophy of the culture?

When we are talking about tipis, why are this important? Why is this now being used in mathematics? What its contemporary significance? And what are the stories that explore that, and, philosophically, how can we think about what we do in mathematics because of what we are studying with the tipis?

The philosophical underpinnings allow teachers and participants involved in the relational project to realize that each culture has its own worldview. Striving to understand the particular worldview and philosophical strands of the First Nations group the teacher is working with will help him/her teach with a cultural relational approach.

Co-developing lessons is based on trust among the participants over a long-term period

Finally, co-creating culturally relational lessons should be based on a long-term relationship, which implies a lot of commitment between the participants. It is also a work that takes years, and is an ongoing and emerging work. As noted by Kathleen, when someone is working with teachers for a long time, the ideas on how to bring culture into the classroom takes on a life of its own, and that is exactly when the most interesting part of the project emerges.

When co-developing lessons under a culturally relational perspective, it is important to allow every person involved to have an area of expertise in the project. It is important to involve Elders, mathematicians, math educators, and teachers in this process.

The other thing that I think is really important is allowing everyone to have some expertise in the project. So that is where the set up of having Elders, mathematicians, and math educators, teachers is really important because there is a variety of expertise that contributes then to the group.
Kathleen spoke about the nice setting at Banff, because the activities continued into the participants’ free time and would be all day long, during which time and food would be shared among all the participants. She considers that this setting facilitates a feeling of community, trust building, and confidence among the participants. In a normal curriculum development setting, after the work was done everyone would go home, and there would not be free time and activities among the developers.

When Kathleen spoke on whether the work we are doing as the tipi group is culturally relational or not, she mentioned that for her it became culturally relational afterwards, when Mary Ruth, Kathleen, and I met to discuss how were we going to develop our work. She is currently working with her teachers developing tipi lessons for grade five students, and for her those lessons will be culturally relational. She envisions that the teachers will write philosophical pieces and give their contact information; this way, the teachers that use the lessons can start building relationships among themselves, ask questions, and start dialogues/discussions and conversations. And finally, they are relational because as mentioned before, the lessons are not only planned with them, but also implemented and modified together.

**Kathleen’s comments summary**

While developing long-term relationships in her projects, Kathleen shows a great commitment to what she does and what she is invested in. She develops relationships step by step, through constant meetings.

For a person like Kathleen, the schedule, goals, and activities at Banff seemed unclear and made her feel somewhat uncomfortable because she was not part of the process from the beginning. This feeling was perpetuated because she did not know the tipi group
members and was expecting to participate with the people she knew before; but most of all, because she could not envision the practicality of the tipi group until we decided to develop lesson.

Kathleen was listening and catching up with the “previous” work of the tipi group, but suddenly she felt comfortable and that encouraged her attend another meeting in Mary Ruth’s house with the two of them and myself. She proposed work on the tipi lessons with the teachers she was working with for four years. Until now, she is one of the most committed participants of the tipi group.

Kathleen stated that the work she is doing with teachers and the work the tipi group is developing is culturally relational because it addresses the community experience and interest (or the elder’s experience and interest). However, in her work with the teachers she is not using the tipi story because she wants to make it local, and because for her the tipi story is a starting point. But if not even her team, whose work is in a Blackfoot community, is working with the story, could the tipi lessons be culturally relational in any context apart from Mary Ruth’s? And if so, I wonder whether the work of the other tipi members will be CRE. And how we will avoid developing tokenism?

I wonder if for Kathleen the impact that culturally relational projects have is only on the classroom and does not go to further dimensions. Kathleen did not comment on the need to involve administrators, or on a strategy to have a bigger impact immediately. However, she did emphasize the importance of sharing the work with more teachers, and in a higher spectrum than the particular classroom they are working at. But the process she seems to suggest is from bottom up, and is always through relationships development.

Kathleen stated the importance in having math education and mathematicians, but according to the purpose of the meeting she will invite one group or the other, or both. But
in the case of developing lessons she articulated that there should have been more math educators or people that know about the math taught in schools, and about the elementary and junior high classroom. And I wonder when Kathleen would include mathematicians in her projects, considering that she is one.

Kathleen noted the importance of working with teachers and having their input in developing lessons, but also in working for a particular group/classroom. For her, those elements: the teachers involved in their classroom (classroom context) are key for curriculum development. In her experience she could not plan lessons for an imaginary audience. It is important to recall Kathleen’s commitment to long-term relationships with teachers that can guide the future work on curriculum development.

**Graduate student: Maria Jose**

As mentioned in Chapter three, I am a person Mexican descent studying a master’s of Arts in Curriculum Studies at the University of British Columbia. Two years ago I arrived in Canada to begin my studies. In November of 2009 I was invited by my supervisor to attend to the First Nations Math Education workshop in Banff. The experience of this meeting impacted me so positively that it encouraged me to learn and study it further.

My Bachelors was in Education, spent studying for a four-year degree in the subject area of pedagogy. My previous working experience in Mexico was in Intercultural Education, which is an educational perspective that strives to create respectful relationships based on dialogue between First Nations and non-Aboriginal people. In this work I participated in the development and planning of three programs for two Intercultural-Indigenous Universities in Mexico.
The work done with Native people in my own country inspired me to achieve a master’s in curriculum studies with an Indigenous perspective so that I could continue my work in this subject area. This project presents the work that myself and the tipi group performed following our attendance in the workshop at Banff.

Before continuing, I want to emphasize how I described myself during the interview:

I am who I am because of the people I have met in my life, and because that people has taught me something. If I could show it, you would see (along my body) all these different faces of the people I have met in my life. Is not only me that I am coming here to talk to you, but is also all those experiences that I had with people that makes me come here and talk to you. If you see it that way, then we need each other. I had learned a lot when working with First Nations people and is funny because what I had learned the most is about my own culture, not their culture. I am thankful of that and it has dignify my own culture... if we could only realized that working with other cultures dignifies your own culture and others.

I enjoyed working with the group assembled

The people gathered at Banff were exceptional to me, because they are all open to listening to each other and creating together. The people assembled acknowledge the past and the colonization, domination, and discriminatory situation in which Indigenous people live. However, they also had the will to look forward, aspirations of doing things differently, and the desire to build a better future for Native and non-Native people. While working with Indigenous educational projects, I often encounter people that look to the past and the negative side of the present, which makes it extremely difficult to create something better for the future, for it seems that any hope is gone. However, the Banff participants were all enthusiastic to create things differently and to find paths towards improving the math education that First Nations students receive. That willingness was contagious, and it provided a hopeful atmosphere and a utopian smell.
Although I enjoyed working with each person, in particular I was excited to work on planning lessons for the first time with a math educator and an Elder. In Mexico I worked with particular field specialists, but have never worked with an educator who was an expert in one discipline. For me was very insightful to work with such a specialist, for they understand the subject differently and they have contact with the classroom context.

Moreover, working with an Elder as a developer was an extraordinary experience. The curriculum development projects in which I had participated in Mexico always involved Indigenous people that were also teachers at the university level (for which the programs were developed). However, they did not involved Elders as part of the development program. Elders were part of an advisor group to the university, and they were involved in entire institutional decisions. However, in terms of the planning process, these Elders did not take part.

Working with Elders as developers was one of the aspects that stood out for me during my time at the Banff workshop. I enjoyed working with them through the development process, but was also deeply enthusiastic to have Elders as leaders of the lessons planning. Mary Ruth guided our discussion as well as the job divisions, and I felt blessed to be part of her team.

Finally, even though I have already worked with teachers, this study helped me to realize the foundational role that teachers have while developing and implementing lessons. The teacher is the one using and putting into practice any curriculum, their knowledge and experience make that lesson idea a significant learning experience. After the work done with this initiative I hope I will always work with teachers when developing curricula.
**Dialogical process for creating the lessons**

The process that the tipi group followed at Banff, was for a very horizontal dialogue in which everyone had the opportunity to give their opinion and to listen. It was hard for me to identify any existing hierarchical relationship. From the beginning I felt welcomed and believed that we all did, since at the end of the workshop everyone was participating openly, even those that had not participated much during the first days.

Within a dialogue we all shared our ideas on which cultural theme we could work on, and decided to work on the tipi story because it had cultural content with more mathematical and cultural richness. Through an open conversation the functions and collaborations were assigned.

The dialogue could take place in a comfortable atmosphere with the help of the tipi leader. In my perspective, Mary Ruth was the leader of the group, but her leading strategy was collaborative and she found a consensus among us. Mary Ruth turned out to be the natural leader, and without noticing we all let group be guided with her enthusiasm and impetus.

**Tipi lessons as an ‘add-on’ project**

I have felt very empathetic with the tipi group and the tipi lessons. However, I have always been concerned of only creating an ‘add-on’ to the curriculum. Although I acknowledge that by not adhering the lessons to a particular official curriculum they have the possibility of being used in many provinces and countries. The lessons can also be used where any official curriculum would have changes. Nonetheless, it can only be considered something to add to the actual curriculum, and that will limit the transformative dimension that a CRE curriculum could have.
By developing add-on lessons I am perpetuating what I have previously criticized about some CRE curriculums that end up with a superficial and simplistic multicultural emphasis. Nevertheless, there are two reasons that I still believe in the possibility of this project. Firstly, I think that it is better to do something than to wait for a transformational change in the educational system. Even though my goal would be change in a systemic way, I hope to continue participating in projects that might have a more narrow scope, but that can provide through experience examples of how to create a broader change. Secondly, since this work was developed with an Elder, who was very keen and proud of the project, I realized that even when the changes are small they can be very valuable for the people belonging to that particular community and cultural group. Therefore, working for the tipi lessons is worthwhile, even when they do not generate an educational systemic modification.

**Working with Indigenous and non-Indigenous people to improve education**

Much of the interview was devoted to talking about the importance of creating educational projects between Indigenous and non-Indigenous people. When I first started working with Native people, and when I identified my theoretical perspective with Intercultural Education, I perceived the crucial importance of working among groups. In particular, because the problem of discrimination, colonization or domination is not the issue of one particular group, whether Indigenous or of the hegemony. On the contrary, it is an area that has to be addressed and worked on by both groups.

Indigenous people already know that they are discriminated against, for they perceive it every day of their life. The dominant group might not acknowledge that they began the racist relationship, which has through history grown greater instead of becoming
narrower in focus or being eradicated. However, they have to be conscious of the problem that they play a part in because they are involved in the issue.

During my initial work in Intercultural Education I learned that there was more work to do with the dominant group than with Indigenous people. In addition, I am part of the non-Indigenous group, and because I am a member of that group I have to work within my own context, but with the help and by the hand of First Nations people, so that any change would benefit both sides.

Finally, I believe more in people than in the barriers that divide us. So, I think that the boundaries have to be made in order to recognize the part that we (or our ancestors) have played in the battle to create respectful and dignifying relationships, but when we meet with each other, we are people more than labels, stereotypes or ideologies.

**Organizer: Melania**

Melania Alvarez is one of three of the workshop’s organizers. She has been working on the First Nations Math workshop since it began, and has developed a team that together are, according to her, the ones that make these meetings work.

Melania has a mathematical background and has been involved in math education projects since she arrived to Vancouver three years ago. She is originally from Mexico City, but lived in the United States before coming to Vancouver. Melania’s background and educational experience in Mexico is a driving force for her involvement in First Nations education issues.

She believes that in Canada every student should learn about Aboriginal history, knowledge, and sciences, a method of teaching that is mandated by the official curriculum in Mexico. Mexican schooling starts by learning about that country’s Indigenous people:
Mayas, Aztecs, Chichimecas, Toltecas, and so on. After that students learn about the conquest of Mexico and the Colonial era, and later on about world history. Melania, as every other Mexican, also learned Nahuatl (Aztec) poetry and arts. So she believes that students in Canada should first learn about the Aboriginal people and then about everything else. Through this sequence of learning, non-First Nations peoples will learn about Aboriginal people, discouraging common stereotypes that they are lazy and only receive money from the government. In addition, it will afford First Nations people the possibility of their culture being reflected in the official curriculum.

According to Melania, every workshop has its own pace. She commented that for the first meeting the agenda was pretty much set up, but she learned very quickly that it had to be more open. As one of the organizers she noted that some things have to be planned, but some of the agenda should be kept open in order to see what happens.

But I realized that you need to see who is there, you need to see the experience; I plan few things, and then see how it builds. I am open to suggestions and ideas. People approach to us and ask for time to present an idea, and we try to accommodate them according to the possibilities and to what is happening in the workshop.

In this excerpt, Melania explains how she tries to accommodate people needs according to the workshop’s goals.

*Organizing the workshops*

Melania’s interest in math and First Nations education brought her to the idea of organizing a workshop in which mathematicians and First Nations leaders discuss how to improve that education. The initial First Nations Math workshop was in 2006, with a group of non-Native mathematicians and Aboriginal educators and mathematicians. The goal of that meeting was to communicate among different groups and to explore the landscape of
First Nations math education. The discussions were centered on what was happening in the math education that Aboriginal students receive all over Canada.

Paternalism and the lower standards expected for First Nations students are examples of some of the problems detected by the group that address why Native students do not perform in math as other students do. Paternalism was expressed in schools and in educational areas through “nice” treatment given to Native students and lower academic expectations based on prejudice of their common underperformance. Melania explains:

There is a lot of, ‘oh these kids, poor kids, they don’t have the opportunities, we are not going to challenge them’… and so, you are basically telling the child we don’t know, we don’t believe that you can do things, therefore do not worry about it, we are just going to be nice to you and that is all. But that is a way of racism even if it is with very good intentions.

As noted, the caring attitude accompanied by not challenging the students and expecting them to underperform is a method of racism, passive racism. Finally, another aspect that surfaced in the first meeting was the importance of teachers as agents of change.

Second workshop

For the second meeting Melania and the other organizers confronted the criticism received from the previous workshop, treating it as a positive quality of the coming assembly. Therefore, the group was formed by Elders, mathematicians, and teachers. This was the first time they experienced the positive implications and the paradigmatic challenges of having Elders and mathematicians in the same room. According to Melania, gathering two groups that had previously been understood as antagonist was a challenge, not because the groups were unwilling to do it, but rather because it was like breaking a paradigmatic idea. As stated:

[T]he meeting happened and it was interesting because the mathematicians were afraid of doing a cultural mistake. They were saying we are going with Elders what are we going to do, we have to be open…So the people who came were really really
wonderful. It was lucky because they are there and some of the Elders were terrify because “oh math, I took it such a long time ago what am I doing in a math meeting”. Ulises came over and over saying I was telling people I am going to a math meeting and they were looking at me like “what?”, “What is happening?”. The Elders told her about people’s reactions when they were told that they were going to a math meeting. The same thing happened with the mathematicians, who hesitated on how to behave and what to do while in the presence of the Elders, who are respected people that usually do not discuss about math with a Western approach.

However, the experiment seemed to work quite well, and every group learned that they had something to share that could improve the workshop. As noted:

It was very interesting, and also to build some confidence. I think mainly what happen in that [first] meeting was that the Elders grew in confidence about their math skills and the possibilities for them and also changing their point of view about math, what math was all about, and that math is all around us. And for the mathematicians also was interesting, because we hear all about this cultural thing and it has to be math. The Elders said no we want you to teach the same math you are going teach to non-Aboriginal kids. But what happens is that you also have to teach within the reality of their life

The excerpt expresses how Elders realized that they had cultural knowledge to share that could be useful for math education. At the same time, mathematicians found that Elders encouraged the teaching of the same math to First Nations students as that taught to non-Aboriginal students.

In addition to the second workshop’s participants, two groups of teachers attended. The first group attended for the first couple of days and the second for the last couple of days. This was intended to provide more teachers with the opportunity to witness the connection between mathematicians and Elders. As mentioned by Melania, teachers needed to see that a consensus among these two groups could be found, and that these two perspectives should be brought into the classroom.
As demonstrated by the statements expressed above, the goal of this second meeting was to bring the experts together and create networks between participants. At the same time, it was an opportunity to define what needed to be done in First Nation’s math education.

**Third meeting: creating resources**

By the third meeting there was a budget cut and the organizers realized that they needed to find a path to developing something that would last longer than a workshop and would benefit more people. It was at this point that they considered the importance of creating resources. The goal of the meeting being explored in this research was to create a solid group from which resources could be built. Melania supported this idea, saying that by the third workshop they had the right people to provide them with resources.

The group of teachers, Elders, and mathematicians were ready to work together, create, and collaborate. Melania thought that some possibilities could emerge, however she argued that in order to have a group ready people must feel confident in one another, and that takes time. So having a strong group is a slow process during which things have to wait until confidence is developed. However, according to Melania only the collaborative work will be solid and foundational.

If you want something to be solid and you want something to go on, you need a group. Sometimes you need to do things on your own, it is true, to push things, get things going. But always keep in mind that the end product has to be surrounded by all these people (follow up transcript).

As stated by Melania, having a group of people would make the work stronger. Therefore, finding the right group of people to gather together for the workshop is a task that takes longer. Melania observed those involved in the first meeting and identified individuals that
cared about the community and understood the purpose of the workshop. The people invited for the next conference were recommended by previous participants.

A lot of thought was put into who was invited and why. And these are lessons I learned really from the first meeting. There were some people there who were really wonderful and there were some people there that it is all about themselves and all that.

It is important to analyze and evaluate participants that would be good to invite, those who are not only concerned about their own ideas. Thus, finding people that care about the community is not always easy. However, the group gathered truly cared about the community and their focus was not only on themselves. They enjoyed the work being done and had fun while doing it. Nevertheless, Melania said that even though this group worked together well, nothing is foolproof.

**Bringing the experts together**

Melania stated that for lessons development projects the experts in the area need to be brought together. Therefore, for the Banff workshop they assembled experts in the culture and subject area: Elders and mathematicians, respectively, but also the teachers who would witness how such varied expertises could come into dialogue.

Melania argues the importance of involving the Elders in this work, because of their cultural knowledge, respect from the community, and because they have seen more and have an overview of First Nations education. According to Melania, the Elders that attended the workshops were very open-minded, not fanatical (as some people might think), and they understand more thoroughly what happens on the land. The Elders were open to talking and listening to mathematicians and teachers, and to discussing with them the issues in how First Nations math education was delivered and how it could be improved. The Elders made clear that teaching math to Native students had to be done with local and
culturally significant examples, not only foreign examples or cases. Elders asked everyone to “talk about the things that we see in everyday life to give us as an example”. Finally, they requested that the same math that teachers and mathematicians taught to other groups be taught to First Nations students.

The mathematicians brought their math expertise, but Melania also noted that the mathematicians invited had experience in education and were involved in educational projects. Nevertheless, it was important for mathematicians to listen to what the Elders had to say, and what was important for them.

Finally, according to Melania, teachers are the harbinger of change, as they are the ones that can change the school culture. Teachers are the most powerful element of schools because they have a great impact on children. Melania gave an example to support her statement saying that we all remember the good teachers that have taught us, and we might also remember what they used to tell us.

Teachers need to witness how these two very different groups of people can communicate with each other and come to a consensus. These two worldviews can agree, and together they can define what needs to be taught and how they can make this happen.

The teacher is the most powerful element in school... teachers have a great impact on children. There are many times that you even remember the teacher who really was substantial, was good, you still remember for many years afterwards. And sometimes it gives you sense of warm, or sense of ‘I can do it, this person believed in me.’ So, yes it is recognition to that possibility and that there are many teachers in these reserves that are really that strong and are that caring. And we have to have the teachers as partners.

As stated, Melania emphasized that good teachers have a permanent impact on the lives of students. In addition, she considers that the teachers invited were good and strong; therefore, they should not only be part of the curriculum development, but also part of the
process of changing the education that First Nations students receive. Lastly, teachers are the ones in the classroom and they are the ones who know the kids and their reactions.

**Having high standards for Indigenous students**

Melania argued that lowering the math standards for a certain minority group of students is a racist act that does not help those kids improve or outperform. She reiterates the need to raise the standards of Native students. At the same time, teaching to Aboriginal kids should be done by using everyday examples, in that sense she considers it would be a more natural or relevant way of teaching math since it would be based on the reality that students face. As she mentioned several times, Melania argues that schools usually teach with “white” or Western examples that don’t allow other cultures in the classroom to rise, but Aboriginal and Latino students can learn the same way as other students.

According to Melania, culturally responsive math education would have high academic standards and First Nations students would see themselves reflected in the curriculum. She commented:

> It will be a good idea to really be more responsive to students; to put a little bit of culture there and then kids can see themselves reflected in the curriculum... they do not see themselves, they do not see their life, they do not see any reality in the curriculum, they do not see it in the math and that is the problem.

As noted, for Melania it is important to relate math with real life examples and activities. Math should be significant and relevant to students’ cultural background. Melania noted that she, as a mathematician, could start developing lessons from her desk and in isolation. But that would not be culturally responsive and those lessons will not have the same impact.
**Melania’s comments summary**

Melania had very clear the process and stage of the workshops and participants. According to her people was ready to co-create resources for First Nations math education. She was praised for bringing Elders and mathematicians together: by the experts in the culture and in math accordingly. But in her discourse she did not include the teachers as experts. It was until I asked her in the follow-up interview about why it was important to include teachers that she gave a longer explanation of the key role that teachers play in education. I wonder why she did not mention it earlier, since during the first interview the importance of the teachers, the importance of their expertise in the classroom, and also about students arose in the conversation. I also wonder if Melania’s perspective on the role of the teacher was similar to the other organizers and was therefore unconsciously transmitted to the participants that attended the workshop.

For her it is of main important to provide First Nations students with an education that has high standards. Teachers should support students within this approach and the naive perspective of caring-discriminating students should be eradicated.

Melania’s comparison between First Nations content in education and that of Mexico, the United States, and Canada, sometimes seemed mixed among the countries. She argued about how Native American and Latino students are treated in the States, and she used those examples and then continued talking about Canadian education. Even though I acknowledge the similarities between American and Canadian education systems, there are foundational differences. Nevertheless, Melania’s observations seemed blended between an American and a Canadian context.

In relation to Melania’s comparison of Mexican education, which is based on Indigenous content, I agree with her interest and the importance of learning first from the
Indigenous people of the place/country. However, the method from which each country was colonized and founded, and the way the colonizers treated and mixed with the Indigenous people was completely different in Mexico than in Canada. In addition, the Mexican conquest was 500 years ago and Mexican independence 200 years ago, therefore the process of treating First Nations people and their content in education has been different and has had a longer period of time to discuss and readjust. Nowadays (and for approximately 100 years), Mexican political discourse is identified more with the Indigenous population than with the Spaniards domination. Thus Mexican history and discourse taught in schools and elsewhere defines the Spaniards (colonizers) as the dominant group that invaded and destroyed very advanced and developed civilizations. So, the West-Canadian context with its recent history of colonization and independence, and with the British strategy of colonizing is very different than that of Mexico.

However, Melania’s concerns about the education that First Nations receive are genuine and push her to go further as an immigrant. She makes that concern her own personal issue in order to improve it and be proactive against it. I deeply appreciate Melania’s interest and commitment to improve the education that the indigenous people in Canada receive.

Summary

These stories show how each person experiences the same event, informed by their previous work, background, concerns, and ideologies. Each journey is exciting and engaging in its essence, but at the same time is very different from one another. Moreover, presenting a contrast among them will enrich the conversation and the particular journey
that the tipi group is following. Still, I want to invite you to experience the stories that you just read on their own, and re-join them through their words.

The first research question of this investigation concerns the experiences of an elder, mathematician, teacher, and math educator that are developing math lessons based on a tipi story. The stories presented in this chapter offer a detailed answer to that question and encourage us to learn about each developer’s perspective because of their richness of comments, concerns, and teachings. These stories are an invitation to do more action research while developing curriculum in order to better understand the actual educational project in progress and to enrich the experience.

Besides the richness of each story, the contrast among them offers a more solid argument about CRE curriculum development. In the next chapter (Discussions) I will present these stories ensemble to understand what are they all telling us and teaching us. The areas that overlap in all stories are related to the people to be involved in collaborative curriculum development, the journey through trustful and confident relationships, CRE collaborative use of the lessons with benefit for all students, and stakeholders dialogues about relevance, cultural meaning and learning success.

Finally, the elements I will address in the conclusions involve the importance of including Elders and teachers as CRE curriculum developers, the crucial role of relationships on CRE curriculum development process, and the need to find cultural contents as catalyst for interdisciplinary learning that could strive to teach cultural philosophical underpinnings.
CHAPTER FIVE

DISCUSSION

Each participant’s perspective and experience alone is rich enough, but bringing the ideas together provides a more profound analysis of the experience of developing lessons based on the tipi story. In this section I present the intertwining of the stories and perspectives, and have organized the comments among stories according to the areas mentioned.

First, I will explore how the group assembled at Banff was so right that it made this project an exceptional opportunity. Then, the areas of the open-ended dialogical process followed by the tipi group will be discussed. Afterwards, I will explore the use of the tipi lessons by all students in a collaborative way, so that it would be closer to culturally responsive education (CRE). Additionally, aspects around CRE curriculum, especially as a production of stakeholders’ connections about relevance, cultural meaning, learners’ success and dialogue among knowledge will be addressed. Finally, a summary of all these areas will be presented.

Co-developing with Elders, mathematicians, math educators and teachers was an exceptional opportunity

This area addresses the joy of working with participants because of their positive relationships; the importance of including Elders, mathematicians, math-educators and teachers for co-developing lessons and the key role of including each one of them; the differences on including mathematicians and math educators; and suggestions on involving administrators and students.
Participants related so well that it was a joy to be with everyone

The comments regarding the relationships among the Banff participants are quite positive. It is noteworthy how happy the people were within the Banff group. In particular, Melania, Robert, and Linda articulated the positive experience they had within the group.

Melania stated that everyone got along so well that it was a joy to be among the participants. As noted by Linda, “the tipi group related well”. The feedback she received expressed the fun and enjoyment that people experienced during the meeting. Thus, all participants had a comfortable relationship among them, not only within the whole group but also in the smaller ones.

For Robert, the relationship among the participants was so good that he stated, “we had magic”; the magic was created because we all respected one another. Melania, in her interview, commented that the relationships among the participants worked so well because they really cared about the community, so rather than thinking mainly about themselves, they thought of a larger community. As Robert articulated, the people at Banff were thinking of how to improve the math education that every student receives, a broad goal for the benefit of everyone. Hence, the people related well and had “magic” among them because they respected one another and the students were their main concern.

Involving Elders, mathematicians, math educators and teachers for co-developing curriculum

The co-development of lessons in a collaborative effort offers one of the most important findings of this research. For all participants the work done in collaboration had different positive adjectives, such as magic, exceptional opportunity, bringing experts in dialogue, and so on. Evans, McDonald and Nyce (1999) argue for the importance of collaboration when developing curriculum for Indigenous institutions. They state that
community participation and collaboration is one of the crucial aspects of their institutional curriculum development. Thus, working with a group of people when developing lessons is foundational, and some of the characteristics of these groups are explored in this section.

As Melania noted, she would bring the same groups of people together (Elders, mathematicians, math educators, and teachers) in future CRE curriculum development. For me, as for many other Banff participants, collaborating in the workshop was an amazing opportunity, as was the experience of working with Elders, mathematicians, and teachers. For the organizers, the objective of the Banff workshop was to bring together the experts in each area (discipline or culture), as well as teachers, who would come into dialogue with them and create resources together. So, as Melania articulated, they assembled the experts on math, the experts on culture, and the teachers who would be the witness to the dialogue and construction amongst those different groups. Therefore, the caring perspective of each participant was narrowed into their particular field, which made the group “just right”. As noted by Robert, Banff participants cared about students from different viewpoints:

[I]n the Banff workshop, specifically, there were people who cared for students from different points of view. The educators cared about them as people to be educated, the mathematicians cared about students because they thought that everybody needed to know more mathematics at a younger age, and of course Native people care about their students because they are their people and want them to succeed.

Robert emphasized how each group of participants cared about students, while noting that it was this attitude that made the group distinct from other projects/people he has collaborated with.

Also, Robert mentioned that every group of experts offered something very important to the whole group, because he learned many cultural stories and traditions from the Elders, but he also learned math concepts from the mathematicians. Mary Ruth also
commented that she enjoyed listening to the mathematicians, as she refreshed her math knowledge during the workshop. Finally, Linda stated she learned from both groups and felt it was an exceptional opportunity to have those people assembled.

Gathering people for the workshop was not an easy endeavour, which is evident from Melania’s comment that “a lot of thought was put into who was invited and why”. The method the organizers followed was a form of snowball sample, because they invited people recommended to them. For example, they now know that I work well with them and that I sympathize with the workshop’s goals, so they would invite me again and they would take into consideration someone else recommended by me.

Additionally, the organizers created teams that were going to work together in sub-groups, meaning that no one else but them knew the composition of the sub-groups. The criteria they followed to create the co-developing sub-groups was balance between the different groups. Therefore, they tried to have a mathematician, elder, math educator, and teacher in each group. Sometimes, however, they would put together people that had worked well in previous workshops and have continued working further on a topic discussed during the Banff meetings. Thus, the organizers placed Mary Ruth and Robert together because they saw the enthusiasm they had for the tipi problem, and they knew that both of them had worked more on the problem during the time between meetings.

_Involving mathematicians, the experts in the field_

All participants agreed that it was important to involve mathematicians in these projects. In my own and in Melania’s perspectives, the key is to have the field specialist present during the curriculum development process, as argued by Freire (1970), Parkay (2010), and Schwab (1978).
The mathematicians participating at Banff were open to listening to each other and engaging in dialogue on different areas of math education. The mathematicians respected one another profoundly, as Robert mentioned while giving the example of one mathematician and how he approached Robert in order to understand and follow the cultural protocols of the Indigenous culture. The mathematicians at Banff found a way to respect each group of people and each person, and to express the need of having Elders and teachers collaborating in the discussion around Indigenous math education.

According to Linda, “mathematicians have a lot to share and [they] keep it safe”. This is the statement of a teacher, and there were many others that showed that the mathematicians collaborated with all of them. However, ideas on when to include mathematicians and for what reasons would be different depending on the experience of each participant.

For Melania, there was a need to involve the experts in this area, thus the mathematicians had to take part in this project. In addition, not just any experts in mathematics were invited, but rather only those that had been working in education for a long period of time, and were open and keen to listen to and dialogue with Elders.

On the other hand, from Kathleen’s perspective, the mathematicians invited had experience teaching adults, but not children. So the mathematicians then had the huge challenge of developing math lessons for a range of ages that they had never worked with. As articulated by Kathleen:

I think the difference between those two [mathematics and the math that children can learn] is understanding school mathematics as opposed to the discipline of mathematics. So when we have mathematicians in our group who have only taught at a university or college level, I think is difficult for them to understand what kind of mathematical process we would have to use in the classroom.
Thus, the math explored during the workshop was of a higher level than that for children, because the mathematicians were bringing that mathematical level into the discussion, even though the target audience was K-12 grades. According to Kathleen:

I did notice that in the group, in the whole group, there were not many people who had a lot of expertise with curriculum writing, with the curriculum development. So there was a lot of mathematical expertise; there was not very much math education expertise.

The lack of math education expertise leads us to the next group: math educators.

**Math educators, bringing different fields together**

If possible, it would be an enriching experience to have the educator expert from the particular field for which the developers are creating content. In the case of the tipi group, we were working on math lessons, and having the math educator involved in this project was fundamental. According to Melania, the math educator knows the educational system and they are able to bridge the two fields: math and education. They can bring together different areas and can dialogue with people coming from different backgrounds and worldviews, such as mathematicians, Elders, and teachers.

In particular, Melania commented that the math educators invited to the workshop usually work with teachers in the classroom, so their experience has continued to create relationships with the school/classroom context. The math educators participating at Banff worked with and respected teachers, and they are very close to the schooling experience. Moreover, they work collaboratively with Elders and have healthy relationships in which they co-develop educational projects and guide one another. As Kathleen articulated, the math educator understands the school math, the classroom math, and in this case they also understand the needs of the community.
It is noteworthy that there is a lack of emphasis in the literature on the importance of involving the expert in teaching a particular subject. The need for involving the specialist in the field is often referred to, but not the specialist or expert on educating within the field. Although I am unsure whether this is something that any of the participants have written about, it represents a huge lack in the literature I have read about curriculum development; as mentioned by Kathleen, the expert in the area understands the discipline, but not how students learn the discipline, and how it should be delivered according to the group age and the developmental level. Instead, Cajete (1999), Freire (1970), Schwab (1978), Villegas and Lucas (2002b), Ladson-Billings (1995a), and Peterson (2006), among others, argue for involving teachers, and Freire (1970) and Schwab (1978) mention the inclusion of the experts in the field. Even though I think it is crucial to include teachers as developers, the math educator has the theoretical perspective that supports the particular lessons and objectives to be developed.

**Having mathematics or math educator expertise**

Including certain people as developers will ensure the curriculum addresses the areas that that group of people are concerned about. Thus, inviting mathematicians or math educators as developers would have different implications in the outcomes. Kathleen argued that “math expertise and math education expertise are both extremely important”.

However, depending on the goal of the project and the scope of it, Kathleen considered that there should be either mathematicians or math educators involved. As articulated by her:

I would think that if the purpose of meeting is to develop lessons, you actually need people who know how to do that; if that is your purpose. That is what seems to be the purpose of our group.
Hence, Kathleen noted the importance of each particular group according to the goal and purpose of the meeting. Thus, for the particular work that the tipi group did, or for the specific goal of developing resources during the third workshop, there were fewer math educators than mathematicians. In comparison to the others participating, for Kathleen the purpose of the meeting was not very clear. However, through Melania’s comments we know that the goal was to develop resources, but we also know that the initial workshops had the objective of bringing together people from different backgrounds and fields in order to discuss the math education that First Nation students receive. Therefore, the group assembled fulfilled both purposes at different times.

**Teachers are the harbinger of change and have to be partners**

The participants in this study commented on the importance of the teacher’s role. This area is elaborated upon more deeply in the conclusions section because of the important function that teachers take in CRE curriculum development.

According to Freire (1970), Ladson-Billings (1995a), Villegas and Lucas (2002b), Cajete (1999), and Peterson (2006), teachers are the ones in charge of developing CRE curriculum, because they know the particular context of the classroom, they know the students and the group that students identify with, and they are the ones learning and working within the community. Therefore, teachers have a key role in curriculum development.

**Involving Elders is important because they know the culture and the background**

All participants articulated the importance of having Elders take part in the planning process. Some emphasized the positive impact that involving Elders in the project had for them. Linda expressed how good it was to have Elders involved in the process of
developing lessons. She argued that Elders have cultural knowledge that no textbook can provide, as they are experts in Indigenous issues. Linda stated that Elders have the cultural knowledge that needs to be passed along and offered in a free exchange. For her, it was the first time that Elders were involved in all the processes of planning, and she felt really comfortable with it and expects to have more opportunities to develop lessons with the guidance and work of the Elders during the whole process. In Linda’s words, “it was good when Elders have that focus” when co-developing lessons. Since this aspect was brought out by all participants, this subject was elaborated more deeply in the discussion.

**Involving administrators and/or students**

Even though most of the participants said that the group of people assembled was perfect and that they all felt comfortable with one another by the end of the workshop, Robert and Linda still stated that they would have wanted others to be involved. In the case of Robert, he commented that the inclusion of administrators or superintendents would add a broader impact to the planning process, because if they agree with the work done then they would promote the curriculum and the teacher would not have to convince the principal and his higher authorities regarding planning changes. Therefore, including administrators as curriculum developers would encourage them to take part in the whole curriculum process, the issues that the plan tries to surpass and the solutions dialogued and adopted. Hence, administrators as developers would help any changes become realized sooner, and require less of the teacher’s effort for convincing them.

Linda was also satisfied with the participants of the tipi group as developers; however, she mentioned that including students would help create significant learning experiences. Hence, involving students would facilitate the creation of a curriculum
significant to them, and would also generate activities that students would adopt readily because they would be glad to participate in them. When asked about the details of including students, Linda argued that students involved should have a genuine interest in education, maybe even an interest in becoming teachers. However, we did not figure out a key process on how and when to make them part of it. Freire (1970) would agree with Linda, since for him students are part of curriculum development, not only while defining the generative themes, but also during the implementation stage, because teachers and students work together to make the lessons significant.

**Developing CRE lessons is a journey reliant on trustful and confident relationships**

According to participants, there are two aspects of the curriculum development process, which are: the open-ended and dialogical process followed, and the process of knowing each other and developing trust and confidence between participants.

**The open-ended and dialogical journey**

The perspective for describing the tipi group process is an ensemble of the experiences of Robert, Linda, and Mary Ruth, which is defined as an open-ended strategy with dialogical decisions. Robert stated that the process followed by the group is hard to identify and define because it was open-ended and guided through free-ranging discussions. In Robert’s words, the Banff participants did not meet only for developing tipi lessons, instead they met to discuss Indigenous math education. Through an open dialogue the participants came to the idea of developing math lessons from the tipi story; however, this was not the only goal or the main goal of the meeting, instead the objective was the result of everyone’s opinions and suggestions. I agreed with Robert, and articulated that we had discussed the possibilities and options to create math lessons from cultural knowledge;
however, it was a process of dialogue amongst the tipi group, and the decisions were made collaboratively. According to Mary Ruth, at Banff “we had room for expansion and further learning”, which is another way of expressing the open process that we followed and how that helped everyone learn.

For Linda, the story was told within the tipi group, and from the story we all pulled out the math ideas. She stated that we had a web of math concept ideas that we could develop with more detail for the lessons. However, she emphasized that the story was chosen because that was what the mathematician and the elder of the group had wanted.

Aside from the free-ranging discussion, Robert noted that although the conversation was open, it was focused with the work of a facilitator. In the case of the tipi group, the facilitator was Mary Ruth; she kept us centered in one area and guided us towards the goal of developing lessons. Even at the time of thesis publication Mary Ruth is still facilitating the group and encouraging everyone.

The open dialogue described by Robert and Linda can be compared to the process of finding the generative themes illustrated by Freire (1970). For Freire the process of planning is an action research project in which developers identify the generative themes through an exploration of the community, and in the evenings developers meet and have open discussions and dialogues that help the whole group select and clarify the generative themes of that particular community. In addition, Freire also states that a researcher or the teacher guides the whole process; in the case of the tipi group, the development was facilitated by Mary Ruth, a community member, who emphasized the importance of the content amongst the community. To a certain degree the process the tipi group followed, as described by Robert, Linda, and Mary Ruth, was similar to what Freire articulates as curriculum development.
On the other hand, the process followed by the various workshops can be seen as similar to the one described by Schwab (1978). Schwab (1978) considers that the first phase of curriculum development is the period in which the planning group learns about the effects of the previous curriculums; according to Melania, during the first workshops participants discussed some of the main problems in the education that Indigenous students receive. Therefore, a “diagnosis” stage could be observed within those first meetings. In the workshop that this study is researching, one goal was to develop resources; this type of objective is similar to Schwab’s second phase of discovery of curriculum potential. In this stage, the tipi group discussed the content possibilities according to their math and cultural potentials. Therefore, it was a process similar to what Schwab and Freire (1970) describe for curriculum development.

In addition, this analysis brings to light how Mary Ruth’s work, suggestions, and ideas guided the tipi group. This is due not only to Mary Ruth’s educational background and her deep belief in the role of the elder in education, but also to her leadership skills; this leadership role was supported by Melania’s comment about counting on Mary Ruth for the tipi project. Mary Ruth felt honoured by what Melania told her, which also challenged her to work further with this group. Thus, Mary Ruth’s role was key during the work at Banff.

In my previous experience the leader was not an Indigenous person, and I really enjoyed that during the tipi work, Mary Ruth was the person leading the activities and the functions of each participant. She was encouraging everyone to be involved and participate further.
The process of knowing each other and developing a solid and trustful team

According to participants, developing CRE lessons involves having a solid group within which people feel confident. However, it takes time to create a concrete group, and also takes time for a group to be solid and start developing resources together. Kathleen said that as with any project, the group evolves over the years and through that process participants begin to know each other. In this section, the tipi group comments on how the relationship between them was built so that they could be a solid team that could create resources.

All participants commented on the relationships built among the tipi group, and on how those relationships shaped the work done in Banff. The relationships seem to be an important aspect for them because they all emphasized it. There are a variety of comments around tipi members knowing each other earlier, but there are also comments about relationships that started at the workshop. For Kathleen, Linda, and Maria, commented that the tipi participants knew one another from previous meetings. According to Kathleen, Robert and Mary Ruth had worked on the tipi problem earlier, and Robert had discussed the problem with other mathematicians and had thought about it deeply.

Those participants that knew each other from previous workshops were more comfortable participating and sharing ideas about the work we were defining within the group. Mary Ruth and Robert shared their ideas immediately, providing perspectives and ways to approach the project because they had thought about the problem beforehand and had already had the opportunity to experience the impact the story had on people and how it generated participation; “it keeps people going” said Mary Ruth in her interview.

However, there were also people like Kathleen, who during the first two days of the workshop mainly listened, because she not only felt that she had to learn about the process
that the tipi group had undergone, but she also needed to find out how to collaborate with everyone when they were already working together. Linda had a similar experience to Kathleen, and articulated that people knew each other from before; in my own observations I noted that for Linda it took a longer time to participate and feel comfortable in her contributions to the project.

Besides not knowing one another and already having confidence built between them, the people new to both the workshop and the project did not know with whom they were going to work, nor how the workshop was going to be developed. Linda and Kathleen both stated, “we did not know who we were going to work with”; Kathleen was uncomfortable because she expected to work with the people she had already worked with. In addition, Kathleen did not feel comfortable disrupting what some of the tipi group members had already worked on together; thus, she tried to understand the process of the group, the story, and the math that evolved from it in order to continue the previous group work.

Nevertheless, Robert and Mary Ruth felt that the tipi group members worked very well together, and neither mentioned anything about not knowing some of the participants. Robert specified that the respect developed amongst the group was in part because they knew each other from before. Both Robert and Mary Ruth mentioned the respect between the tipi group participants, and Robert emphasized that it was “magic”. In addition, Robert noted that at the Banff workshop we did not start working with the tipi story, instead it was an idea developed from open-ended conversations. So, although working with the tipi group members was a smooth path for some participants, for others it took longer to listen, understand, and know each other in order to feel comfortable sharing ideas.
CRE lessons for collaborative use which benefit all students

Participants referred to different areas regarding the teacher’s use of the tipi lessons.

In this section I will cover the benefits that all students will obtain from these lessons; the importance of a collaborative, cross-curriculum, and holistic approach to the lessons; and the issue around labelling the tipi lessons as CRE.

**Benefits for Indigenous and non-Indigenous students from using the tipi lessons**

In different moments of the interview, participants spoke about the importance of creating CRE lessons for Indigenous and non-Indigenous students. For various reasons they all were assured that all students would benefit from learning Indigenous cultural content. Robert stated that our work in Banff is of value for Indigenous and non-Indigenous students because participants cared about students from every background. Melania noted that the lessons can be used with every student; likewise, Kathleen articulated that Indigenous and non-Indigenous students could benefit and learn from the lessons. In Robert’s words, “all students could learn math from the tipi lesson,” but students would also see the richness of the tipi.

I feel the tipi lessons can make us see one another as people, beyond the group that we resemble or belong to. As Robert commented, these lessons could develop tolerance between cultural groups. Likewise, Kathleen articulated that the teachers she works with are enthusiastic about other kids (not only Indigenous ones) using the CRE lessons developed, because “they said it would develop understanding, it should help other people be more empathetic”. Thus, this lesson could be a pathway for developing understanding between cultures.

Additionally, for Robert the use of the tipi lessons will be relevant to Indigenous cultures because the tipi is significant to all Native American cultures, including many in
Canada. Moreover, the tipi lessons could increase dignity ascribed to Indigenous cultures. Finally, listening to Indigenous stories is powerful for Indigenous students because it is a part of their heritage (Kathleen, interview transcript), and it can create a significant impact, especially if they belong to the community that the story comes from.

Cajete (1999), Dion (2004), Kawageley (2001), and Ladson-Billings (1995a) argue about the importance of creating CRE lessons for all students. Moreover, Crispin and Athie (2006), while talking about intercultural education, state how important it is to offer culturally relevant and responsive education based on Indigenous culture for all students, because, as mentioned, that is a fruitful pathway for initiating common dialogue and respect among different groups. Crispin and Athie (2006), and Schmelkes (2001, 2004) state that non-Indigenous students should learn a CRE perspective so that the racism started and perpetuated by the dominant group and continued by both could actually be stopped within all the parts involved.

Additionally, even though the tipi lessons could be used in any context, it would be necessary to acknowledge and make clear that the tipi story comes from a particular Blackfoot community in Alberta. However, it is interesting that people with Blackfoot, Cree, Sioux, Mexican, and Canadian backgrounds have developed the lessons, which is an example of how they can work in many contexts.

**Collaborative, cross-curriculum and experiential use of tipi lessons**

Collaboration among teachers from different fields is an interesting element of the tipi lessons development. As noted by Linda, Melania, and Robert, the lessons and the story can be used in all fields: language, history, writing, science, and math, just to name a few. In addition, Linda stated that the tipi lessons could cross the curriculum in different
ways, because as Robert mentioned they can be explored in all subjects. For Linda, working with the tipi lessons across the curriculum will make the lessons more useful and broaden their scope. The most important requirement for teachers using the lessons in a broader way, according to Linda, is that they will need to know the curriculum very well in order to adapt and apply the knowledge in all fields.

I agree with Robert and Linda, but will add another aspect, that is, the holism of Indigenous Knowledge (IK). Even though it would not be my job to label the tipi story as Indigenous Knowledge (IK), I definitely think that it has a holistic element that IK shares (Castellano, 2000; Sette, 2008). Also, I venture to qualify the tipi story as holistic because it has teaching and learning potentials in all subjects. It has been hard for the tipi group to limit the lessons only to the math field, which is why they immediately defined it as math and science lessons; however, all of the tipi members continue to mention the valuable work that can be extracted from the tipi story in all disciplines.

Finally, even though the tipi lessons can be used collaboratively with teachers of all fields, or can be used across the curriculum, they could also be only used for math. So, no matter how broad or narrow a teacher’s scope, the teacher can use them in different ways.

The vision for the tipi lessons was that they would be used with hands-on activities (Robert, interview transcription). Melania added that it would be important for students to be involved in building tipis while using the lessons; this is an experiential component that the tipi developers want to include in both the lesson plans and the teacher’s activities. It is also another aspect that would give to the tipi lessons an IK perspective (Castellano, 2000; Sette, 2008).
The tipi lessons considered as CRE

When I asked this particular question, Kathleen, Linda, and Robert answered immediately that they were not able to answer; instead, only the people from the actual community and from the Blackfoot culture could say whether it is CRE or not. However, there are two reasons why Kathleen, Linda, and Robert each one of them believes the tipi lessons would be CRE. Kathleen noted that since we (the tipi group) worked with Mary Ruth, an elder from the Blackfoot culture, the tipi lessons are CRE because they are based in the knowledge and ideas of a community member. For Robert, the tipi lessons are culturally informative, and according to what defines CRE, he believes that these lessons are closer to CRE than anything else he has seen.

In order to define what culturally responsive means, and to improve curriculum developments within such a perspective, some participants strived to define culture or offer a general overview of what CRE meant as a term. Robert first commented on the definition of culture in simple words, acknowledging that defining such a term is not an easy endeavour and has caused long paradigmatic discussions. Robert articulated that culture comes from the history and background of a group of people; however, it is more than that. Culture is a living thing, and it expresses the way a group of people live and how they value things. Culture informs the viewpoint of people based on their own experience within that particular group. Lastly, culture gives the people of that group a sense of community. Therefore, for Robert, a CRE project has value and elements align to the life of the community”. Also, a CRE project should include things or elements that are infused with the life of the community.

Additionally, for Melania, a CRE project would consider in its foundational principles that students should be expected to achieve higher standards; teachers would
teach students to strive to be better and over-perform, rather than expecting them to achieve poorly.

Stakeholders’ dialoguing about relevance, cultural meaning and learning success

All participants had complementary inputs in this section; it is comprised of three sub-sections: encoding Indigenous knowledge and culture into the actual curriculum, making learning culturally relevant and meaningful, and assuring learners’ academic success.

Encoding Indigenous knowledge and culture into the actual curriculum

Participants talked about the importance of including Indigenous cultural knowledge in the official curriculum. They mentioned this concern through diverse arguments and considerations. Some participants, such as Mary Ruth and Robert, have invested much of our conversation with the importance of bringing Indigenous knowledge into the actual curriculum. Therefore, I dedicated a portion of these conclusions to the integration of Indigenous Knowledge into the official curriculum, or as Mary Ruth states, the encoding of Indigenous content into the provincial curriculum.

Participants also spoke about the importance of including cultural knowledge in Indigenous math education and about the common barriers they found in this area. Significantly, four participants did not elaborate in detail about their deep interest in developing math lessons based on cultural knowledge. Mary Ruth started our conversation by emphasizing how crucial it is to include Aboriginal culture and knowledge in the actual curriculum. In her words, there is the need to encode the actual curriculum with Indigenous culture. She explained in detail how before European contact, Indigenous cultures had development in all fields. Indigenous development covered all the disciplines and included
a different perspective in explaining reality, which is a part of human knowledge that is very valuable and important.

Mary Ruth articulated the benefits that both Indigenous and non-Indigenous students would obtain from including Indigenous knowledge in the actual curriculum. In the particular case of math, according to Mary Ruth, the tipi story will encourage Indigenous students to get excited about math, which is generally an area where they do not feel any connection with their culture. Finally, Indigenous students will identify themselves within the Indigenous knowledge within the curriculum.

Robert also wishes non-Indigenous students would learn Indigenous knowledge and understand that Indigenous culture was developed in science and math. The example that he gave was of Mayan math and science, because it is one of the more famous cases of Indigenous development due to its impact on Western math and science. His statement of why it would be important is related to acquiring the dignity and respect that Indigenous people, culture, and knowledge deserve; this is an academic position of some Indigenous scholars, who primarily strive for Indigenous recognition in academia. Additionally, Mary Ruth suggested that by including Indigenous content in the curriculum, non-Indigenous students would learn more of a good side of Indigenous people and be offered a different picture of Indigenous people than the poverty and alcohol abuse stories promoted by the media.

Another point that supports Mary Ruth’s statements and concerns is that the provincial curriculum is developed, and then implemented across the whole province. These processes are created from top-down (Fullan, 1999), so the curriculum has a general perspective and is more relevant to the urban context of the area. Among the developers of provincial and federal curriculums there exists no community or cultural members, thus the
approach of the curriculum is focused on a centralized and Western perspective. Therefore, what Mary Ruth and Robert strive for with the tipi lessons is the inclusion of an Indigenous perspective in the math curriculum, which is something I wholeheartedly agree with.

Even though Mary Ruth believes that the teachers in her reserve are making a big effort to include Indigenous culture in education, she stated that there are still many things to be done in this respect. According to Linda, our work at Banff is one attempt at looking into different ways to teach math to Indigenous students, and the tipi lessons are an example of math in an Indigenous context. Thus, projects like the tipi story are important because they strive to cover an area that has been fairly unexplored.

As argued by Ladson-Billings (1995a), teachers inclusion of students’ cultural knowledge in the curriculum will not only help them perform better, but will also help build their own self-esteem and identity, or “cultural competence”, as Ladson-Billings defines it. In this aspect, Mary Ruth had a solid intuition about the importance of encoding the actual curriculum with Indigenous knowledge, and her work in this area reinforces the literature by not only increasing the dignity of Indigenous culture and knowledge, but also by transforming Indigenous education through acknowledging Indigenous Knowledge and putting it in dialogue with other knowledges.

*Making learning culturally relevant and meaningful*

Another aspect explored thoroughly was the need to develop math lessons based on everyday experiences, rather than what Kathleen called “disconnection”. Usually math is taught with a very abstract approach, in which the problems, examples, and activities are not related to the particular culture or community. Generally, examples given are from
perspectives, contexts, and life experiences different than that of Indigenous students (Ezeife, 2002).

Acknowledging this issue, Kathleen suggested looking at the math used in the community. Linda agreed with this comment, and articulated that “each culture uses math” in their own ways because “math is a big portion of things that happen” in everyday life. In addition, according to the Elders of the workshops, teachers should “use everyday examples in math,” and that they should “do it more natural” (Melania, interview transcription). Melania articulated that during the workshops Elders had “asked not to use foreign examples while teaching math to First Nations students”. The CRE perspective emphasizes the importance of including culturally relevant content as pathways for learning (Ladson-Billings, 1995a); additionally, it argues for the need to include students’ life experiences and concerns in the curriculum (Freire, 1970; Gutstein, 1997).

Moreover, professors should teach Indigenous students the same math that is taught to all students. The common idea shared in the workshops is that Indigenous students should learn math with examples brought from their particular community and culture, but at the same time learn the same math all students have to learn. In other words, bring the two perspectives and knowledges into dialogue (Cajete, 1999; Peterson, 2006) and teach from a culturally responsive perspective (Castango & Brayboy, 2008).

Assuring students’ academic success

Participants from previous and current workshops had profoundly elaborated upon the issues with the math education that Indigenous students received, and they all agreed on the need to have high academic standards for Indigenous students. Melania articulated that during the first workshop, participants met to discuss the issues in the way Indigenous
education is delivered. During those discussions, some of the main areas brought out were: the paternalistic perspective from which Indigenous education is delivered, and how the standards, expectations and activities are lowered in Indigenous education. Melania defined this paternalism as an approach that involved being caring to students, but not showing them how to survive by themselves; this caring approach makes students dependent upon others (teachers, principals, government). As they say in Mexico, “si le das un pescado a un hombre comera por un día, si le enseñas a pescar come toda la vida”, or people should be taught to fish because it is learnt for life; just giving a person a fish one day is an example of the paternalistic approach. In addition, what ends up happening in Indigenous classrooms is that teachers trying to “help” Indigenous students do not set high expectations of them, and they do not push them to over-perform. Teachers usually set their goal as Indigenous students passing the year instead of getting a challenging educational experience that will make them over-perform later on. As noted by Melania, having low expectations in the academic performance of students is a form of passive racism, or settled racism.

Melania is arguing as Gay (2000) did in stating that teachers have good intentions, but also that discriminatory and ethical awareness is not enough to help students perform academically; “goodwill must be accompanied by pedagogical knowledge and skills as well as the courage to dismantle the status quo” (p.13). Melania also articulates what Ladson-Billings (1995a), and Villegas and Lucas (2002b), state about lowering the standards of minority groups’ students. As argued by Ladson-Billings (1995a), the culturally responsive teachers are the ones that have high expectations of their students and they know that their students are able to accomplish them. Finally, having low expectations of a racial group of students is a racist attitude (Ladson-Billings, 1995a; Villegas & Lucas, 2002a; Villegas &
Lucas, 2002b) and even if twinned with very caring approach it is nonetheless very harmful.

**Discussions summary**

Through the analysis and discussions that participants had at the workshops, comments arose on the paternalistic approach and low expectations that teachers have when teaching math to Indigenous students. Participants also mentioned the need to teach math with a more practical and local perspective, instead of in an abstract way that is removed from a student’s reality. When discussing the issues around how math education is delivered to Indigenous students, participants also stated the foundational need to bring Indigenous content into the official curriculum through intertwining Indigenous and other knowledges into dialogue; this integration was also a pathway to CRE. Therefore, these are elements to take into consideration when developing CRE math lessons.

While discussing about the people involved as lesson developers, participants all agreed on having Elders, teachers, and the field specialists or experts teaching that particular subject (in this case mathematicians and/or math educators). However, some of the participants considered the importance of involving administrators and students in the process.

The curriculum development process was defined by participants as an open-ended and dialogical procedure. During the development of the lessons, participants commented on the process of creating a solid group to co-develop lessons. In addition, participants elaborated on the math and cultural possibilities that the tipi story offers.

In the conclusions chapter, I will highlight the four elements emphasized for CRE curriculum development in this study. The fore-mentioned four aspects are: involving
Elders as developers, the important role of the teacher, including a relational dimension in the planning process, and finding cultural content catalysts for including the philosophical underpinnings of the emphasized culture. Finally, the implications for further CRE curriculum development are also stated.
CHAPTER SIX

CONCLUSIONS

The first research question of this study is: what do Elders, mathematicians, and teachers say about their experiences co-developing mathematics education curriculum materials? This question has been answered in the analysis results chapter, with the stories of each participant, and has also been reinforced in the discussion section, through the intertwined stories.

In this chapter I will highlight the four elements that address my second research question, which is what we can learn from this experience for future CRE curriculum development, or “What can we learn from Elders’, teachers’, and mathematicians’ experiences when developing culturally responsive math lessons based on a tipi story, that could be applied for further curriculum development?”. As briefly mentioned in the discussion section, participants commented mainly on four elements suggested for further curriculum development. Those four aspects are: the significance of including Elders in the planning process; the key role of teachers; the emphasis on creating relationships between developers, but also between the developers and teachers that implement the lessons; and the importance of finding and using cultural catalyst content for CRE lessons from which to include cultural philosophical underpinnings. Finally, the implications of this study will be described.

**Importance of involving Elders: knowledge of the culture and the background**

The importance of involving Elders in curriculum development was an aspect emphasized by all participants. Linda, for example, had worked with Elders in previous
projects, however she mentioned that Elders would only add the cultural knowledge in the class, instead of having the Elders involved in the whole planning process. According to Linda, having Mary Ruth as part of the development from the beginning and throughout the project was an exceptional opportunity.

Elders have a lot of experience; “they understand more what happens in the land and the background” (Melania, interview transcript). According to Melania, Elders have seen more, and therefore have more vision. The schooling experience of the Elders enables them to give feedback according to what they have struggled with when learning the official curriculum and by having a different cultural worldview than that of the hegemony.

The voice of Elders is respected in the communities (Melania interview transcription), therefore it is important to involve Elders in curriculum development because their input is valuable to the community and is based in their expertise as Indigenous people studying within the official curriculum.

In particular, Mary Ruth was an exceptional Elder to work with, and as Robert stated, “Mary Ruth is good at explaining things”. She could tell us not only about the tipi story, but she was also knowledgeable about other projects and cultural issues in her region, and was involved in many different areas. Mary Ruth’s guidance was so useful that Robert considered her “a mathematician in another life”. Mary Ruth guided us as a team and she was the natural leader of the tipi group.

Freire (1970) and Schwab (1978) argue for having community members or their representatives as developers. Freire (1970) states that in the process of researching generative themes, community members play a key role; from the first meeting where the “researcher/teacher” introduces his teaching objectives in a particular area, various community members are invited to participate as developers/researchers. From the first
meeting, and throughout the whole process, community members are crucial participants in the planning phase. In Freire’s view, community members are essential to curriculum development because they have the knowledge to make the educational content and topics significant to the community. Thus, community members work collaboratively with the developer/teacher in the planning period, and later on the teacher is able to recreate and redevelop the curriculum with students as community members in this living and emerging curriculum, as Kathleen also articulated.

For Schwab (1978), community members or their representatives should be part of the development because they provide knowledge of the community and can share the issues, needs, and concerns that arise from the community. However, Schwab argues that there could be either the actual community members or their representatives in the developing process, and also that a representative could fulfil the role of more than one expert. In other words, the community representative could represent the student and teacher at the same time, which in the end could mean that not all the areas represented by the person would be covered with the same emphasis.

Moreover, the CRE approach articulates the need to include adults who share the students’ culture when developing lessons (Delpit, 1995). Indigenous scholars praise the work done with Elders, and express the multiple teachings they receive from it. Additionally, Hulan and Eigenbrod (2008) articulate the fundamental role of community participation in co-developing curriculums. Elders are the community members through which Indigenous Knowledge is passed on from generation to generation. Involving Elders in education facilitates having Indigenous content in the curriculum. Evans, McDonald and Nyce (1999) argue for the importance of considering community knowledge when co-developing curriculums; the Elders or people who have the cultural knowledge have to be
treated with deep respect even when they might not have as many degrees as other co-developers involved.

According to all of the members of the tipi group, the role of the Elder was crucial, and not only because of all the guidance, support, and leadership provided by Mary Ruth, but because the Elders worked alongside the participants, which ensured participants had an enriching experience with the Elders. Therefore, the role of the Elder as a developer is key in any CRE curriculum development.

The participants all commented on the importance of the Elders’ role and they all expect to continue working co-developing lessons with the support of the Elders. Thus, a crucial conclusion of this research is how foundational it is to involve Elders in curriculum development within a Freirian and Schwabian approach of including community members while co-developing lessons.

**Teachers are the harbinger of change and have to be partners**

Teachers, like math educators, have the ability to bring different fields into dialogue and also into their lessons. Teachers have a great impact on students, as Melania commented, because everyone recalls the good teachers they had during their schooling experience. Teachers are the key group to involve for any change in education, as they will implement and make true any innovation in schools.

In order for any improvements to be realized, teachers have to participate, because they have the power to transform an idea into a reality. Hence, teachers have to be partners in any curriculum development. Through the experience of conducting this research, I believe teachers are essential in the process of curriculum planning, change, and implementation. Kathleen, Linda, Melania, Mary Ruth and I, after acknowledging the basic
role that teacher has in curriculum implementation, will collaborate with teachers in any CRE planning.

Finally, teachers are the group of people who know the students, and their needs and characteristics. Therefore, as Schwab (1978) argues, the teacher will bring the knowledge of the classroom and the students in it. Moreover, Cajete (1999), Freire (1970), Ladson-Billings (1995a), Peterson (2006), and Villegas and Lucas (2002b) argue for the key role of the teacher in curriculum development. Actually, scholars like Cajete (1999), Ladson-Billings (1995a), Peterson (2006), and Villegas and Lucas (2002b) seem to refer to CRE curriculum development only in the context of the classroom; they do not discuss planning lessons on a higher level or for a broader range of impact. However, Ladson-Billings (1995a), Peterson (2006), and Villegas and Lucas (2002b) argue for the importance of acknowledging the struggles in education that minority students experience, as they are impacted by broader forces such as Socio Economic Strata and domination. Even though these struggles have to be considered in any CRE transformational project, in the area of curriculum development these researchers and authors refer only to teacher’s planning. Thus for all these authors, teachers are key in curriculum classroom development.

Likewise, teachers are a group of people with practical knowledge; they are able to make teaching an art, and to transform educational theories into classroom realities. In education, theory without practice is nonsense; only a theory founded on experience is solid enough to make a deep impact in schooling. Additionally, the practice of teaching provides the foundation for any theory. Therefore, teachers provide knowledge, experience and expertise that none of the mathematicians, math educators or Elders have.

Finally, teachers know how to write lessons; they have to read the curriculum, interpret the outcomes, and develop lessons accordingly. Thus, as Kathleen argued, if the
goal is to develop lessons, then there should be people involved that are able to do so. Hence, the teachers are essential for writing and developing lessons, providing practical knowledge about the context of the classroom, and also students’ knowledge and development.

**Culturally responsive curriculum development as a relational process**

One of the main findings is the importance and emphasis that participants placed on the relationships created amongst the tipi group. Participants mentioned different aspects in this respect, thus in this section I will reinforce their input on the importance of having a group of people to work with when developing CRE lessons, but also the need to develop trusting and long-lasting relationships among the developers, and between the developers and teachers that implement the lessons.

According to Robert, Melania, Linda, and Mary Ruth, the experiment of gathering Elders, mathematicians, and teachers to co-develop lessons worked so well that they would do it again, as it was done in the third workshop at Banff. However, if the goal is to co-develop curriculum with different people, it is important to mention that there is no exact recipe or formula to follow. Instead, there should be a combination of two main things: a collection of people with different points of view and mutual respect and excitement that makes it happen. The collection of people with diverse perspectives should include mathematicians who see math’s richness, Elders who see the cultural richness, and math educators who see the pedagogical richness. In terms of respect and excitement, Robert said that in this particular tipi project there was “magic” between the tipi group members, a magic based on respect, so there should definitely be deep mutual respect. Additionally, the
people involved should get excited about the math and cultural possibilities of the math problem that the developers would be working with.

When working in collaboration, everyone should have an expertise, so that all feel comfortable and needed. People have to feel comfortable, and only if each person is contributing and offering feedback will they feel as if they are as important as everyone else. Thus, as argued by Melania and Kathleen, the opportunity of having people who are experts in their own area will make them feel that their input is important, which is key for the development of a more solid CRE project.

CRE lessons should be developed by a group of people. Linda, Melania and Robert stated that they could develop math lessons by themselves; however it would not be CRE if it did not take into consideration the perspective and ideas of the Elders and the teachers from Indigenous communities. As argued by Evans, McDonald and Nyce (2008), collaboration is a crucial aspect when developing curriculums in Indigenous contexts.

Furthermore, the most powerful work happens when people know each other well. Thus, as expressed by Kathleen, “it takes several years to trust each other and to ask the hard questions” which are the basis for culturally relational work. Working with a group that knows one another for a long period of time facilitates the trust and the confidence needed to share ideas and create something in which all the participants collaborate.

A CRE relational work involves participants over a long period of time, during which they all get to know one another, and also get to know each teacher’s students and classroom. In addition, when co-developing lessons, everyone in the planning group should feel that they have something to share, and acknowledge that their work is important and a key part of the project (Kathleen interview transcription). Therefore, co-developing lessons
implies work over years, or long-standing relationships with participants committed to the project.

Evans, McDonald and Nyce (1999) talk about the challenges of giving everyone a voice, even when the group of people co-developing lessons have diverse backgrounds and educational degrees. Kathleen, Melania and Robert stated that participants have an expertise to share, and everyone felt blessed and honoured to work with Elders. Hence, participants acknowledging Elders’ expertise, and that respect for and valuing of Elders’ perspective can be a path to creating relationships that work in tandem with the academic hierarchy and creates a community among developers. Creating respectful and trustful long-term relationships is foundational in collaborative planning work.

Moreover, the respectful and trustful long-term relationships have to expand to include both developers and implementers. According to Melania, Linda, and Kathleen, this relationship should extend to the teacher that will use the lessons planned. The developers and the teacher implementing the lessons would have the opportunity to expand the relationship even when working with the curriculum. Such a continuation of the relationship will offer more support to teachers using the lessons, and would involve them in the co-development process. The curriculum would be considered as a living and emerging curriculum, due to the relationship between teachers and developers and their work redefining the lessons, therefore it will also be possible to have local and relevant knowledge.

Respectful, trusting and confident long-term relationships are the basis for developing CRE curriculum. CRE curriculum development is a relational process that permeates all stages of lesson design, from planning to evaluation. It is key that any CRE projects have a considerable amount of effort devoted to relationships between co-
developers (within which community members and teachers are extremely important),
developers and teachers, and teachers and students. Relationships between teachers and
students is one of the areas that is crucial for CRE (Delpit, 1995; Gay, 2000; Ladson-
Billings, 1995a; Villegas and Lucas, 2002b), however, as noted in this study, the relational
dimension of CRE projects goes beyond the classroom, and into the whole educational
process.

**Cultural content as catalyst for learning cultural philosophical underpinnings**

According to participants, the cultural content used in these lessons (the tipi story)
could work as a catalyst for developing numerous cultural, math, science, history and arts
lessons. The potential of the cultural content is so vast that it brings different possibilities
for all subjects. Finding cultural content that has the richness to be functional for use in any
discipline enables CRE lessons to be holistic and to be explored through many different
perspectives. Thus, CRE lessons that can provide context in diverse areas are powerful
because the cultural content provides learning experiences for a variety of academic
knowledge.

The cultural content used for the tipi lessons also provides the context for teaching
math, but at the same time is a catalyst for deeper learning about the culture and its cultural
underpinnings. One pathway to generate cultural philosophical understanding among
groups is through posing questions “why?”.

Besides facilitating trust between developers so there is confidence in one another to
participate, there is also a need to have close relationships so people ask the difficult
questions that follow the word “why?”. The word “why?” opens the door to the
philosophical underpinnings of each culture. These questions make people think further, through the answers they present, about the particular cultural worldview of each group.

According to Robert, teachers should develop curiosity in students and they could do so through the word “why?” Questioning makes people learn more about the culture and history of each group, learn further, learn a little more about the Indigenous culture; that additional learning is what makes people understand the culture and further appreciate it (Robert, transcript interview).

The questions beginning with “why?” expose the philosophical underpinnings of each group, which also guides the worldview of each culture. For Kathleen, the philosophical strands are key for any relational work; people realize the worldview of other cultures through the philosophical underpinnings, which she says is the only pathway to CRE. These philosophical underpinnings guide the relational work and transform any project into a more deep and foundational one, instead of only creating an add-on or a superficial change to the curriculum. Hence, to make a foundational change, and not take the superficial perspective of some multicultural educational projects (Villegas & Lucas, 2002b), CRE projects should be guided by the philosophical underpinnings of each group.

Moreover, only through learning about the philosophical underpinnings of the cultural content/knowledge will teachers be able to teach from a CRE perspective. Therefore, while developing CRE curriculum, the developers should also create a trusting relationship in order to pose the important questions that begin with “why?” Thus, any CRE planning process should be accompanied by questions including “why?”, which lay the foundational thought of any cultural-educational project.

Finally, CRE curriculum content potentials increase when the lessons can be used as context for many subjects, and for learning deeper cultural aspects. However, these two
characteristics are possible when the curriculum is considered as a living and evolving curriculum. CRE lessons are a place to start, but the development has to continue based on local knowledge. Any lesson could become contextualized and locally significant if used as a starting point and adapted for the particular classroom. Therefore, the work that the teachers create will not only be local, but also unique in itself.

On the other hand, CRE lessons have to be adapted by teachers (Linda, interview transcript), because teachers can have access to community members and local stories, and understand to what degree the cultural content reflects their students’ background. Thus, adapting lessons is essential in CRE projects. The role of the teacher, as mentioned above, is key in CRE curriculum development, because it is the teacher who would make it relevant and responsive to the particular students and classroom. However, only if the lessons are treated like a living curricula can they be transformed into responsive education.

In order to take CRE transformative approaches, the CRE curriculum should use cultural content as a catalyst that could have impact in different subjects, and from which cultural philosophical underpinnings could be explored. CRE curriculum should also have to be understood as a work in progress, and not a finished one; CRE lessons will not be culturally responsive unless they are treated as “living, emerging, working, developing curriculum... not fixed” (Kathleen, interview transcription).

Implications for the CRE curriculum development model

Having presented the Schwab, Freire and Cajate curriculum development models, I argue that there are different elements of those models, complemented by participants’ comments, that are useful for CRE curriculum design.
This research illuminates guidelines on CRE curriculum development in relation to the collaborative aspect of curriculum design and the suggested people involved in Indigenous responsive education. These proposed guidelines also advise on the qualities of the relationships among developers and the characteristics of the cultural content. Finally, it describes the elements of the process that CRE curriculum development should consider.

Collaborative curriculum development and stakeholders involved

Participants’ conversational emphasis reveals the need for collaboration amongst different participants while co-developing CRE lessons and curriculums. In Robert’s terms, there should be people caring about students from different perspectives: disciplinary, cultural, and pedagogical. Or as Schwab (1978) states, representatives of students, the learner’s milieu, teachers, the subject matter, and curriculum specialists have to be included in planning lessons.

CRE curriculum development needs to be a collaborative process in which people from different backgrounds and perspectives dialogue and work together. It is crucial to involve different stakeholders as developers, and in particular to collaborate with Elders and teachers. Cajete (1999) primarily mentions the teacher, and includes community members such as parents. This research is aligned with Cajete’s stakeholders, but is different because I suggest that Elders should not only be sources of support but they need to be developers. This study, as most CRE scholars, considers the community has to participate in curriculum development (Delpit, 1995; Evans, McDonald & Nyce, 2008). As argued by Delpit (1995), involving adults with the students’ cultural knowledge would bring relevance to any curriculum. Elders not only share the knowledge that is not available through textbooks, but additionally they offer guidance for including cultural content and
give the context and philosophical implications of the content. According to Freire (1970), the people from the area are the ones which the curriculum should arise from and come back to. Thus, including community members is a fundamental aspect of Freire’s model, as it has been for the tipi group participants. Hence, Elders are essential to restoring Indigenous education according to the cultural knowledge, needs, and goals.

Teachers are needed, not only when developing curricula, but also in the process of adapting and making lessons significant for the particular context, and for implementing and realizing the discussions between developers. Most CRE authors consider the classroom level as the scope for developing CRE lessons, and agree with the tipi group participants that the final adaptations and the implementations of curriculum changes take place through teachers. However, as mentioned by participants, teachers should be part of the whole development process.

**Relational aspects of CRE curriculum development**

The collaborative dimension of curriculum development involves providing guidelines for making the CRE project development a relational process. The relational aspect of the curriculum development acquired major importance in this study. Thus, it is key to create respectful and trustful long-term relationships.

CRE curriculum development should have a first stage in which respect and trust can be constructed. Only through a deep respect for the people assembled, their knowledge and experience, and the journey of Indigenous and non-Indigenous people walking side-by-side can CRE development be possible (Silver et al., 2006). It takes time for respect and trust to be developed between participants, however it has to be the first goal of the developers. Building strong and confident relationships among developers will ignite
respectful collaboration. Although at the beginning of this project some people knew each other and felt there was respect between them, others instead felt they started to build that respectful relationship very recently. Therefore, creating a respectful and trusting relationship is a journey and endeavour that the each group has to take.

Moreover, relationships should be part of the whole process of curriculum development and be expanded to include the implementers. CRE curriculum development and implementation should include a long-term relationship between co-developers and with implementers that builds confidence amongst the group and a deep commitment within and to the community. Thus, CRE curriculums should require the commitment of the people involved to be part of a long-term relationship project based on trust and respect, as CRE requires needs a confident relational process among developers and between developers and implementers. The respectful relationship has to expand to involve the developers and implementers in a long-term project in order to provide more relevant, meaningful and responsive curriculum, and to evaluate and re-design the lessons planned.

**Process of CRE curriculum development**

The CRE suggested model recommends following the developers’ path through collaborative and dialogue decisions. This research shows that developers felt they had the will to decide how to create the lessons, and that generated feelings of satisfaction. Open-ended discussions among developers are essential so that curriculum development decisions are made between them through a dialogical process, instead of to fulfill the needs of other stakeholders. Rather than a recipe to follow, developers should establish principles for the relationships they will create. Freire (1970) offers a process through dialogue between developers, to decide which elements are relevant for them, and identify the themes that the
local people are experts on. Therefore, this research supports Freire’s model of participatory decisions and definition of curriculum. However, beyond Freire’s curriculum development model, this study suggests taking into consideration a reasonable period for knowing each other and developing trust, respect and confidence with each developer in order to have collaborative decisions guiding the process.

**Characteristics of CRE curriculum content**

This research illuminates some characteristics that CRE curriculum content should have. First, the curriculum should include Indigenous knowledge. Second, CRE curriculums should have high standards and expectations for students’ academic success. Third, creating lessons around cultural and Indigenous Knowledge should be discussed and developed with Elders. Fourth, the curriculum should be considered as evolving. Fifth, the curriculum that includes culture and Indigenous Knowledge provides cultural philosophical underpinnings.

This research supports the importance of having Indigenous Knowledge and content in the curriculum. Participants considered this a prime goal of the project, and a crucial motivation for their involvement in curriculum development. CRE considers it important to have Indigenous content. Cajete (1999) is one author that has this objective in mind all the time. He illustrates how to include Indigenous Knowledge, contents, perspectives, and paradigms in science. Like Cajete, the participants in this research expressed the importance of these goals in CRE curriculum development. In addition, including Indigenous Epistemologies in curriculum would reinforce an area Castango and Braboy (2008) consider rarely addressed in CRE for Indigenous youth. Therefore, this suggestion
reinforces Cajete’s objective in CRE curriculum, and Castango and Braboy’s (2008) need to including Indigenous knowledge in CRE curriculum.

Those developing CRE lessons should endeavour to find cultural content that can work as a catalyst for various themes, both within one discipline and among diverse fields. There is cultural content that can provide deep and challenging learning experiences across diverse grade levels and subjects. Such content, with a teacher’s guidance, can illustrate how profound and complex Indigenous Knowledge can be, and therefore help students to respect and re-value Indigenous perspectives.

CRE lessons should provide Indigenous perspectives that pursue high standards for students’ academic success. Development of CRE curriculum should be based on the premise that students can and will over-perform; CRE curriculum should strive for students’ academic success and over-performance. Thus, high standards and goals are one of the qualities of CRE content.

Including Indigenous Knowledge that is not token or folkloric, and that has a real relevance to the community must be achieved through involving Elders. Community members as developers bring cultural relevance and responsiveness to the curriculum. Therefore, it is the work of the curriculum developers group to make sure that community members, and in particular Elders, are involved in the process. As argued by Freire, community members have to collaborate in identifying the generative themes or meaningful topics from which to build significant learning.

The CRE curricula should be considered as a work in process or an emerging collaborative design that can be constantly modified and improved. CRE curriculum cannot be treated as fixed plan, because that will not provide the possibility to localize it. Therefore, CRE lessons should be used as the starting stages from which teachers and
developers can find ideas to adapt, modify and implement. CRE lessons should imply the invitation to include local knowledge and to work with ideas as applicable and adaptable aspects for the particular classroom.

Moreover, CRE curricula should provide cultural philosophical elements that can help teachers and students better understand the Indigenous culture that they will be learning from. The inclusion of cultural philosophical guidelines in CRE curriculum will offer the possibility for teachers to encourage students to learn about the worldview of the culture, and hopefully to respect and learn from one another. Sharing the philosophical underpinnings of the culture should also include the opportunity to develop a relationship with the developer Elder, who has the cultural knowledge and could share it through a relationship of respect. However, as argued by Evans, MacDonald and Nyce (1999) and Simpson (2004), because of the colonial domination that has existed between Indigenous and non-Indigenous groups, developers and Elders have to make sure they include knowledge that can be shared and that will not threaten Indigenous integrity or cultural ideology. Finally, a transformative CRE curriculum would only be realized when it included the philosophical underpinnings of the cultural content, so that implementers would be able to question their worldviews, stereotypes, and paradigms. Therefore, incorporating the cultural philosophical strands in the developed curricula is the pathway for transformative change.

These are only some implications that emerged from this particular experience, but they are not specific rules or steps to follow. As this summary implies, these are only recommendations that can be adapted to every CRE curriculum development; these areas will need further research. However, creating relationships founded on key elements
including respect, trust, confidence, and dialogue is the basis, and would help any group
find their own path when striving for solid CRE curriculum development.
REFERENCES


Crispin, Maria Luisa and Athié, María José. (2006) “¿Qué es eso de la educación intercultural?” (What is intercultural education?) *DIDAC, Educar en la Diversidad*, vol. 42.


APPENDICES

Appendix A: Interview questions

This is a semi-structured interview; therefore these questions are a guide for the interviewer. The questions include:

Experience

1. As I have mentioned, my interest is in the tipi Lesson Planning Group at BIRS. Looking back at the workshop at Banff, could you tell me about your experience there?
   a. Why were you interested on participating? Since when you have participated in these workshops?
   b. How did you get involved in this workshop?

2. Could you tell me about your experience in developing the tipi lessons?
   a. Is there a particular aspect of the experience of developing the tipi lessons that stands out for you? Is there something important about the experience of developing the tipi lessons that stands out for you?
   b. How is this experience different from or similar to how you usually design lessons?
   c. What are the challenges you experienced developing the tipi lessons?
   d. Would you want to do this again or not? Why?

Working with the group

3. What could you say about working with Elders, mathematicians and educators in co-developing lessons?
   a. How was the dynamic of the group?
   b. Do you think it is important to include all those groups of people in every lesson design?
   c. Is there any other group of individuals that you would include? Who and why?

Process of curriculum development

4. What is your opinion of the way we went about developing the tipi lessons?
   a. Do you remember how we went about choosing the tipi story? Could you elaborate on how we went about choosing the tipi story? How did the idea of using the tipi story come about?
b. What would you keep the same about the tipi Lesson Planning?
c. What would you change about the tipi Lesson Planning?

Use of the lessons in the classroom

5. How do you envision the lessons being used in the classroom?
   a. What do you feel the teacher needs to know or do in order to teach the lessons?
   b. Which students would most benefit from these lessons?

Culturally responsive math

6. “The tipi Lesson Plan could be considered as an example of culturally responsive math”. Why do you think this is or is not true?
   a. What does curriculum need in order to be considered culturally responsive?

Future curriculum development

7. Based on this experience, what suggestions would you give for the development of lessons based on culturally knowledgeable/culturally responsive math?

8. Could you elaborate on the 5 things that stood out for you in this process?

Now that you know what the research is about and the interest I have in exploring our experience, is there anything I should have asked but I didn’t?

Is there is anything you want to add that I didn’t consider?
Appendix B: Common concept map
CERTIFICATE OF APPROVAL - MINIMAL RISK

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<td>UBC/Education/Curriculum and Pedagogy</td>
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Other locations where the research will be conducted:
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SPONSORING AGENCIES:
N/A

PROJECT TITLE:
Learning from inside: the perspectives of Elders, teachers and Mathematicians developing culturally responsive curriculum

CERTIFICATE EXPIRY DATE: April 7, 2011

DOCUMENTS INCLUDED IN THIS APPROVAL:

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The application for ethical review and the document(s) listed above have been reviewed and the procedures were found to be acceptable on ethical grounds for research involving human subjects.
Approval is issued on behalf of the Behavioural Research Ethics Board and signed electronically by one of the following:

Dr. M. Judith Lynam, Chair
Dr. Ken Craig, Chair
Dr. Jim Rupert, Associate Chair
Dr. Laurie Ford, Associate Chair
Dr. Anita Ho, Associate Chair