Investigating Complex-Value-Based Community Mine Education Strategies:
A Case Study with the Tlı́chǫ́ Community in the Wek’eezhìı Region
Northwest Territories, Canada

by

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ABSTRACT

This thesis attempts to define an effective model for developing educational programs related to mining for communities in an iterative manner that speaks to the needs and values of the community. The lessons learned provide direction on methods to replicate an effective education program for communities. The success of a process that was used to develop an education program in a mining context for a particular case has been evaluated. Reasons for why learning does or does not transpire for this case were explored.

A case study of the Tlı́cho community in Canada’s Northwest Territories was conducted to investigate this query. A combination of theories, approaches, and methods were utilized in the development of the education program, the collection and interpretation of data, and the formation of key findings. The inquiry led to the following four key conclusions:

1) Knowledge and understanding are effectively acquired by situating information as primary experiences or through oral accounts by persons who have experienced.
2) The objects of learning for education programs must be valuable, useful, and meaningful to the intended learners. Each individual must be given the autonomy to decide what topics or concepts are appropriate for him or her. Thus, choice and flexibility must be built into the programs. The “I am going to teach you…” approach to education is less superior than a humble humanistic approach to education.
3) The process to develop programs should involve cycles of action and reflection, input from the intended learners, and repetition.
4) Assimilation of information occurs through the experience of knowledge that is presented in culturally based frames informed by particular stories, experiences, teachers, places, values, histories, and materials.

These conclusions provide some insight on how governments and mining companies can and should engage with communities to learn. Enhanced knowledge and understanding through learning by communities, governments, and mining companies, strengthen relationships and agreements. When everybody’s knowledge and understanding improves, better decisions can be made.
## TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABSTRACT</td>
<td>ii</td>
</tr>
<tr>
<td>TABLE OF CONTENTS</td>
<td>iii</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>vi</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>vii</td>
</tr>
<tr>
<td>ACRONYMS, PLACENAMES, AND DEFINITIONS</td>
<td>viii</td>
</tr>
<tr>
<td>DEDICATION</td>
<td>xi</td>
</tr>
<tr>
<td>1 INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>1.1 The Community - Mine Knowledge Conflict</td>
<td>1</td>
</tr>
<tr>
<td>1.2 Problem Statement and Research Question</td>
<td>3</td>
</tr>
<tr>
<td>1.3 Outline of the Thesis</td>
<td>4</td>
</tr>
<tr>
<td>2 THE TLICHO CASE</td>
<td>6</td>
</tr>
<tr>
<td>2.1 Introduction</td>
<td>6</td>
</tr>
<tr>
<td>2.2 The Lay of the Land and its People</td>
<td>8</td>
</tr>
<tr>
<td>2.3 A History of Mining</td>
<td>12</td>
</tr>
<tr>
<td>2.4 A Recent History of Tlicho Governance</td>
<td>16</td>
</tr>
<tr>
<td>2.5 A History of Mine Education</td>
<td>18</td>
</tr>
<tr>
<td>3 THE RESEARCH DESIGN</td>
<td>22</td>
</tr>
<tr>
<td>3.1 Introduction</td>
<td>22</td>
</tr>
<tr>
<td>3.2 Influential Theories and Approaches</td>
<td>22</td>
</tr>
<tr>
<td>3.2.1 Humanistic Participatory Education</td>
<td>23</td>
</tr>
<tr>
<td>3.2.2 Value-Focused-Thinking</td>
<td>24</td>
</tr>
<tr>
<td>3.2.3 Complexity Theory of Education</td>
<td>24</td>
</tr>
<tr>
<td>3.2.4 Innovative Demonstrations</td>
<td>25</td>
</tr>
<tr>
<td>3.2.5 Culturally Based Education</td>
<td>26</td>
</tr>
<tr>
<td>3.3 Applied Methods</td>
<td>28</td>
</tr>
<tr>
<td>3.3.1 Data Collection</td>
<td>28</td>
</tr>
<tr>
<td>3.3.2 Action – Reflection Cycles</td>
<td>29</td>
</tr>
<tr>
<td>3.4 Data Sources</td>
<td>31</td>
</tr>
<tr>
<td>3.4.1 Interviews</td>
<td>31</td>
</tr>
<tr>
<td>3.4.2 Observations</td>
<td>32</td>
</tr>
<tr>
<td>3.4.3 Surveys</td>
<td>33</td>
</tr>
<tr>
<td>3.5 Data Integration</td>
<td>33</td>
</tr>
<tr>
<td>3.6 Data Limitations</td>
<td>35</td>
</tr>
<tr>
<td>3.7 Chapter Summary</td>
<td>37</td>
</tr>
</tbody>
</table>
4 KEY ACTIONS AND REFLECTIONS ................................................................. 38

4.1 Introduction ................................................................................................. 38

4.2 Interviews and Workshop .......................................................................... 38
  4.2.1 Action ..................................................................................................... 38
  4.2.2 Reflection ............................................................................................... 41

4.3 The Caribou Hunt ...................................................................................... 44
  4.3.1 Action ..................................................................................................... 44
  4.3.2 Reflection ............................................................................................... 47

4.4 The Education Sessions ............................................................................ 48
  4.4.1 Action: Pilot Session ........................................................................... 48
  4.4.2 Action: Yellowknife Session ................................................................. 50
  4.4.3 Action: Wekweeti Session .................................................................... 51
  4.4.4 Reflection ............................................................................................... 52

4.5 Community Affairs .................................................................................... 57
  4.5.1 Action ..................................................................................................... 57
  4.5.2 Reflection ............................................................................................... 59

4.6 Chapter Summary ...................................................................................... 60

5 ACTION-REFLECTION LESSONS LEARNED ............................................. 62

5.1 Introduction .................................................................................................. 62

5.2 Incorporate Culture and Values ................................................................. 62

5.3 Know the Participants and Be Known to Them .......................................... 63

5.4 Teach How They Teach ............................................................................ 64

5.5 Show it Don’t Tell it .................................................................................... 64

5.6 Relate Education to Local Realities ........................................................... 65

5.7 Break Down the Teacher-Student Barrier ................................................. 66

5.8 Build it with Them ....................................................................................... 66

5.9 Take the Program to Them ......................................................................... 67

5.10 Create Credible Alliances ......................................................................... 67

5.11 Determine Who Wants to Know What ....................................................... 68

5.12 Know Where to Start and How to Move Forward .................................... 69

5.13 Repeat, Repeat, Repeat ............................................................................ 69

5.14 Personality Counts ..................................................................................... 70

5.15 Plan the Logistics ....................................................................................... 71

5.16 Chapter Summary ....................................................................................... 71

6 EVIDENCE OF SUCCESS ........................................................................... 73

6.1 Introduction .................................................................................................. 73

6.2 Acquiring Knowledge .................................................................................. 74

6.3 Acquiring Understanding ............................................................................ 76
LIST OF TABLES

Table 2.1: Community Profile Data ................................................................. 12
Table 4.1: Key Informant Interview Responses .................................................. 39
Table 4.2: Original Training Session Outline Menu .......................................... 42
Table 4.3: The Evolution of the Training Material .............................................. 53
LIST OF FIGURES

Figure 1.1: The Community-Mine Conflict ............................................................... 1
Figure 2.1: Map of NWT Land Claims, Regions and Communities ......................... 9
Figure 2.2: Map of Tłı́chǫ Agreement Regions and Communities ......................... 10
Figure 2.3: Mining Activity in the Tłı́chǫ Region ................................................. 15
Figure 2.4: Tłı́chǫ Government Structure .............................................................. 17
Figure 3.1: Influential Research Theories and Approaches .................................. 22
Figure 3.2: Research Action-Reflection Cycle ...................................................... 31
Figure 4.1: Photo of Needs Assessment & Value Workshop .................................. 39
Figure 4.2: Photo of Snare Lake Camp ................................................................. 45
Figure 4.3: Photo of Daring Lake Research Camp .............................................. 45
Figure 4.4: Photo of Pilot Education Session Preparation .................................... 49
Figure 4.5: Photo of First Education Session ...................................................... 50
Figure 4.6: Photo of Second Education Session .................................................. 51
Figure 4.7: Photo of Behchokǫ Hand Games Tournament .................................. 57
Figure 4.8: Photo of Wekweetì Hand Games Tournament .................................. 58
Figure 4.9: Photo of Elder Expressing Concerns at BHP Billiton Public Hearing ...... 58
Figure 4.10: Summary of Activities and Outputs ............................................... 61
ACRONYMS, PLACENAMES, AND DEFINITIONS

Behchokò  Rae-Edzo
BHP      Broken Hill Proprietary Incorporated (Now BHP Billiton Inc.)
Dogrib  The name used for the Tl’cho until 2005
Ezodziti An area of historical and cultural importance to the Tl’cho
defined in the Tl’cho Agreement
Gamètì  Rae Lakes
GMP     Global Mercury Project
GNWT    Government of the Northwest Territories
IBA     Impact Benefit Agreement
INAC    Indian and Northern Affairs Canada
Kwe     Tl’cho word for rock
Kwetiji Tl’cho word for unfriendly mineral explorer
Monwè Gogha De Nintlee The Tl’cho traditional land use area as described by Chief
Monwè to the Federal Treaty Commission in 1921
Nakan   A villainous bushman described in Tl’cho stories
NWT     Northwest Territories
TGLP    Tl’cho Government Lands Protection
Tl’cho The name for the people formerly known as Dogrib
Tl’cho Lands The area that the Tl’cho own in fee simple defined in the Tl’cho Agreement
TDU     Transportation Demonstration Units
UNIDO   United Nations Industrial Development Organization
Whatì  Lac la Martre
Wek’eezhì The resource management area defined in the Tl’cho Agreement
Wekweetì Snare Lake
WLWB    Wek’eezhì Land and Water Board
WRRB    Wek’eezhì Renewable Resources Board
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This thesis combines various research disciplines in an attempt to integrate a holistic system of knowledge into the education strategy that emerged. As such, expertise was gleaned from numerous people and faculties.

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The participants of this study taught me so much about their land and culture. The Elders educated me in their classrooms – on the land. Everybody’s knowledge enriched the education experience. I shared unique encounters caribou hunting, watching hand games, and eating dried caribou flakes wrapped in fat with the participants. The memories of the land, the culture, and the warmth of the people I met will live with me forever. Masi cho.

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DEDICATION

To Rhoda Irene and Jean-Paul Chouinard, my guardian Angels.

And

To Joe Migwe, the Angel who inspired this work.
1 INTRODUCTION

1.1 The Community - Mine Knowledge Conflict

The mining industry provides revenue and employment for many, and products for essentially everybody in modern society. However, the industry can be met with conflicting opinions about the benefits of the mining sector - particularly from communities that are directly impacted by development activities. The effects of mining-induced displacement – of community dwellings, productive lands, and other land-use assets – affect many communities around the world, and Aboriginal communities in particular (Downing 2002). Statistics show that more than 1,200 Aboriginal communities are located within 200 km of mining operations (NRCAN 2006). Community-mine conflicts can arise for a number of reasons. Conflicts may stem from false expectations, unfair agreements, force, experienced or perceived negative impacts from mining, and from the unknown (Figure 1.1). When communities do not know what is happening, why it is happening in their region, or what the potential benefits or negative impact will be; project development risks public scrutiny, project delays or closures, and in extreme cases, violent community conflicts (Handelsman et al. 2003).

Figure 1.1: The Community-Mine Conflict

Community involvement in mine planning initiatives, a relatively new phenomena, is gaining momentum around the world. The initiation of social impact assessments and the incorporation of “traditional knowledge” into plans and programs,
have become mainstream, if not mandatory, components of regulatory mining regimes, strategies, and directives in many countries (e.g. GNWT 2004, PDAC 2009a, UNPFII 2005). Impact Benefit Agreements (IBAs) are used in indigenous communities across Canada as a means to establish relationships with mining companies and reduce the negative impacts from mining (Gibson and Zoe 2009).

How can communities contribute their local knowledge and make decisions or agreements to effectively manage resources, relationships, and effects resulting from mining activities without knowing and understanding how mining contributes to these decisions and agreements? It is argued that effective community involvement in mine planning initiatives can be improved through education strategies – a process that involves coming to experience the world (Marton and Booth 1997). Community members that are involved in making decisions and agreements on mining projects are typically unable to seek adequate advice from expert consultants and digest all of the information needed to make informed decisions and recommendations in a timely manner (Sosa and Keenan 2001). Quick, uninformed decisions and recommendations can result in unfair agreements, inadequate safeguarding of things that are valued, and conflicts with proponents and governing bodies. Resources are required to help community members understand the potential environmental, social, and economic implications of mine development projects (Keeney 1982). This resource-seeking stage can create a bit of a conundrum for communities that are not familiar with the mining industry, especially when pressured with limited funds or time.

Knowing and understanding are the intended outcomes of education strategies. “Knowing” is the ability to recall or recognize details such as terminology, principles, rules, conventions, and criteria. “Understanding” on the other hand, refers to the ability to internalize, synthesize, and systematize knowledge (Bloom et al. 1981). Knowing and understanding issues that affect key community values may be the best way for communities to engage in meaningful dialogue with mining companies and governments and make informed decisions and agreements. An increasing number of studies are pointing out the lack of research being done on effective learning methods to instigate policy change, particularly at the organizational or group level (Parson and Clark 1995). The same is likely true about a lack of research on effective learning strategies to prepare
communities with the tools needed to respond to resource development on their lands – the paradox being that few studies have been conducted to state this.

Some efforts are taken in the mining sector to promote mine training and education. Efforts fall short in that they are mainly aimed at developing skills for mine workers or promoting mining curriculum for teachers and students, while community-level education programs are just beginning to surface (e.g. CIM 2009, PDAC 2009b). Programs are often unidirectional, ignoring the potential for emerging knowledge and truths that can be discovered through a more participatory approach. Programs that are founded on a vested interest (from an industry or government perspective) will have, or could appear to have, a strong bias. Furthermore, the process and frames of collecting and using “traditional knowledge” is biased towards Euro-Canadian perspectives (Nadasdy 2003).

1.2 Problem Statement and Research Question

Programs to promote learning in communities impacted by mining have largely ignored the investigation into appropriate topics, concepts, and modes of educating. They fail to truly engage. They fail at being meaningful. They are unidirectional, and fail to incorporate participatory input for program design. For the majority of civil society, they often do not exist at all - namely because there is no specific agenda for governments or industry to engage in public education. There is no recognized model for developing educational programs related to mining operations for communities in an iterative manner that speaks to the needs and values of the community. Furthermore, the incorporation of local knowledge and culturally sensitive learning modes are often ignored in the “short-term technical education and training platforms that do occur from time-to-time” (WRRB staff member, pers. comm.).

The central question guiding this research was:

_How should education programs be designed for communities and their resource managers in a meaningful way to improve technical knowledge and understanding of the mining industry?_

Three specific objectives of this research were:
1) To provide direction on replicating the development of successful mine-education programs,
2) To evaluate the success of a process used to develop an educational program related to mining for one case-study, and;
3) To gain insights on how learning happened or failed to happen for one case-study.

The lessons learned upon reflection of the inquiry as a whole are detailed in this thesis. These lessons provide general directions and suggestions for the development of similar education programs. In order to determine whether or not the education program was successful, this inquiry considered whether or not knowledge was acquired, if understanding of this knowledge transpired, and if proof that this knowledge could be applied was evidenced. Finally, once the level of program success was considered, an analysis of how learning happened or failed to happen took place. The indicators of how learning happened or did not happen are arguably more subjective than finite. They rely on observations and reflections that connect the research methods and activities with the outcomes. Rich descriptive analyses of emergent themes that provide insight to draw claims are referenced in this thesis.

1.3 Outline of the Thesis

This thesis is separated into eight chapters. The first chapter introduces the research problem, question, and objectives. The second chapter introduces the specific case where this thesis was developed – in the Wek’eezhii region of the Northwest Territories with the Tłı̨chǫ communities. Chapter three details the research design including influential theories and approaches, applied methodologies, data sources, data integration, and data limitations. Chapter four describes the key activities conducted and how the educational path evolved over time upon reflection. In chapter five, key lessons learned from the action-reflection cycle are presented. The findings presented in this chapter address the first research objective: to provide direction on replicating the development of successful mine-education programs. Chapter six attends to the second research objective: to evaluate the success of a process used to develop an educational program related to mining for one case-study. Evidence that success was attained through proof of acquired knowledge, understanding, and ability is argued. The seventh chapter
delves into key themes that emerged throughout the course of the research. These themes are analyzed to satisfy the third research objective: to gain insights on how learning happened or failed to happen for one case-study. The eighth and final chapter of this thesis returns to the research question: How should education programs be designed for communities and their resource managers in a meaningful way to improve technical knowledge and understanding of the mining industry? Final conclusions are made, a summary of the key findings are presented, key recommendations for future work and applications are made, evidence of the lasting success of the research is offered, and some final thoughts bring the thesis to a close.
2 THE TLICHO CASE

2.1 Introduction

The Tlčho community\(^1\) from the Wek’eezhı̨ region of the Northwest Territories was chosen as a suitable case for this research because of their unique political situation, their geographic location with respect to mining, their cooperation and willingness to participate, and because of my personal experience with this community and region. Tlčho peoples are ethnologically classified as part of a larger group of subarctic Athapaskan First Nations Dene. Also classified in this group are Chipewyans, Slaveys, Mountain Indians, Bearlake Indians, Hares, and Ktuchin, now Gwich’in (Helm 2000). Although this study involved the participation of Tlčho citizens specifically, literature on Dene research and culture have been used and referenced throughout this thesis.

The political setting with the Tlčho community lends itself to a unique and interesting case to consider. Negotiations between the Dogrib Treaty 11 Council, the Government of the Northwest Territories (GNWT), and the Government of Canada led to the ratification of the comprehensive land claim and self-government Tlčho Agreement in 2005 (Tlčho Agreement 2005). This agreement provides certain rights and benefits, and self-government to the Tlčho Citizens. With the development of the Tlčho Government, the community itself has become influential in its role of decision-maker and resource manager. There is a need for the community decision-makers, resource representatives, and other community members to acquire a scientific knowledge base to govern the land responsibly. It is customary in this culture to seek advice and direction from the Elders of the communities. There is also a concern that the youth are not receiving all of the information they need to tackle important resource management issues for the future. This stress exists because the community leaders do not have this type of knowledge to pass on, and thus, must rely on outside sources to educate the youth.

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\(^1\) When referring to the Tlicho community – note that most participants are of Tlicho descent, but not all. All of the community members that participated in the research are broadly being referenced. They all live in the traditional Tlicho region and/or are involved in the Tlicho governance of mining.
with this knowledge. The community as a whole “is hungry for knowledge” (Interview with Tłı̨chǫ Government staff, March 28, 2008). They are politically charged with the formal duty to make decisions that hinge in part on scientific knowledge. The formalized political structure of the Tłı̨chǫ Government Agencies aided in the logistical coordination of the study.

The Wek’eezhì region hosts rocks rich in valuable minerals, making it an active area for Canada’s mining industry. Mining in this region has been prominent since the late 1800s, and continues to prevail as a dominant economic industry. The industry has been met with varying degrees of acceptance and resentment from the Tłı̨chǫ community. The industry has been held responsible for the disruption of animals, fish, water, spirits, and relationships (Gibson 2008). It has also been a major source of employment for many in the region and the source of funding for many community development projects (BHP Billiton Inc. 2009, De Beers Canada 2009, Rio Tinto 2009). The people of the region have at least some understanding of the industry. They are in some way affected by mining; they are employed by mines, their traditional hunting areas have changed because of mining, they use infrastructure that has been developed because of mining, or they see more traffic and people in the area because of mining.

The opportunity to develop this research with this community was available because they were interested in the scientific learning objectives, and the timing of this research made sense (the Tłı̨chǫ government has been working towards completing their resource strategies to guide decision-making on mining and other land uses in the region). The presence of Tłı̨chǫ offices in the city centre of Yellowknife made it easier to approach the community leaders at the outset, and maintain contact with community officials throughout the project. The community’s support was demonstrated by active, detailed participation in all stages of the work, as well as by strong logistical and financial contributions.

Finally, my personal experience made this community an appropriate choice. I have lived and worked in the Northwest Territories off and on since 1999. During this time I have made many contacts and have worked on many mine-related projects. I became actively involved with Tłı̨chǫ community affairs when I worked as a regulator...
for the mines in their traditional region. I have attended numerous workshops, public hearings, and meetings with Tłı̨chǫ members and representatives, and worked directly for one of their current resource management assistant Directors for many years. Thus, my familiarity with the region, the community, the mines in the area, and the staff made this an attractive case to select.

The people involved in this case study were asked to participate voluntarily by the Directors of the three agencies directly involved with mine resource management issues: the Wek’eezhìı Land and Water Board (WLWB), the Wek’eezhìı Renewable Resources Board (WRRB), and the Tłı̨chǫ Government Lands Protection (TGLP). Participants included staff from the three agencies, prominent Tłı̨chǫ Elders, and at times, the community as a whole was invited to participate if they desired. The repetition of participation in all of the phases was encouraged of the key research participants.

2.2 The Lay of the Land and its People

The Tłı̨chǫ community case refers to the research participants who live in one of the four communities within the Wek’eezhìı resource management area or work to manage the resources in the Wek’eezhìı region. The Wek’eezhìı resource management area is a geographic region defined in the Tłı̨chǫ Agreement. The Agreement applies to four areas: Monwhi Gogha De Niitlee is the traditional land use area, the Wek’eezhìı resource management area borders land claims settlement areas and traditional areas of other Aboriginal groups, Tłı̨chǫ Lands is the area that the Tłı̨chǫ own in fee simple, and Ezodziti is an area of historical and cultural importance to the Tłı̨chǫ (Tłı̨chǫ Agreement 2005). Four communities are located in the Wek’eezhìı region: Behchokǫ, Whatı̨, Gamètì, and Wekweetı̨. Figure 2.1 and Figure 2.2 show the Tłı̨chǫ Agreement geographic areas and the four Wek’eezhìı communities.
Figure 2.1: Map of NWT Land Claims, Regions and Communities

Source: Map Courtesy of Rob Dobson, WLWB 2009
Figure 2.2: Map of Tłı́chǫ Agreement Regions and Communities

Source: Map courtesy of Mark Fenwick, TG 2009
Table 2.1 provides census data that highlights information about the community population, language, lifestyles, and education. Behchokǫ is the largest of the communities with a population of 2,016. This is where the central office for the Tlı́chǫ Government is located. Behchokǫ is located along the north arm of Great Slave Lake, about an hour drive southwest of NWT’s capital Yellowknife city, and about 300 km south of the diamond mines. (Tlı́chǫ Government 2009a).

Whatı is located along Lac La Martre 164 km by air northwest of Yellowknife. It has a population of 523. The community is accessible by a winter ice road from Behchokǫ. There is a multi-grade elementary school, small hotel, a co-op general store, and a health center that employs two nurse practitioners five days a week. The community is known for its great fishing, migratory birds, and traditional crafts (Tlı́chǫ Government 2009a).

Gamètì is located about 177 km by air northwest of Yellowknife and can be accessed by a winter ice road from Behchokǫ. It has a population of 307. The community is located in a traditional hunting area mid-way between Great Slave Lake and Great Bear Lake. It was used as a temporary hunting camp before people settled here in the 1970s. Gamètì has a community store, hotel, restaurant, fire station, health centre and a multi-classroom school. Arctic greyling fly-fishing and caribou hunting outfitters contribute to the economy in this region. The area is also known for its handicrafts and Dene drummers (Tlı́chǫ Government 2009a).

Wekweetì was established as a settlement region in the 1970s. Today the population is about 143, the smallest of all the communities. The community is located along Snare River, close to the hydro-dams that provide the community with power. It is the most northerly of the communities, boarding the treeline that melts into the Barrenlands. It is an important area for Bathurst caribou migration – and thus, is an important hunting region for the Tlı́chǫ people (Tlı́chǫ Government 2009a).
Table 2.1: Community Profile Data

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<tr>
<th>Census Data</th>
<th>Behchokò</th>
<th>Whatì</th>
<th>Gamètì</th>
<th>Wekweetì</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population (2007)</td>
<td>2,016</td>
<td>523</td>
<td>307</td>
<td>143</td>
</tr>
<tr>
<td>Language (2004)</td>
<td>93.1</td>
<td>96.9</td>
<td>98.5</td>
<td>96.1</td>
</tr>
<tr>
<td>(% Speak Tłı̨chǫ)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lifestyles (2003)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(% Hunting/Fishing)</td>
<td>35.3</td>
<td>42.9</td>
<td>41.6</td>
<td>64.2</td>
</tr>
<tr>
<td>(% Trapping)</td>
<td>15.1</td>
<td>8.1</td>
<td>16.7</td>
<td>19.3</td>
</tr>
<tr>
<td>(% Households Consuming Most/All Country Meat)</td>
<td>38</td>
<td>46.0</td>
<td>50</td>
<td>63.9</td>
</tr>
<tr>
<td>Education (2006)</td>
<td>37.2</td>
<td>38.5</td>
<td>32.4</td>
<td>47.4</td>
</tr>
<tr>
<td>(% With High School Diploma or More)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: NWT Bureau of Statistics 2009

Helm (2000) details the ethnohistory of the Dene community involved in this case study in great depth. Gibson (2008) provides a descriptive synopsis of the evolution of Tłı̨chǫ relationships and agreements from historic to present times. Agreements and Treaties frame relationships with animals, places, and people in the Tłı̨chǫ cosmology. Offerings of time, knowledge, and customs signal faith to these agreements (Gibson 2008). The significance of knowing, respecting, and incorporating historical and cultural frameworks into educational strategies are stressed throughout this work.

### 2.3 A History of Mining

The Northwest Territories has a rich history in mineral prospecting and mining ventures that have kept the economy prospering in the region. Mining began with uranium - and when uranium mining tapered, gold mining took over. As the prices of gold fluctuated on the market, base metals such as zinc, lead, silver, and tungsten have contributed to the economy. Today, diamond mining dominates the mineral industry in
NWT (INAC 2009a). An extensive list of mining and exploration ventures in the Wek’eezhii resource management area can be found at the WLWB’s public registry (http://www.mvlwb.ca/WLWB/Registry.aspx). There are currently two operating mines in this region (the Ekati and Diavik diamond mines), and more than 45 active land use permits and water licenses for mineral exploration ventures. Figure 2.3 depicts the active mines, inactive mines, and reclaimed mines in the region. A brief synopsis of NWT’s mineral commodities is listed below.

**Uranium**

Eldorado Gold Mining Company began Canada’s uranium operations in Port Radium, NWT in the early 1930s. The industry gained momentum in the 1940s due to military demand, and continued operation until the 1960s (World Nuclear Association 2009). A second uranium mine opened 145 kilometers northwest of Yellowknife in 1957. The Rayrock mine operated until it was abandoned in 1959. Indian and Northern Affairs Canada (INAC) reclaimed the 70,903 tonnes of radioactive waste in 1996 and 1997 (INAC 2009b).

**Gold**

The discovery of gold dates back to 1898 when a prominent prospector collected rock samples in the area that were later found to contain gold. It wasn’t until 1933 that gold was discovered in the field and the first gold camp was established. By 1935 a staking rush was creeping up the west side of Yellowknife Bay, leading to the opening of the Con and Negus mine. The discovery of the Giant mine followed in 1945, with hundreds of other companies vying to make it big. The gold mining industry fluctuated for the next 30 years with the depletion of ore reserves and a fluctuating gold market. The 1980s resurrected prospecting in the area with increasing gold prices, and the city continued to boom. In 1999 Royal Oak Mines Inc. claimed insolvency, leaving behind a legacy of un-reclaimed mine sites that include the Giant and Colomac mine (NWT Mining Heritage Society 2009).

**Other Metals**

Metal mining has historically cushioned the uranium and gold mining economy in the NWT. The underground Pine Point Pb-Zn mine had its peak production between 1966 - 1970 and 1986 -1987 (Hannigan 2007). The mine closed in 1988 due to economic...
reasons, and is now being revisited as a potentially attractive venture. The Cantung tungsten mine was discovered in 1954. Production commenced in 1962 and has continued to operate off and on since (North American Tungsten Corp. Ltd. 2009). The Cantung mine is operating today, with prospects for additional tungsten mining at the more northerly MacTung site along the Yukon boarder. Prospecting for other ores such as copper and silver have continued in the NWT since the early exploration days.

Diamonds

The discovery of diamonds in 1991 at Lac De Gras was the event that would sustain the mineral industry of NWT to the present day. BHP Billiton Inc. opened the Ekati mine, Canada’s first diamond mine, in 1998. Rio Tinto followed suit and opened the Diavik diamond mine in 2003. The most recent diamond mine is the Snap Lake mine that began production in 2008. It is owned and operated by De Beers Canada (GNWT 2009). Numerous diamond exploration projects continue in the NWT with efforts to sustain the mining industry in Canada’s North well into the future.
Figure 2.3: Mining Activity in the Tłı̨chǫ Region

Source: Map courtesy of Mark Fenwick, TG 2009
2.4 A Recent History of Tlı́chо Governance

In 2003, the Tlı́chо Land Claim and Self-Governance Agreement (The Agreement) was signed, installing a resurgence of hope and power to the Tlı́chо communities (Tlı́chо Agreement 2005). The negotiations for the Agreement took place between the Dogrib Treaty 11 Council, the Government of the Northwest Territories (GNWT), and the Government of Canada. The Agreement was ratified in 2005. It is the first agreement of its kind in the Northwest Territories, providing rights, benefits, and royalties to Tlı́chо citizens (Tlı́chо Agreement 2005).

The Tlı́chо citizens have fought long and hard for their right to self-government. On August 22, 1921 Chief Monfwi signed Treaty 11 with the Government of Canada on behalf of the Dogrib of North Slave. According to Zoe (Interview, March 31, 2008), at the time of the signing, Chief Monfwi declared the words that are symbolized by the Tlı́chо flag: as long as the sun rises, the river flows, and the land does not move, we will not be restricted from our way of life. On June 27, 2004, 92.7% of Tlı́chо voters supported the ratification of The Agreement. Grand Chief Joe Rabesca addressed the crowd with these words:

In 1921, our great Chief Monfwi, entered into a relationship with the Government of Canada, called Treaty 11. Today, our people have continued the work begun by our great Chief Monfwi by approving this Agreement. I'm overwhelmed by the support of our people, for the work of our negotiators and cannot begin to express what a proud day this is for the Tlı́chо”.

-Grand Chief Joe Rabesca (Tlı́chо Government 2009)

The Agreement defines the Tlı́chо Government’s power and obligation to:

- Pass and enforce laws in some areas,
- Own resources, receive tax revenues and protect resources,
- Protect the Tlı́chо language and culture, heritage and wildlife, and;
- Establish the Constitution that sets out the rights and freedoms of Tlı́chо citizens, provides election rules, and ensures Tlı́chо Government accountability (Tlı́chо Government 2009).
The Tl'icho Governing Structure is made up of three parts: the Tl'icho Gathering, the Tl'icho Assembly, and the Chief’s Executive Council. This structure is depicted in Figure 2.4.

Figure 2.4: Tl'icho Government Structure

In 2005, the Wek’eezhii Land and Water Board (WLWB), and the Wek’eezhii Renewable Resources Board (WRRB) (collectively termed the Boards) were established as co-management decision-making Boards. These Boards are made up of appointees from the Government of Canada, the Government of the Northwest Territories, and the Tl'icho Government under the authority of the Tl'icho Land Claim and Self-Governance Agreement (Tl'icho Agreement 2005).

The WLWB regulates the use of land and water and the deposit of waste in the area. They are the decision-making authority for the authorization of projects. They are responsible for issuing, amending, extending, renewing, or canceling Water Licenses and Land Use Permits within the regions boundaries. They conduct preliminary screenings for development proposals and can refer projects to Environmental Assessment or Environmental Impact Review. This Board consists of four members; two appointed by
The Tl’icho Government, one appointed by the Government of Canada, and one appointed by the GNWT (Tl’icho Agreement 2005).

The WRRB is the authority on wildlife management in the Wek’eezhii region. They are responsible for making management decisions on wildlife, plants, forests, and protected areas. They review development proposals and applications and collaborate on research activities and programs. This Board also consists of four members; two appointed by the Tl’icho Government, one appointed by the Government of Canada, and one appointed by the GNWT (Tl’icho Agreement 2005).

The formalization of Tl’icho governing authority has been accompanied by the growing pains of emerging resource management boards – still trying to define their key strategies for safeguarding the things of value to the communities they represent. Challenges include soliciting input from community members, making fast-paced technical decisions, and communicating the decisions back to the people they embody (pers. comm. with WLWB, WRRB, and TGLP staff). The resource management staff has to be prepared to make decisions on mining endeavors. They are also responsible for informing the communities they represent.

### 2.5 A History of Mine Education

There are a number of government and industry educational programs that are being offered to citizens in the Tl’icho region. The NWT Mine Training Committee (formed by the Minister of Education, Culture and Employment, and the Government of the Northwest Territories), with partners from Industry, Aboriginal Governments and the Federal and Territorial governments have developed a skills training program to help build community capacity in the mining sector (NorthWays Consulting 2002). INAC supports an array of educational programs that include: the Aboriginal Workforce Participation Initiative, Aboriginal Bursary Search, Aboriginal Education and Training and various other grant and loan opportunities (INAC 2009c). The NWT Geoscience Office runs a number of geo-based outreach programs such as the Community Mapping Program, the NWT Bedrock Field School, and the Daring Lake Tundra Science Camp (NWT Geoscience Office 2009).
Industry training and education initiatives are also surfacing in the region. Hiring protocols are typical in mining Impact Benefit Agreements (IBAs) and as such, training for community members is offered on-the-job. Additionally, BHP Billiton Inc. offers a voluntary Workplace Learning Program to help employees with low literacy levels increase their literacy and numeracy confidence (BHP Billiton 2009). Rio Tinto supports community education through its comprehensive scholarship program (Rio Tinto 2009).

The Aurora College is the formal institution for certified adult education. Hodgkins’ (2008) review of adult education in the NWT discusses the theoretical dilemma that educators face in “choosing to either serve the needs of the market through provision of vocational training, or instead strengthen civil society through education promoting the development of a critical consciousness”. He found that the College’s curriculum is largely aimed towards strengthening the skills for the potential workforce. He goes on to explore the weaknesses of this approach in terms of capacity building and the role of community interests and values in education.

It is important to acknowledge the efforts that are being taken and the resources available to achieve success in community education endeavors. However, access and awareness of educational opportunities for Tlicho citizens are lacking. Education strategies and curricula that truly engage and address the concerns and interests of the community members and their resource managers are deficient. The following excerpt describes a typical training situation that recently occurred in the region from the perspective of one of the participants (identity protected, pers. comm.).

In February, 2009 a two and a half day course took place in one of the Boardrooms in Yellowknife to discuss the Administrative Law. There were about 20 people in attendance; various NWT Board members and their resource staff attended. Breaks were taken frequently; coffee, tea, and muffins were provided.

The course was custom designed for the specific audience; the content was not appropriate for community members as a whole. Two lawyers delivered the course material. One lawyer was very familiar to the audience and had been working in the North for over two decades. The other lawyer came from the Southern provinces; his experiences were limited to Ontario and British Columbia mostly. The course was presented using overhead slides with the lawyers standing up facing the audience. The participants were given binders that contained the presentation slides and additional reading materials. There were no visuals in the presentation slides or in the binders.

The course began with the first lawyer introducing his colleague to the audience, followed by an outline of the course material. A general discussion on why Boards exist, how tribunals are set up by legislation, the role of quasi-judicial Boards, and the government’s powers over these Boards preceded the specifics of the course.
The lawyer with Northern experience gave personal examples from the North that were interesting and easy to follow. He also described hypothetical situations that applied to the North. Because he was familiar with the crowd he used real people, Boards, and situations in his examples. His session took a narrative format, telling stories that were humorous and reminiscent. People felt comfortable sharing their experiences, asking questions, and making jokes. When people asked questions he was able to understand the context of the concern or uncertainty because of his familiarity with the situation. There was also a sense of obligation to pay attention because the “teacher” was someone the audience knew and respected.

The other lawyer shared his experiences from the South. Although these examples were legitimate, and informative, they lacked the Northern application. Experiences and stories shared were about unfamiliar locations, people, and situations. The audience was less engaged.

This was the second time this course had been given in the region. The people attending the session were new to the Boards or had not received the training before. The timing of the session was deliberate; the new Board was set to attend an important public hearing just two weeks after the training. The purpose of the course was to teach the staff about the legal aspects of their jobs so they would have a better sense of what to do. Feedback from the participants was that the course was generally good and applicable to their immediate job duties. People commented that the slide presentations were a waste of time. At times the presenters simply read off of the slides, and the lack of visuals made the material less interesting. People liked the stories that naturally emerged and the logical progression of material. They expressed interest in learning about the local background information about tribunals.

Reflection of this typical training situation highlights important lessons about training and education that should be identified and addressed. The specific training described above was considered to be a “pretty good course” by the informant. Things that worked included the “teacher” who was familiar with the people, places, and relevant situations; the local context of the material taught; the storytelling format with humour; and the background information that led to the presentation of specifics.

Alternatively, examples of things that did not work in this scenario that are common with other educational programs delivered in the north include:

- The most effortless logistical planning for training location (always in Yellowknife), venue (always in Boardrooms), and catering (local preferences are not considered),

- A “teacher” who is not familiar with the local people, places, culture, and contexts (referring to the lawyer from the south),
• A teaching situation where the teacher faces the “students”, presents materials using slides and handouts with very little visuals, and uses examples that are irrelevant to the north, and;
• Training for staff only, for a specific – and usually immediate – purpose.

One WLWB member (interview, March 28, 2008) described the pitfalls of training that does target communities by saying:

A lot of briefcases come and make presentations, and at the end they ask if there are any questions. When there are no questions they assume everyone understands. But people are shy; many people cannot read and write or understand the instructions. We cannot miss the opportunities to hear from people because they are shy or uncomfortable or because they have a different understanding.

They pointed out the lack of engagement, trust, and relationships that accompany training opportunities. The culture and modes of preferred learning are absent. As a result, important knowledge and experiences go ignored or unheard.
3 THE RESEARCH DESIGN

3.1 Introduction

This chapter reviews the main theories and approaches that guided the research. These include: humanistic participatory education, value-focused-thinking, complexity theory of education, innovative demonstrations, and culturally based education modes (Figure 3.1). The research methods that were applied are presented. Three data sources were used for evidence to satisfy the research objectives – interview data, observation data, and survey data. The integration, limitation, validity, and credibility of these data sources are discussed.

Figure 3.1: Influential Research Theories and Approaches

3.2 Influential Theories and Approaches

The majority of the research was conducted without explicitly using any one theory or approach, which, according to Patton (2002), can be an acceptable way to get meaningful answers to practical questions. The opportunity to gain a greater understanding of the research problem can be enhanced by this pragmatic philosophy because of the different perspectives and research tools that are utilized. The validity of findings can be strengthened by considering different data sources (Cherryholmes 1992).
Pragmatic researchers concentrate on *what* to research and *how*; choosing multiple worldviews, methods, techniques, and procedures that best meet their needs and purpose (Creswell 2009).

The research problem, and all available sources and approaches to understand and solve the problem, is emphasized in pragmatic worldviews rather than the methods used to solve the problem (Rossman & Wilson 1985). To this effect, various experts on the topic of education and Dene culture influenced the approach of the study. For example, works by Chouinard and Veiga (2008), Davis et al. (2007), Freire (1968), Keeney (1982), McDaniels and Trousdale (1999), and Veiga et al. (2007) provided insights on effective learning situations. Works by Gibson (2008), Gibson and Zoe (2009), Helm (2002), Nadasdy (2003), and Rushforth (1992) provided more specific details about how learning happens in the specific case considered.

The common thread that runs through each of these theorists and practitioners is the unbounded openness to adapt to evolving systems, interacting systems, and culturally unique systems. The educational process and content that resulted from this research was influenced by the work of the individuals described below.

### 3.2.1 Humanistic Participatory Education

The late educator Paulo Freire promoted the philosophy that education is the practice of freedom – a process that contributes to the development of individuals and the world around them (Findsen 1999). He believed that education could be used as a tool to promote freedom and the autonomy for individuals to transform their own realities, and the realities of their surrounding society. Through humanizing vocations, every individual - through dialogue with others, and when provided with the appropriate tools - is able to deal critically with their personal and social worlds. This vocation breaks down old, paternalistic teacher-student relationships and encourages people to mutually educate each other. His methods of education united theory and praxis, whereby consciousness is discovered through repetitive action-reflection cycles (Freire 1968). This humanistic approach to participatory educating and learning was adapted for this study. Action-reflection cycles played a key role in developing the educational program and in drawing interpretations and conclusions.
3.2.2 Value-Focused-Thinking

“Value-focused-thinking” is advocated by researchers such as Ralph Keeney (1982) and Timothy McDaniels (McDaniels and Trousdale 1999) as a starting point to problem solving and decision-making. Value-focused thinking is a method of generating objectives for a community by focusing on the community’s deepest roots - values. Essentially it entails deciding what is important for the community to achieve within the context of a decision problem (McDaniels and Trousdale 1999). Value focused analysis involves the collective discussion of the decision problem in workshops, which are effective forums for collecting wide community representation of key values. Workshops also help keep the community involved with the process (McDaniels and Trousdale 1999).

The mining proponent, government authorities, or other stakeholders should not select the decision question that is discussed in a workshop. Rather, the decision question is one that the community designs; framed in a manner that recognizes the complexity of the problem and avoids assumptions and option-limiting prejudices (Hammond et al. 2002). Defining the decision problem however, is not as easy as it may first appear. How a decision problem is framed can greatly influence the course of action taken. For example, before the community had been consulted, the decision problem for this study was framed as “How can communities impacted by mines receive technical knowledge about Acid Rock Drainage in an effective manner?” This decision question did not allow for the inclusion of knowledge needs, interests, or gaps of the community in the framing of the problem. Value-focused-thinking strategies were used to redefine the decision problem with the community participants. Community values were elicited in order to set the stage for the education program design and execution. Values and objectives important to the community were identified to objectively determine the type of information that was needed in education on mining topics (Keeney 1982).

3.2.3 Complexity Theory of Education

Complexity theories, categorized as such, began to surface roughly fifteen years ago. They are a merger of several sciences, built on chaos theory or systems thinking (Nooteboom 2007). The theory is built around the idea of ever evolving interacting
systems that are capable of adaptation (Nooteboom 2007 and Davis et al. 2007). In an educational context, the role of complexity theories is to organize experiences that will orient learners’ perceptions to particular details that will prompt them to make associations with other details. Essentially, the aim is to create the opportunity for collective action and information, not to predetermine what action or information will emerge (Davis et al. 2007). Davis et al. (2007) define the teacher’s role as “expanding the space of the possible and creating conditions for the emergence of the as-yet-unimagined”.

Studies have shown that teaching based on specific theories helps participants to focus on critical attributes important for discerning the intended object of learning (Pang and Martin 2003). Furthermore, the use of a tested theory of learning helps “teachers” organize and plan classes by stipulating and clarifying the definitions of key learning components. These may include: the object of learning, objects of complexity, and natural arrangements of phenomena (Pang and Martin 2003).

Complexity theory of education was used to organize and frame the education lessons. Emphasis was placed on particular details – or objects of learning. The “space” or “opportunity” was created to allow for the knowledge, beliefs, interests, and ideas of the participants to make connections and shape the direction of the discussions. Lessons were flexible and adaptive to allow contributions from the participants. The learning setting was situated to direct attentions and thoughts towards a mining context, without stripping meaningful ideas from the learners. Understanding of the topic is enhanced through individual interpretations, histories, and connections. This process is more effective than merely passing factoids or perspectives from the “teacher” to the student (Davis et al. 2007). Certain background information is necessary to re-arrange, discover, or re-discover certain phenomena. Copying and repetition are valuable techniques in acquiring important background information.

3.2.4 Innovative Demonstrations

The United Nations Industrial Development Organization’s (UNIDO) Global Mercury Project (GMP) has clearly illustrated the effectiveness of building innovative demonstration tools for targeted learners. For example TDUs, or Transportation
Demonstration Units, constructed with cheap, local materials are used to demonstrate techniques to mine more efficiently and responsibly. GMP officials, such as Marcello Veiga, travel to artisanal mine sites to design and implement TDUs. The targeted learners for this project are artisanal miners who have little access to technology, education, and funds. Each unit is designed with “hands-on” demonstrations that meet the needs of the miners. The miners decide what is of importance to them based on their specific needs. This approach is successful because of the easy access to information (the TDUs go to the miners and are constructed using cheap local materials), the relevance or importance of the demonstrations (the demonstrations reveal methods to produce more gold), and the “hands-on” approach (miners can see and participate in the demonstrations) (Chouinard and Veiga 2008).

The participating community members in this study were exposed to some of the approaches used in the GMP. They were given the opportunity to comment on what topics they wanted to learn more about and how the education process should take place. The participants decided what information was or was not useful for them based on their immediate interests and needs. There was an overwhelming degree of support to take the educational program to the various communities, to use local tools and contexts in the program, and to maximize the “hands-on” visual aspect of the education strategies.

Another educational technique supported by Veiga et al. (2007) is engaging learners through song. The creation of music as a tool for educating is used in mining engineering courses at the University of British Columbia to foster motivation and engage participants. This method involves hands-on activities that allow students to be creative and make unconventional links between music and science. Survey and observational data have demonstrated that using creative, hands-on avenues to teach science improves the opportunity to learn (Veiga et al. 2007). This research emphasizes innovative avenues, which are of interest to the learners, to engage participants and increase participation.

### 3.2.5 Culturally Based Education

Specific educational strategies were derived from cultural and historical anthropology of the Dene. Literature from experts like Ginger Gibson (2008), June Helm
(2000), Paul Nadasdy (2003), Scott Rushforth (1992), and the Honorable John B. Zoe (Gibson and Zoe 2009) was referenced to draw insights on appropriate methods to educate in a Tłı̨chǫ context.

Rushforth (1992) argues that knowing constitutes believing that something is true based on culturally derived justifications. He goes on to state that there is no truth independent of individuals and their culturally based interpretations of the world. Thus, reasons for believing are inseparable from what to teach or how. His studies of Dene culture define two distinct systems of knowledge or believing - primary knowledge and secondary knowledge. Primary knowledge is acquired when an individual experiences a phenomena first hand. It is not hereditary, or passed down through generations. This is the key mode in Dene culture to legitimate knowledge and validate truth. Secondary knowledge is legitimized indirectly by primary knowledge, through myths, stories, literature, conversation, instruction, and gossip. It is founded on primary knowledge (i.e. the source of information must come from somebody who has experienced the phenomena first hand or from a storyteller or shaman who possesses special powers or authority). Who shares this information becomes as important as the information that is shared. Everybody should have equal access to knowledge and experience. Each individual will have access to different types of knowledge, both primary and secondary. This means that authority on information will shift depending on the topic or situation. For example, one person may be a legitimized authority in hunting, while another person may be the authority in medicine.

Educational preferences in Tłı̨chǫ culture rely on experience and observation. People prefer to learn by watching people who know about something. They prefer to learn by directly experiencing phenomena themselves. By watching and experiencing, they can then draw personal observations or discernments. They rely on indirect, informal instruction that does not impose an external authority. They often reject instruction based on facts presented in the absence of experience because it does not provide the full justification of beliefs to warrant knowing, and it violates traditional tenets of nonintervention (Rushforth 1992, Nadasdy 2003).

John B. Zoe, the central Tłı̨chǫ leader in the negotiation of land claims and self-government learned about Tłı̨chǫ history on the land with the Elders. He speaks of the
Tłı̨chǫ Cosmology, which is based on stories of relationships and agreements that are pursued with peace, friendship, continual renegotiations, and reciprocity that have been passed down by Elders (Gibson and Zoe 2009). He is viewed as a knowledgeable leader because of his experiences (primary knowledge). He is a respected source of secondary knowledge for the Tłı̨chǫ people (through his stories). Helm (2000) provides a rich description of the importance of oral history in the Tłı̨chǫ culture. She describes the meaning of power and the origins of shared understandings about power through knowledge. Affirmation of knowledge attained via personal experience such as dreams, miracles, and exceptional achievements are described as evidence of power, and thus, knowledge. In Dene culture, the ability to apply knowledge to provide for the people defines a knowledgeable person (Helm 2000).

Tłı̨chǫ citizens are inspired through a contemporary myth to build strength through knowledge. “Strong like two people” is the axiom that has been adopted by the people as a way to move forward. This concept is credited to a significant Tłı̨chǫ Elder, Chief Jimmy Bruneau, and was spoken of by Elder Elizabeth Mackenzie as the guiding philosophy for the regional high school and for Tłı̨chǫ inspiration (Gibson and Zoe 2009). These principles and preferences are important to honour in the development of educational models.

3.3 **Applied Methods**

This research utilized various methods to collect evidence, in the form of data, to support claims and interpretations used to answer the research question and satisfy the research objectives. The theories and approaches described above contributed to the methods that were used to orchestrate actions and critically reflect on activities and outcomes. The diverse research methods and activities combined to produce complementary results to the diverse overarching influences that guided this study.

3.3.1 **Data Collection**

This thesis used a mixed-method research design whereby; quantitative and qualitative data were collected and integrated as evidence to satisfy the research objectives and address the research question. A case-study strategy defined boundaries
for the inquiry, and situated the research to explore the process of educating. Case studies are anticipated to capture the complexity of a single situation involving people and programs (Stake 1995). They allow for closer relationships between people, land, and events to develop. The first priority of case study work is not to draw conclusions to represent the “whole”, but rather to understand and make interpretations of the selected case (Stake 1995).

Qualitative methods involved interviews, discussion sessions, observations, and the interpretation of themes that emerged during the research. Qualitative methods explored specific perspectives and experiences from individuals and groups, which were then woven together with observations and interpretations. This teaming of perspectives and experiences lends itself to a reduction of personal bias and improves the validity, and thus quality, of the research (Creswell 2009). Findings were triangulated to complement, supplement, and test the findings (and to test the theory of research methods) for the project (Strauss and Corbin1998). Furthermore, this method allowed for the flexible unfolding of concepts and themes that could not be fully understood at the outset of the research.

Quantitative methods utilized close-ended survey questionnaires to assess attitudes and self-assessed confidence of concepts (Creswell 2009). The systematic approach to gathering information, in contrast to the more flexible qualitative methods, was meant to confirm or challenge the qualitative findings. This method offered insights on the appropriateness or value added of investigating the research problem in this manner.

3.3.2 Action – Reflection Cycles

The development of the educational program was not linear, nor was it established at the outset of the research. Actions were a product of intention, opportunity, chance, and participatory involvement – influenced by the theories and approaches described above. The program developed and evolved over time as input was received from the participants and insight was gained through circumstance. This educational approach of action and reflection is supported in the pedagogy defined by Freire. Freire claims that true reflection leads to action, and that action will “constitute an authentic
praxis only if its consequences become the object of critical reflection” (Freire 1968). This stance enhances the importance of letting the complexities of the system emerge, contributes to an innovative education design, and supports the community participatory nature of the inquiry. Feedback loops are important for complex systems that, by their very nature, involve parts that can never be reduced or considered in isolation of a greater system of change (Davis et al. 2008). Investigating the systems deepest roots, the community’s values, is an appropriate place to begin. The values will provide insight on the direction and context of topics that should be explored.

At each phase of the research, actions were reflected on using participant feedback from interviews, observations and surveys (Figure 3.2). The participatory element of this approach cultivates the basis for informed judgments and decisions on how to proceed in program development effectively (e.g. Gregory 2000, Quigley et al. 2000). Reflections were used to modify proceeding actions. This cycle progressed throughout the research. It was used to address whether or not the content and delivery of the program was effective, and to alter the proceeding course of action accordingly. Each activity shaped the direction of the research and enriched the final product. An analysis of the action-reflection cycle in this thesis describes how the educational program was developed. It is used to evaluate the knowledge and understanding that was established. It unveils themes that contribute to the understanding of learning outcomes and reasons for believing. The analysis from this case are compared to and strengthened by literature on education and learning in a Dene culture later in this thesis. Rich descriptions of key activities and the resulting key reflections are detailed in chapter four of this thesis.
3.4 Data Sources

The sources of data for analysis took the form of interviews, observations, and surveys. The combination of data sources provided the opportunity to investigate the research question from various angles and to verify findings by cross-referencing results. These data also provided insight throughout the research that contributed to the resulting education program (in the form of materials and process). The details of each data source are detailed below. These data sources were gathered throughout the study during one-on-one interviews, workshops, retreats, meetings, gatherings, and education sessions. The settings and activities for data collection and the results of the data (interpretations and outputs) are detailed later in this thesis.

3.4.1 Interviews

Interviews were chosen as a data source to uncover background information about people, places, feelings, opinions, and events from multiple points of view. Interviews offer control, via the line of questioning, which can help in the acquisition of specific information. Four semi-structured key informant interviews were held at the outset of the research, three in person, and one over the phone. The Directors of the three organizations that were involved in this research: the Wek’eezhìı̨ Land and Water Board (WLWB), the Wek’eezhìı̨ Renewable Resources Board (WRRB), and the Tl’íchå
Government – Lands Protection (TGLP), chose the interviewees. Key informants were chosen based on their roles in the community, their involvement in resource management responsibilities, and their availability. Questions were open-ended and revolved around key training needs, community values and fears, and effective formats for education programs. The interview template that was used followed protocols presented by Kvale (1996), and is attached in Appendix A.

Less formal interviews took the form of group discussions before, during, and after the execution of the education programs. From time to time, between formalized events, the opportunity to engage in casual conversations with the participants arose. Significant points from such discussions were tracked, and have been treated as interview data.

All of the data gathered from interview situations was summarized and analyzed using an *ad hoc meaning generation* technique described by Kvale (1996). This method combines meaning condensation and categorization, it allows for different treatment of the various interview data collected, and it allows for reinvestigation of data over time as themes and meanings emerge. Some interview data was condensed; key portions of the interviews were summarized and organized according to predominant themes or descriptive statements about the relativity of the data. Some themes surfaced early on in the research from the key informant interviews. These themes were used to structure categories for coding interview data that was generated at workshops and training sessions. A narrative dimension to the interview data was loosely used to organize data. Narratives were encouraged during the interview situations; stories told - however unrelated they seemed to the topic of investigation at the time - were later analyzed and woven into the meanings and interpretations. When analyzing the data, accounts of the interviews were reflected on as narratives to draw out themes that contained temporal, spatial, or social dimensions (Mishler 1986).

### 3.4.2 Observations

Every occasion during this research presented an opportunity to observe - to observe anything that would help to gain a better understanding of the case or research question. Mannerisms, face expressions, (non) actions, (non) responses, attitudes, and
abilities were tracked as events unfolded. Qualitative descriptions of an occasion, situation, problem, resolution, or interaction; along with quantitative tracking of categorical events or repeated situations for analysis and interpretation are typical for observational data (Stake 1995). Both qualitative and quantitative methods were considered. Observations were taken from a “participant as observer” format, whereby I – as researcher – participated in situations and assigned my role as observer as a secondary objective (Creswell 2009). Data was tracked in narrative formats (in diaries), in descriptive meeting notes, and in follow-up reports. Great detail was tracked in field notes because at the time of data collection, the important themes and concepts were not yet established or understood. The data was condensed and categorized into predominant themes in a similar manner as the interview data.

3.4.3 Surveys

Surveys were issued at two education sessions, however; survey data was only collected at one of the sessions. Survey data was used to solicit quantifiable data to measure participant’s self-assessed confidence and attitudes before and after the education program. The survey was designed using an end-defined psychometric Likert scale. This scale was designed by psychologist Rensis Likert as a valid way for respondents to specify their level of agreement to a statement (Uebersax 2006). The survey was described to the participants, and each question was read aloud. People had the opportunity to ask questions about the meaning of the survey questions if they desired. The data was intended to complement the qualitative descriptions and accounts gathered through interviews and observations, and to contribute to the triangulation and validation of data. Due to the level of uncertainty in the data (described below), it has only loosely been used to enhance claims and findings. Some broad scale conclusions or trends from this data have been acknowledged and are used to support the qualitative work.

3.5 Data Integration

Efforts were taken to preserve the credibility and validity of the qualitative data collected. Multiple methods were used to integrate all data sources, adding to the
legitimacy of the findings. Furthermore, specific descriptions of data analyzed to reach conclusions are provided within this thesis for the reader to critique interpretations. The findings and interpretations are presented as explicitly as possible, backed by direct arguments that are used for interpretation. Strategies supported by Creswell (2009) used to enhance the validity of the findings included: triangulation, member checking, rich descriptions to convey findings, a presentation of biases and data limitations, prolonged time spent in the field, peer debriefing, and an external auditor.

Multiple interpreters analyzed the qualitative data and interpretations to minimize personal biases. Differences in interpretations were satisfied by agreed upon hybrid categories, codes, or themes. As a result, the findings were arguably enriched by the application of multiple perspectives (Kvale 1996). The validity of interpretations was sought through the participants, the involved organizations, and the academic community. The interview responses were condensed and interpreted during the interviews to allow the interviewee the opportunity to confirm or disconfirm interpretations. The interviews were then summarized in writing and sent back to the interviewee to further confirm or refute interpretations. The organizations had the opportunity to review all follow-up activity reports and participate in workshops and training sessions. Numerous experts in the academic realm reviewed data sources, interpretations, and methods of analysis. Some experts contributed firsthand to the analysis, while others reviewed the inquiry from an outside perspective at the tail end of the work.

Once all of the data was collected, the material was revisited; quantifications, deeper interpretations, flow diagrams, visualizations, qualitative descriptions, and narratives were used to find meanings, significance, and connections (Kvale 1996). Meanings were extrapolated out of the qualitative data using the tactics described by Miles and Huberman (1994). These included:

- Noting patterns and themes,
- Seeing plausibility,
- Clustering,
- Using metaphors,
- Counting,
• Making contrasts and comparisons,
• Noting relations between variables, and;
• Building a logical chain of evidence.

The quantitative survey data has only been used in a broad sense to strengthen certain claims or concepts that are arguable from the qualitative data alone. The data results by nature are explicit. They are available for the reader to reference claims that have relied in part on the surveys.

The validity of drawing generalizations to other cases will depend on the extent of relevant similarities; which is why good analysis must hinge on “rich, dense, thick descriptions of the case” (Kvale 1996, 233). All findings and claims are specific to the time, space, participants, researcher, and situation - and should be referenced with caution if applying to other scenarios.

3.6 Data Limitations

Qualitative interview and observation data, by their very nature, are subjective, and thus may introduce or exaggerate error. Although the quantitative survey data is explicit, the design, implementation, and use of the quantitative survey data may pose limitations. How these quantitative and qualitative data sources are used together impact the reliability of interpretations and conclusions (Strauss and Corbin 1998).

The influence of the interview setting, the line of investigation, the comfort of the interviewee, the articulation ability of the interviewee, and the ability of the researcher to interpret responses may pose limitations (Creswell 2009). The interview setting was a casual face-to-face encounter for three of the key informants. The fourth key informant interview was conducted over the phone, reducing the ability to build meanings of observation into the data. Group interview settings may have reduced the opportunity or comfort of individuals to share their opinions. Participants may not have had ample time to share their knowledge and opinions, or sufficient time to feel comfortable in the interview/discussion setting. Interview feedback was limited to the questions asked or topics discussed. Furthermore, data recovered from these interviews solely represent the views and expressions from these specific participants and may not accurately reflect the feelings of the community as a whole. Language barriers may have limited the
articulation ability and comfort of the participants. Many of the Elders that participated in
the research do not speak English at all. The interpretations of interview data are
inevitably subjected to the personal biases and experience of the researcher.

Observation data will be subject to a thick cultural barrier that existed between the
Tłı́chǫ participants and the researcher. Furthermore, observations can only be
documented if they have indeed been observed. Anything that happened outside of the
research realm went unreported. Observations considered only reflect what was observed,
who was observed, and where these observations took place. The participant’s actions or
behaviours may have been influenced by the presence of an outsider (the researcher), or
by the situational context of the research (Creswell 2009).

The analysis and integration of qualitative data were limited by the subjectivity of
data recorded. Group discussions and observations were not tape-recorded, and as such,
only the data that was written in meeting notes and reports was used to draw conclusions.
Quantitative coding of themes therefore, has been done “loosely”; it relies on the general
impact or frequency of topics rather than explicit counts. Bias may have contributed to
uneven weighting of certain data, or the absence of certain data, leading to a source of
error.

The credibility of the quantitative survey data source was low for the following
reasons:

• This method of data collection was not well perceived by the Tłı́chǫ participants,
  and outright rejected by the Elders who do not read or write,
• There may have been discomfort boxing views into a numerical likert scale
  format, or distrust as to how the information would be used,
• The resulting sample number of completed surveys was too low and not inclusive
  of all of the participants to make conclusive claims,
• The participants who filled out the pre-lesson surveys did not match up with the
  participants who filled in the post-lesson surveys (some participants filled out one
  or the other, but not both),
• The participants communicated some confusion surrounding the meaning and
  significance of some of the survey questions,
• There may have been some concern over the anonymity of the survey because of the low number of participants who filled them out - concern around answering “correctly”, or appearing to be knowledgeable may have been a factor, 
• The responses capture biases associated with the “one-time” opportunity to fill out the survey and are subject to their moods, thoughts, and interpretation of the survey questions at that particular time, and; 
• Survey questions did not fully anticipate important themes worth investigating that emerged as the study progressed.

3.7 Chapter Summary

The research was designed with an overarching pragmatic worldview that drew upon various philosophies and experiences from an educational practitioners, theorists, and Tłı̨chǫ cultural specialists. Various tools and methods were employed to collect a variety of data that inquired, observed, and measured evidence to address the research question and satisfy the research objectives. The data was organized to present important “lessons learned” to guide the development of future education efforts in a mining context. This data was used to evaluate the success of the educational program that was designed and implemented in this case. The data was interpreted to improve the understandings, assertions, and generalizations about how learning happens in this case. Finally, this data was used to address the central research question:

How should education programs be designed for communities and their resource managers in a meaningful way to improve technical knowledge and understanding of the mining industry?
4 KEY ACTIONS AND REFLECTIONS

4.1 Introduction

This chapter describes the key activities that occurred during this research inquiry. Significant reflections of these activities helped shape the subsequent activities and contributed to the evolving nature of the education program. The final material output of the research – the education course – was very much a product of this action-reflection cycle. Descriptions of how the education program evolved and the product it created are presented in this chapter. The data collected during the action-reflection cycle was analyzed to track important lessons learned to satisfy objective one (how to reproduce a successful program), to evaluate the acquired knowledge, understanding, and abilities to satisfy objective two (determine the success of this educational program), and to interpret key emergent themes to satisfy objective three (understand how learning happens in this case). The data used to address objectives one, two, and three are discussed in chapters five, six, and seven respectively.

4.2 Interviews and Workshop

4.2.1 Action

The first planned activity was aimed to better define the roles and mandates of the three organizations (the WLWB, WRRB, and TGLP), to clearly identify the knowledge gaps and research needs of the organizational unit, and to introduce the proposed research to the greater Tlııchǫ community. A Needs Assessment & Value workshop brought together staff from the three organizations and key Elders from the Wek’eezhı region (Figure 4.1). There was an open invitation to community members to also attend. Before the workshop took place, key informant interviews were conducted with four staff members, identified by the Directors of each organization, to gather opinions and insights.
The interviews solicited input on the vision and key values of the Tłı̨chǫ community. Questioning led to a discussion of knowledge gaps and needs, and opinions about effective education strategies. A summary of topics that emerged from the key informant interviews is presented in Table 4.1.

Table 4.1: Key Informant Interview Responses

<table>
<thead>
<tr>
<th>Vision</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Strong like two people</td>
</tr>
<tr>
<td>• Self-sufficient</td>
</tr>
<tr>
<td>• Maintain hope and respect</td>
</tr>
<tr>
<td>• To be better, individually and together</td>
</tr>
<tr>
<td>• Young generation with power (history + technical expertise)</td>
</tr>
<tr>
<td>• Safe animals, land, and water</td>
</tr>
<tr>
<td>• A Board operating together smoothly, organized, making good choices</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Key Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Water</td>
</tr>
<tr>
<td>• Caribou (categorized alone to amplify its significance)</td>
</tr>
<tr>
<td>• Animals: fish, ducks, moose</td>
</tr>
<tr>
<td>• Education - especially for the younger generation</td>
</tr>
<tr>
<td>• History, roots - sites of importance, gravesites, lakes, travel routes</td>
</tr>
<tr>
<td>• Respect: for Elders and leaders - keep their stories alive</td>
</tr>
<tr>
<td>• Maintain preferred lifestyles: hunting, fishing, close ties to the land and animals</td>
</tr>
<tr>
<td>• Families, relationships</td>
</tr>
</tbody>
</table>
### Knowledge Gaps

- The information to make good decisions to protect the things valued
- The roles of everybody, who is doing what, who is responsible for doing what
- Scientific knowledge and knowledge of the land
- It is difficult to know if something is important if you don’t experience it
- It is difficult to define something you don’t know

### Knowledge Needs

- Organization: how to keep track of all the information
- Board staff need to communicate technical information clearly
- Good relations & consistency between the 3 governing bodies
- Community Traditional Knowledge (YK), Guidance on incorporating TK into decision-making
- Stronger connection with community members, Guidance on passing information to communities
- Knowledge of both sides
- Dedicated, committed staff
- Science: what is happening at the mines
- Technical project specific training
- What chemicals are being released and how they are affecting land and water
- Younger generations (some working at the mines) need to understand the technical aspects and the history of the region [education]
- How things are changing (caribou routes, water quality, animal health)
- Remediation
- Personal Research

### Education Strategies

- Structured
- Meaningful
- Practical
- Narrative/Stories
- Interactive
- Replicable
- Demonstrative
- On the Land/Field Based
- Learn what we Hear + See
- Go to Elders/Leaders
- Go to the communities
- Know both sides: science and traditional knowledge
- Humour
- More time, continuous opportunities

The Needs Assessment & Value workshop followed the key informant interviews. It took place in Behchokô over the course of two days. The first day was spent getting better acquainted with each of the organizational mandates and goals. On the second day discussions were initiated with the interview findings and centered on knowledge gaps.
and effective methods to transfer knowledge. Using tactics outlined by Keeney (1982), key community values were solicited to initiate discussions on community needs and knowledge gaps. Discussions were tracked and presented in a follow-up workshop report. The report highlighted themes and values that were beginning to emerge, through the interviews and workshop discussions, topics that participants were interested in learning more about, and advice on how they would like to receive the education.

The research proposal was presented to the community at the workshop, and a strong supportive response was received. It was agreed that in order to build an effective educational program, it was important for the “teacher” to become better acquainted with the Tl'ch'o values and culture. To aid in this endeavor, I was invited to participate in the WLWB’s annual retreat – a traditional caribou hunt.

4.2.2 Reflection

Feedback from the key informant interviews and the Needs Assessment & Value workshop was tracked and analyzed to help prepare the educational program and later used for interpretations to satisfy the research objectives. Community needs addressed topics of interest for education sessions. Ideas on how the education programs should be executed were gathered. When developing the education program, the key community values were used to relate to the concepts discussed. It is important to acknowledge that diverse educational interests were expressed; however, the research was limited by time, scope, and the expertise of the researcher, and thus, only considered the topics relevant to mining.

A number of the participants commented on the need to learn about responsible mining practices in light of a string of insolvent mines that continue to remind the community of historical bad mining practices. Informants mentioned the Colomac, Rayrock, Discovery, and Giant mines as examples of areas that have been mismanaged. Participants wanted to learn more about mining chemicals; they specifically identified Uranium numerous times. There was interest in learning more about the mining cycle, from exploration to mining to reclamation. The technical language used in mining was identified as an area of knowledge gaps; they expressed a need to understand the technical language in order to share information and make good decisions together. They
also noted the importance of sharing this knowledge with the younger generations, so they are prepared for the future.

Protecting the environment and learning about changes in the environment were mentioned. Employment opportunities provided by mining ventures were acknowledged, however; it was stressed that these types of benefits should not outweigh the importance of protecting the surrounding ecosystem. Participants were curious about the other benefits of mining such as the products produced by mines. How climate change would impact the land, water, animals, and winter roads were issues important to the participants. Effects of mining on water and wildlife; particularly caribou, fish, ducks, and moose were of great interest.

This feedback from the key informant interviews and Needs Assessment & Value workshop was drafted into notes, reflected upon, and used to draft a preliminary “menu” of topics for the participants to consider for training (Table 4.2). The menu included a module on mineral exploration, mine development, metal toxicity, and Acid Rock Drainage (ARD). A cartoon booklet was designed to present the objects of learning for this last session on ARD (Appendix B). Topics of interest on this menu were identified and used to structure the pilot education session.

Table 4.2: Original Training Session Outline Menu

<table>
<thead>
<tr>
<th>Objects of Learning</th>
<th>Glaciology</th>
<th>Stages of Exploration</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Geology</strong></td>
<td>• Geologic Provinces</td>
<td>• Reconnaissance</td>
</tr>
<tr>
<td>• Rock Types</td>
<td>• Glacial History</td>
<td>• Sampling Program</td>
</tr>
<tr>
<td>• Mineral Assemblages</td>
<td>• Glacial Landforms</td>
<td>• Drill Program</td>
</tr>
<tr>
<td></td>
<td>• Drift Prospecting</td>
<td>• Pre-Feasibility</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Feasibility</td>
</tr>
</tbody>
</table>

Session One: Mine Exploration
## Session Two: Mine Development

<table>
<thead>
<tr>
<th>Objects of Learning</th>
<th>Mine Techniques/Design</th>
<th>Mine Components</th>
<th>Mine Waste &amp; Management</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Underground</td>
<td>• Underground Workings</td>
<td>• Effluent</td>
</tr>
<tr>
<td></td>
<td>• Open Pit</td>
<td>• Open Pit</td>
<td>• Dust/Volatiles/Air Pollution</td>
</tr>
<tr>
<td></td>
<td>• Other (Heap Leach,</td>
<td>• Waste Rock and Overburden</td>
<td>• Contaminated Soils</td>
</tr>
<tr>
<td></td>
<td>Amalgamation, Mountain Top Removal, etc.)</td>
<td>• Tailings Impoundment and Containment Systems</td>
<td>• Tailings/Waste Rock</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Buildings and Equipment</td>
<td>• Acid Rock Drainage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Infrastructure</td>
<td>• Landfills/Garbage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Landfills and Other Waste Disposal Areas</td>
<td>• Waste Management</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Water Management Systems</td>
<td>(Design, Control, Treat)</td>
</tr>
</tbody>
</table>

## Session Three: Metal Toxicity

<table>
<thead>
<tr>
<th>Objects of Learning</th>
<th>Routes of Toxicity</th>
<th>Properties of Metals</th>
<th>Toxicity Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Mammals</td>
<td>• Heavy Metals</td>
<td>• Abiotic Factors</td>
</tr>
<tr>
<td></td>
<td>• Fish</td>
<td>• Toxic vs Essential</td>
<td>• Biotic Factors</td>
</tr>
<tr>
<td></td>
<td>• Plants</td>
<td>• Bioavailability</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Bioaccumulation/ Bioconcentration</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Biomagnification</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Persistence</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Chemical Species</td>
<td></td>
</tr>
</tbody>
</table>

## Session Four: Acid Rock Drainage

<table>
<thead>
<tr>
<th>Objects of Learning</th>
<th>ARD Ingredients</th>
<th>Prevent, Control, Treat</th>
<th>Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Water</td>
<td>• Design</td>
<td>• Human</td>
</tr>
<tr>
<td></td>
<td>• Air</td>
<td>• Eliminate ARD</td>
<td>• Wildlife</td>
</tr>
<tr>
<td></td>
<td>• Sulphides</td>
<td>ingredients</td>
<td>• Environment</td>
</tr>
<tr>
<td></td>
<td>• Bacteria</td>
<td>• Lime</td>
<td></td>
</tr>
</tbody>
</table>
4.3 The Caribou Hunt

4.3.1 Action

Members of the WLWB planned a retreat to get better acquainted with the land they manage, to foster stronger relationships, and to share or experience traditional knowledge of the region. The participants included members of the WLWB, their resource staff, and other friends and family from nearby communities. The retreat began at Joseph Judas’ cabin along Snare Lake. Joseph Judas is a prominent Tłı̨chǫ community leader, one of the founders of the Wekweeti settlement lands, and at the time of the retreat, one of the Board members for the WLWB and the WRRB. Many of the participants were familiar with the surrounding land; the remainder of the group was comprised of scientists and other staff working for the WLWB, mostly from outside the Northwest Territories. The retreat offered an opportunity for the Tłı̨chǫ staff and members to share their knowledge of the land and culture prominent in the region. The retreat took place over the course of three nights and four days.

The first two nights were spent at Snare Lake (Figure 4.2). The activities included:

- Cutting down trees, tying the trunks together and weaving the needles to build a tent,
- Hiking North to the treeline in search of caribou and moose,
- Fishing,
- Collecting berries,
- Building fires,
- Practicing target shooting,
- Telling stories,
- Talking about the history and geology of the area,
- Learning how to prepare dried fish, and;
- Feasting on caribou, moose, fish, and bannock.
The final night was spent at the more northerly Government of the Northwest Territories (GNWT) Daring Lake research camp. Here the group learned about the variety of scientific research projects that take place based out of this camp. The local geology was discussed, herds of caribou off in the distance were observed, and card game competitions took place before heading back to Yellowknife (Figure 4.3). No caribou were harvested on this retreat. One duck was not so lucky.
Throughout the retreat the participants had the opportunity to experience the Tlı̨chǫ culture and social norms first hand. This refers to the traditions, routines, hobbies, and “little rules” that are unique to the Tlı̨chǫ.

To honour tradition, a prayer was said before embarking on the retreat to ask for a safe journey. This was followed by “paying the land” – a tradition of offering tobacco, coins, a branch, or some item of value to the land or water to negotiate for safe passage (Gibson 2008). This establishes an agreement with the land.

A common routine is to sit together around a fire or stove and share food – a big part of socializing. Dene people define a strong relationship between food and identity. Food, mostly wild meat, is symbolic of the social culture that links people to the land, animals, and to each other. Meaning and organization of social relationships often involves gathering around a traditional feast (Nadasdy 2003). In this forum, stories passed on from generation to generation were told late into the night. Storytellers are often community leaders, and the stories told are repeated and passed down through the generations. For example, stories of Nakan are common in Dene communities; Nakan are villainous man-like creatures known for luring women and children into the bush with a whistling sound or the sound of a crying baby. They kidnap, set forest fires, attack, and spy (Helm 2000).

Hobbies, such as friendly competition, were observed as another form of socializing. This was sometimes in a structured form, like a game of cards or the traditional hand games. At other times it was a less formal challenge of target shooting or wood chopping.

The “little rules” refer to the conventions that exist in every culture. In this culture women are not supposed to step over men, and never over blood. There is an underlying anxiety around “femaleness” and blood in Dene culture. A women stepping over a man (particularly his riffle), is said to bring him bad luck in hunting. There is a strong sentiment of danger and impurity associated with blood - and with women and blood in particular. To step on the blood of a slain animal could mean that bad luck is to follow, such as the death of a child. A menstruating woman is seen as a threat to the health of a male and sexually tabu (Helm 2000). A woman touching her hair is seen as a provocative gesture.
Meat and berries should not be removed from the area they are harvested. Removing meat from an area fails to honour an agreement that has been made with the animal and land, and thus, may terminate the relationship that has been established with that animal and area. As a consequence, that animal may refuse to give itself in the future, and that land may fail to produce berries in the future. Disrespectful behaviour by anyone in the region threatens the relationship that the entire community has with the animals and land (Nadasdy 2003). All food is to be shared. Food should not be sat on, even when stored in a cooler.

It is bad luck to talk about fears; it means that these fears may come true. It is particularly inappropriate to say or think bad thoughts about animals. Doing so jeopardizes the relationship with that animal and can lead to bad luck (Nadasdy 2003). This point was reinforced by comments made during the Needs Assessment and Value Workshop. One of the means used to solicit community values was to ask the community what they did not want, or what they feared from the mining industry. People did not appreciate this line of questioning and stated that they did not wish to think about fears or negative thoughts.

Formalized laws, such as the prohibition of alcohol in Wekweetì, Gamètì, and Whatì, also exist. To bring alcohol into one of these communities would be extremely disrespectful, and would immediately terminate the relationship that was established.

4.3.2 Reflection

In effect, participating in the caribou hunt contributed to an evolving relationship of reciprocity. Educating others on the land could be viewed as an offering or a gift from the local participants. To refuse a gift in this culture is to be disrespectful to the giver and to the gift itself (Nadasdy 2003). The reciprocation of this gift was later honoured by sharing mining knowledge with the participants. The retreat provided an opportunity to become familiar with the local “tools” (places and things), and the local people (culture and values).

An old saying that surfaced at the Needs Assessment & Value workshop was, “go to the community and observe. If you are going to work with them, use what they have”. This approach is supported by the GMP strategies outlined by Chouinard and Veiga.
Observations of the local “tools” were made: the landscape, the rocks, the wildlife, the weather – anything that might have helped connect the training methods or materials to the world of the participants was observed and tracked. For example, a lot of people in the region drive (Ford) F150 trucks. To explain the weight and quantities of waste rock produced at the local mines, comparisons were made to the equivalent number of F150 trucks. The participants related to this comparison because they had experienced the size and weight of these trucks. Examples of rocks and landforms seen while walking on the land were referenced. Topics were related to the impact or influence they had on the local wildlife – expressed as a key community value. Not only did using local “tools” help the participants relate to the information through direct experience, it also helped to earn credibility by showing a knowledge and interest in the local culture and environment.

The caribou hunt experience highlighted the participant’s attitudes, teaching methods, culture, and values. Attempts to copy or replicate their attitudes and teaching methods, and to respect and consider community culture and values are important when the teaching role shifts. These attitudes and methods were incorporated into the design of the subsequent training sessions. Confidence, patience, respect, humour, pride, passion, chivalry, and loyalty to authority figures and ancestors are attitudes that should enter the classroom when the favour of sharing knowledge is returned. Chapter five expands on some of the key lessons learned that should be considered when replicating education programs of a similar nature.

4.4 **The Education Sessions**

4.4.1 **Action: Pilot Session**

Using ideas and materials from the key informant interviews, the Needs Assessment & Value Workshop, and the WLWB retreat, the first draft of the education program was designed. A pilot session was organized to better define what information would be of interest to the Tłı̨chǫ communities, and how the information should be presented. The three Directors and two senior staff from the WLWB, WRRB, and TGLP attended the two-day session hosted in Yellowknife (Figure 4.4).
Before the session began, the participants provided feedback on the “menu” of topics they were given (Table 4.2). The menu was condensed to focus on the topics that were of greater interest to the participants. For example, they expressed that ARD was not of huge concern or interest to them. Therefore, less emphasis was placed on ARD concepts.

The pilot session started with a brief introduction of the participants, followed by the first education module on geology. This module began with some general definitions, the geology of the Wek’eezhú region, and the glaciology of the Wek’eezhú region. Rock and mineral samples were spread out along the table and power point presentation slides were used to go through the material. The second module described the activities and stages associated with mineral exploration. The final module focused on mining and mineral processing. A plan of what was in the works for the larger community-wide training session was presented for comment. Time was set aside to discuss the training content, format, and approach. The feedback from the pilot training session was used to update and modify the course and incorporated with the feedback that had already been acquired.
4.4.2 Action: Yellowknife Session

The first trial run education session took place over the course of three-days in Yellowknife. The Directors of the three resource management organizations arranged the session logistics, including the invited participants (Figure 4.5). All fifteen of the participants at this session were paid employees of one of the three organizations, along with two interpreters; three of the participants had attended the pilot session.

Figure 4.5: Photo of First Education Session

The session covered the same topics as the pilot session, but was modified to incorporate the suggested changes. For example, more visuals were used to convey knowledge. Rock and mineral hand-samples were spread across the room along with photo albums, resource books, maps and posters on the walls, geological tools, and mineral processing demonstration materials. Videos and animations were played to show some of the objects of learning such as plate tectonics, the formation of minerals, and drift prospecting concepts. The visuals helped the participants to see and experience the topics of discernment.

The participants were asked to fill out a short survey to investigate how their self-assessed knowledge and confidence on the objects of learning changed after the training. The pre-lesson survey contained eleven questions; the post-lesson survey contained twenty-one questions. Some of the participants filled out both the pre-lesson and post-lesson surveys, some filled out one or the other, and some chose not to fill out either.
Questions, comments, and suggestions were encouraged throughout the session. Participants were asked to share stories, knowledge and experiences that linked to the topics under discussion. Some of the participants who had been involved in the pilot session were called upon to share some of their knowledge, and played a more active role during the discussions. Formal feedback questions and discussion on the format, content, and delivery of the materials completed the session. Once again, the feedback from the trial run education session was used to update and modify the content and approach of the course.

### 4.4.3 Action: Wekweeti Session

On the advice gathered from the previous training sessions and meetings, and with considerations of the transportation of demonstration approach used in the Global Mercury Project (GMP) example (Chouinard and Veiga 2008), the final training session was held in a different community (Wekweeti). It was open to a much wider audience (Figure 4.6). A total of about twenty-five people attended the session.

Figure 4.6: Photo of Second Education Session

Participants suggested that the session should be held in the local school gym to promote the involvement of youth. An open invitation was extended to all community members, Elders from each of the four Tlitcho communities, research staff from the
WLWB, WRRB, and TGLP, and two interpreters (one had previously attended the trial session). For some of the other participants, this was the second or third time they had been involved in the training.

The topics of geology, mineral exploration, and mining were discussed again; the details of the session had been updated to incorporate suggestions and observations from past sessions and experiences. For example, more time was spent discussing the glacial history of the area and how this relates to the movements of rocks (drift prospecting) and their ancestral lineage. More time was spent on the background material such as plate tectonics, how rocks form, and why rocks have different properties.

When participants walked into the room the tables and chairs were in a circle to create the forum for discussion – as opposed to facing the front of the room to create a teacher-student ambience. Rock hand samples, photo albums, textbooks, brochures, and mining equipment were spread across the room. Posters, maps, and schematics of a local mine sites were hung on the surrounding walls. Again, a lot of time was set aside to share knowledge and stories, to ask questions, and to gather comments and suggestions on the training itself.

4.4.4 Reflection

When participants walk into the training space, their first impressions are significant. If the space is inviting and captivating, their interest and curiosity will be peaked. Immediately the participants began to touch the rocks and discuss the maps and posters. Essentially, questioning and learning was initiated before the session formally began.

Throughout the sessions the nature of questions and comments that arose were tracked in order to gauge the level of detail, pace, background requirements, and appropriate mass of the information. Affirmation of discernment was sought through statements and stories that were shared. Many of the same questions and stories arose in different sessions from different people. There was a lot of interest on the historical glacial landscape of the region and how this has influenced their ancestral lineage. Also, the effect that glaciers have had on the landscape and rocks was of great interest to the participants. An association of these concepts to values that had previously been
discussed surfaced, in a context that had not been expected. More emphasis was placed on these aspects at following sessions to respond to these observations. Table 4.3 lists how the education materials evolved throughout the action-reflection cycle.

Efforts were made to include comparisons and analogies to topics or items familiar to the region and to link concepts to the land. Relying on the participants that had been involved in earlier planning and training sessions to share their stories and analogies encouraged greater participation of the others and helped people relate to the concepts. When calling on community members to share their knowledge or stories from previous sessions, participants seemed more at ease. They asked their colleagues more questions and spoke more freely in their native tongue. This reiterated the need to involve the community in the “educator” role, the importance of establishing trusting relationships (this level of comfort takes a lot of time), and the benefit of repetition (of training and participants that attend the training).

Table 4.3: The Evolution of the Training Material

<table>
<thead>
<tr>
<th>ORIGINAL IDEA</th>
<th>ALTERED</th>
<th>EXPLANATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARD Cartoon Booklet</td>
<td>Mineral Exploration Booklet</td>
<td>More appropriate to use real photos / experiences from the region</td>
</tr>
<tr>
<td>Focused on mining and environment</td>
<td>Focused on theoretical background of geology, exploration, and mining</td>
<td>Participants did not have the necessary theoretical background</td>
</tr>
<tr>
<td>Used general examples and words to describe concepts and scale</td>
<td>Used real maps of the area to show specific examples</td>
<td>Participants could relate to real/local examples and preferred visual explanations</td>
</tr>
<tr>
<td>Discussed concepts in a linear progression</td>
<td>More repetition of topics and backtracking to discuss how everything fit together</td>
<td>Need to reinforce why each piece is important and connected to the big picture</td>
</tr>
<tr>
<td>Too many messages and too much information on the slides</td>
<td>Less slides with less material on each slide 3-4 key take-home messages for each section</td>
<td>Participants could not retain too much, take-home messages must be clear</td>
</tr>
<tr>
<td>Some hands-on/visuals in the room</td>
<td>Much more visuals and hands-on materials around the room</td>
<td>Increased interests, easier to visualize examples, raised new questions and promoted discussion during the breaks</td>
</tr>
<tr>
<td>ORIGINAL IDEA</td>
<td>ALTERED</td>
<td>EXPLANATION</td>
</tr>
<tr>
<td>---------------------------------------------------</td>
<td>----------------------------------------------</td>
<td>----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Some slides consisted of predominantly photos</td>
<td>Include more words or the main message in the title</td>
<td>Important that people could go back to the slide and remember the message</td>
</tr>
<tr>
<td>General examples were used to explain mine types, mineral processing, and exploration methods</td>
<td>Presented region specific examples and did not include examples that do not apply in the region</td>
<td>People wanted to relate information to their immediate circumstance</td>
</tr>
<tr>
<td>Planned a group activity to build and reclaim a mine site (group demonstration)</td>
<td>Demonstrations on mineral processing techniques were conducted by the researcher</td>
<td>The group activity was too complicated and time consuming</td>
</tr>
<tr>
<td>Distributed presentation hand-outs showing six slides per page</td>
<td>Words and photos were made larger in the hand-outs</td>
<td>Many Elders could not see small photos/writing in the hand-outs</td>
</tr>
<tr>
<td>One slide depicted the products used from mining</td>
<td>More slides and discussion on the products produced from mining were presented</td>
<td>Many of the participants were unaware and interested in mining products</td>
</tr>
</tbody>
</table>

The survey data collected was limited for reasons discussed in chapter three, and the use of this data collection method alienated the participants - particularly the Elders. It broke down some of the trust and understanding that had been established. It emphasized the differences in cultures, it created an “us” and “them” barrier, and it created a sense that the participants were being studied. The disapproval of the survey was witnessed when participants pushed them away, asked if “they had to fill them in”, didn’t fill in the surveys, or outright rejected to fill them out. The latter occurred with all of the Elders, many of whom are non-literate and do not speak English. The following points broadly summarize data collected from the survey:

- Interest in the topics discussed increased after the course,
- Self-assessed knowledge in topics, processes, and the relation between geologic phenomena and mining increased after the course,
- Self-assessed confidence in the topics discussed and in forming opinions on the industry increased after the course,
- Topics discussed were useful,
- The training methods were effective, and;
- The most challenging and interesting module was the geology session.
The final material output – the education course – consisted of handouts, presentations, demonstrations, and visual displays. The materials used in the education program are listed below. Greater detail on some of these items is presented in the Appendices of this thesis.

**Handouts**
- Course agenda
- ARD cartoon booklet (Appendix B)
- Guide to Mineral Exploration booklet (Appendix C)
- Course notes on three modules: geology, mineral exploration, and mining

**Presentation Displays**
- A mine map of the Ekati mine depicting the various mine components and the mine site location
- A map depicting the current exploration and mining ventures underway in NWT
- A map of various minerals that are predominantly mined in the provinces across Canada
- A poster of the Periodic Table of Elements depicting photos of each, and some properties of the elements
- A poster showing the rock cycle (the relation between igneous, sedimentary, and metamorphic rocks)
- A poster showing the properties and dimensions of the earth’s crust and the process of plate tectonics
- Posters with graphics and explanations of various geophysical exploration techniques
- Posters depicting various products that are produced by mining and the minerals used to create these products

**Media**
- A DVD on the Slave Geologic Province displayed how the rocks in the region formed, the minerals contained within these rocks, the glacial impacts on these rocks, and methods used to explore for valuable minerals
- A DVD on the Global Mercury Project showing artisanal mining techniques, and education strategies to mine more responsibly from across the world
• Animation displaying the principles of drift prospecting
• Animation displaying how kimberlites form and why kimberlites are associated with diamonds
• Animation of rock and mineral formation
• Animation of geophysical exploration techniques
• Power Point presentation on Geology, Mineral Exploration, and Mining

**Handsamples**

- Igneous, Metamorphic, and Sedimentary rocks
- Common minerals
- Local rocks and minerals including: Acasta Gneiss, Kimberlite drill core, mudstone, Fortune Mineral ore, pyrite, sulphur, and quartz

**Demonstrations**

- Mineral and rock properties: density, foliation, streak, and chemical composition
- Mineral processing techniques:
  - sizing sieves; rock grains were separated based on size fractions using sieves
  - magnetic separation; magnetite was separated from similar sized rock grains using a magnet;
  - gravity separation; a hand jig, pan, and heavy liquid\(^2\) were used to demonstrate how the density of minerals can be used to separate grains
  - electrostatic separation; a comb was electrostatically charged by rubbing it on a piece of fur, then used to separate peanut shells from a sample of peanuts

**Space and Time**

- The space and time to share stories, experiences, questions, and opinions was purposefully created

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\(^2\) Heavy liquid separation principles were displayed by showing how two rocks of similar size, shape, and appearance can behave differently in water. A volcanic tuff sample floated while an igneous diorite sample sank. The use of actual heavy liquid media was not used due to safety concerns.
4.5 Community Affairs

4.5.1 Action

During the research period, time was spent in the communities getting to know more people and getting involved in community affairs. For example, the opportunity to meet many new people from the surrounding communities was realized by attending a championship traditional hand games tournament in Behchokô (Figure 4.7). This was a high profile tournament, and people from all over the Territories traveled to witness and participate in the traditional games. Another hand games tournament was attended in Wek’weeti (Figure 4.8). Hand games are a traditional Tlicho guessing game, played by men only, to the beat of rhythmic drumming. There are two teams involved, each taking a turn as the “guesser”. One guesser from each team tries to guess – by way of a hand signal - which hand from each of the opponent men hides a token. Once all of the tokens are discovered, the roles switch. The opponent team selects a guesser and tries to find the tokens hidden by the other team. For each “missed” guess, the hiding team receives a point. Points are tallied, and payments are made to the winners via bets placed by the opposite team (Helm 2000).

Figure 4.7: Photo of Behchokô Hand Games Tournament

Source: Photo courtesy of Amos Hertz
A public hearing on a water license renewal for the BHP Billiton, Ekati diamond mine took place during the research period (Figure 4.9). Here, observations on the type of technical information that was presented and the type of concerns that were raised were documented. Attending important public meetings was another occasion to get known, to get to know the community, to display more signs of interest in community affairs, and to create the opportunity for informal learning through questions and discussions to transpire.
A Tlı́cho Assembly meeting in Edmonton followed the education sessions. Here the research goals, approach, and preliminary findings were presented to top Tlı́cho government officials. A summary of the educational sessions was conducted; the topics covered were highlighted, some visuals (including posters, maps, and rock samples) were displayed, and a couple of demonstrations to convey the impact of the approach used were conducted (magnetic separation and heavy media separation).

4.5.2 Reflection

Involvement in community affairs, such as the hand games, allowed everybody to feel more relaxed and at ease during the education sessions. It provided an informal venue to talk. These experiences were referenced during the education session. For example, questions community members expressed at the hand games were raised as examples during the session. One community member from the hand games asked if the rocks in his front yard would make him sick. The local geology was discussed and the modes of toxicity were introduced using this example.

Specific topics and concerns that were raised at the BHP public hearing were highlighted in the education session. The experience highlighted certain terms or concepts that were missing from the training, and to notice the technical level of discussions and presentations that are required “on-the-job”. For example, BHP staff gave a presentation at the hearing that introduced the term “pluton”. A discussion of this term was presented at the following education session. The types of concerns raised by the community – namely the Elders – were woven into the education session. This mostly included a discussion on the impacts that mining has to the surrounding environment and wildlife.

The Tlı́cho Assembly meeting took place after the educational program was complete, and as such, did not contribute to the design of this particular program. However, participants at this meeting showed a genuine interest in the topics discussed and were captivated by some of the methods used to convey these topics. People passed around the rocks, looked at the posters around the room, and continued – well after the session – to talk about the demonstrations. This provided evidence the topics and techniques used were effective.
4.6 Chapter Summary

This chapter essentially described the actions that evolved during the study due to continuous reflection (Figure 4.10). This action-reflection cycle as a process, led to the development of education materials. The process, together with the materials that resulted, can be used to replicate similar educational programs, to evaluate the success of this educational program, and to gain insights on how learning happens in this case. These outcomes are presented in chapters five, six, and seven. The product of this process was a combination of materials, people, and events that contributed to a positive educational experience for the participants and researcher of the study.
Figure 4.10: Summary of Activities and Outputs

- 4 Key Informant Interviews → Interview Notes
- Needs Assessment/Value Workshop → Workshop Report
- WLWB Retreat: Caribou Hunt → Observation Notes
- Pilot Session → Session Report
- Yellowknife Session → Session Report
- Hand Games Competition (Behchoko) → Observation Notes
- BHP Billion Public Hearing → Observation Notes
- Wekweeti Session → Session Report
- Hand Games Competition (Wekweeti) → Observation Notes
- Tliho Assembly Meeting → Observation Notes
5  ACTION-REFLECTION LESSONS LEARNED

5.1  Introduction

The action-reflection cycle produced valuable sources of data that have been used to categorize key lessons that were learned. These “lessons” act to satisfy objective one of this research: to provide direction on replicating the development of successful mine-education programs. Interview feedback and observations were analyzed and integrated to develop the main directives to replicate effective education programs discussed in this chapter.

5.2  Incorporate Culture and Values

Respecting and understanding cultural or social-norms contributed to building trust and effective teams. The numerous Tlııchǫ traditions, routines, hobbies, and “little rules” that were observed improved this understanding and respect. Respect, in Dene culture, is not viewed entirely in the same way as the “whiteman’s” definition; that is: to be polite, considerate, thoughtful, or to have admiration for (pers. comm., participant). In Dene culture, respect is built around relationships, human-to-human or human-to-non-human, and is rooted in reciprocity (Nadasdy 2003, Gibson 2008).

It is important to respect and understand the local cultural and social-norms of the participants to gain trust and credibility, to improve the ability to relate to the participants and their needs, to foster reciprocity through relationships (Gibson, 2008), and in some cases, to gain access to conduct and continue the training (for example, breaking one of the “little rules” in this case study could have led to the removal of the offender from the community). The cultural-social norms that were considered in this research include local: traditions, routines, hobbies, and the “little rules” that were discussed in chapter four.

When conflicting explanations for phenomena arose in this case, sharing beliefs and the background on why these beliefs are espoused was important. Claims that certain beliefs are “right” or “wrong” were avoided, and the emphasis placed instead on understanding how beliefs are justified or why they exist. The notion that each individual must gather the knowledge and tools of their choice, and create their own realities and
belief systems that makes sense to them was promoted. Maintaining respect for where people come from and why they may reach a different conclusion is very important; showing the openness to different viewpoints earns trust.

Learning basic phrases in the native language of the participants shows interest and respect. Asking for the translation of words that are used often – such as rock, or kwe in Tłı̨chǫ, or standard greetings and niceties – such as thank you, or masi cho in Tłı̨chǫ, can have great impacts on the success of the program by the efforts returned by the participants. For example, after the research program I was told that very rarely do “southerners” attempt to connect with the community in their traditional language, and that people talked about my effort in the streets well after the sessions.

5.3 Know the Participants and Be Known to Them

Spending time with the participants, in a place that is comfortable and common to them fosters understanding and a spirit of relationship building. It allows for participants (teachers and learners) to get to know each other, it is an effective team-building strategy, and it provides a different learning context (person of knowledge authority, place where learning happens, and thing that is the object of learning).

Talking to people, on a one-on-one basis allows for deeper relationships to develop and for an awareness and appreciation of different perspectives and opinions within the community. Informal settings, such as the caribou hunt, are excellent venues to get to know one another without the stress that can be associated with “work” or more formal settings.

The community hand games tournaments allowed for the interaction with the research participants in an informal setting, and for the opportunity to meet other people in the community. Dene hand games have a strong cultural significance; they represent a festive community opportunity for bonding and are recognized as an expression of intragroup identification through intergroup competition (Helm 2000). The cultural and social significance of the hand games in particular are discussed by Helm (2000). She details the timing of the games to celebrate successful hunts, the team and spiritual building that occurs, and the intra-community ties that are strengthened. Showing interest
in important cultural activities strengthened the relationship with the community members.

5.4 **Teach How They Teach**

Catering to traditional ways of sharing information – verbally, through stories – was important. It was more important to create the space for stories than to parrot the stories that had been heard before. In one instance I was told in jest to cease from writing down a story that was being shared and politely told that it was not my place to capitalize on their stories in this written fashion.

Sharing personal stories and information helps others understand how personal experiences have led to personal beliefs and truths. For example, the participants stated that the personal stories I told in passing helped them to identify with me, the values I have, and with the information I was sharing. Sharing personal information helped to understand each other’s perspectives and consider perspectives that others may have (such as geologists or miners). It provided the opportunity to develop informed impressions of characters and personalities – important to understanding, respecting, and believing one another. The participants noted that sharing personal stories and information in this manner was something that differed from other training experiences. Rushforth (1992) states that secondary knowledge (acquired through stories of somebody else’s primary experience) is a legitimate mode of learning in Dene culture. One Elder strengthened this claim by stating: “Thanks for telling us about your life and your stories, and about these different types of rocks. That’s how we learn from each other.”

5.5 **Show it Don’t Tell it**

Learning by watching actions had a profound influence in this study, particularly when learning occurred across language barriers. The participants on the retreat learned many things from the Elders and community leaders by watching. People learned how to build a tent; what type and size of tree to cut down, methods to strip the needles and sharpen the tips of the trunk to form tent poles and stakes, and how to tie the ends of the trunks together with sinew before wrapping a canvass around the trunks to make the tent. The cleaning and preparation of dried fish and dried caribou were observed. Good sites
for fishing and collecting berries were discovered. The identification of footprints of bears, caribou, and moose were taught. Most of this learning occurred through actions – not words. Unspoken teamwork, trust, and assumed roles were taken to get tasks done efficiently. The significance of these observations was that a lot of the time, actions did speak louder than words. Rushforth (1992) describes this type of learning, by “watching people who know how to do things”, as a valid form of legitimizing knowledge.

It was effective to rely on photos and samples around the room to help explain concepts. Specific examples had an emphasis on local contexts. The participants emphasized the impact that the hand samples and other visual course components had on the success of the program, and how this varied from past educational experiences. One Board member commented on how effective it was to see the rocks, touch the rocks, and smell the rocks - and particularly the same rocks that are seen on the land in the area. The visual component of the course allowed the participants to experience the information, or to recall an experience from the land that they could relate to. Thus, primary knowledge – the preferred mode of receiving information – was experienced (Rushforth 1992).

Having a variety of materials and methods to explain concepts worked well such as DVDs and animations to show some of the processes. A short film on mining communities from other parts of the world was presented. People were interested in this glimpse of the bigger picture; to see what is happening in other places around the world and how their “brothers and sisters” were involved and affected by the mining industry.

Using visuals and hands-on materials promoted questioning and learning – even before the sessions formally began, during breaks, and on the streets after the sessions had ended. This demonstrates the level of interest and engagement that accompanies visuals and hands-on experiences.

### 5.6 Relate Education to Local Realities

Using local “tools” and realities helped connect the training methods and materials to the world of the participants (supported by Chouinard and Veiga 2008, Freire 1968, Keeney 1982). Participants related to the visuals that were local; they had seen these rocks on the land, they had visited these mine sites that were discussed, they had traditional stories that related to the concepts discussed (e.g. the formation of rocks).
Common analogies and comparisons were observed to be useful – they helped the participants make sense of complicated concepts such as kimberlite formation (analogous to blood from a cut), plate tectonics (analogous to the upwelling of the ice road), and waste rock management (compared to F150 trucks). Learning from specific examples, places, and stories that are local improved discernment of the objects of learning in this study.

### 5.7 Break Down the Teacher-Student Barrier

Breaking down the teacher-student barriers situates the importance of everyone’s knowledge, encourages participation, and emphasizes equality. This was observed through body language of the participants. Community members were observed nodding their heads, smiling, and responding with comments like this:

> It’s good to listen to each other. We have many meetings in the past, but this is the first time we’ve met to talk about rocks like this, to learn about rocks and mining. I worked at the mines but I didn’t know anything about these rocks or why this mining was happening. You went to school. As for us – we went through a lot of school in the bush life but never sat in a classroom like this. Thanks for telling us about your life and your stories, and about these different types of rocks. That’s how we learn from each other. I was working at the mine, touching the Uranium. Thank you for telling us about this. I don’t want to say anything more.

> - Harry Apples, Elder (March 2009)

It is important to “listen to each other” and allow the authority on information (the “teacher”) shift throughout the program.

### 5.8 Build it with Them

The process used in this research advocated a community participatory approach that involved acting and modifying based on reflections. Participant’s active participation and the feedback collected in this research inquiry demonstrated their acceptance and preference for this type of approach. Without community support, without community input on what topics are useful and meaningful to them, and without direction on how best to convey topics of learning, it is difficult – perhaps even impossible – for true discernment to take place. The participants stressed the importance of everybody’s knowledge to understand ecologies and the interactions of systems – or in other words, “the big picture”, repeatedly throughout this research. Chapter six provides more evidence of the effectiveness of this approach.
5.9 Take the Program to Them

Feedback solicited from participants included the importance of going to other communities (not just Yellowknife), and hosting meetings in other locations (not just Boardrooms). The GMP also supports this approach, where demonstrations are taken to the miners in the field (Chouinard and Veiga 2008). Taking the education to various places involves more people – particularly civil society who do not receive travel assistance. Hosting sessions in novel places and in novel ways also helps to engage people (Veiga et al. 2007), and to engage people who would not normally be included in education opportunities. It allows for the participants to experience new places, and perhaps new phenomena that exist in these places. Engaging in education on the land brought forth new knowledge and exposed different teachers or authorities on topics. Engaging in education in the small community of Wekweeti – and choosing a school gym as the venue – exposed new people (people outside of Yellowknife and the youth of the community) to the opportunity.

Efforts to involve as many people from the community as possible also improve the database of community values, perspectives, and knowledge. Identifying comprehensive sets of community values, interests, and concerns, helps to clarify learning objectives, knowledge gaps, and knowledge needs (Keeney and McDaniels 1999). More people involved in the education programs, equates to more knowledge in the room to address objectives, knowledge gaps, and knowledge needs.

5.10 Create Credible Alliances

Making alliances with community leaders and respected authority figures contributes to successful learning and creates new opportunities. It was very worthwhile to have somebody who is known and respected from the community to conduct introductions when the sessions began. Having a community leader introduce the “teacher”, the research, and the relevance of the education to the community needs helped build alliances and gain faith from the community up front.

The Edmonton meeting was meant as an information item only. The intent was to inform the Assembly about the type of activities taking place in the region, and on the approach I had adopted as an education strategy. Participants at this meeting became
engaged in a manner that I had not expected. They began asking questions about the concepts of the course, rather than simply questioning the approach and intent of the education program itself. This venue, involving political figures with authority, helps pave the way towards establishing formalized permanency in educational methods and initiatives. They also have the authority and respect to direct how community capacity building, through education strategies, should be designed and executed.

5.11 Determine Who Wants to Know What

It is important to provide education opportunities for everybody in the community: community leaders, resource managers, youth, Elders, hunters, miners, healers, men and women, etc. Everybody in the community supplies perceptions, fears, acceptance, support, and resistance that are involved in the research problem: how the “unknown” contributes to the community-mine conflict. It is also important that people on the other side of the conflict equation are involved. This includes mining industry and government representatives. Everybody involved must learn to understand each other.

When delivering the education program it is important to be clear about people’s expectations and to clearly define what will and will not be discussed. Elders in this case made it clear that there were many things that they would like to discuss, but expressed that they would honour the intent of session by limiting their input to the topics identified for the sessions.

The needs assessment and value workshop, combined with the evolving participatory outcomes of the research helped to identify topics that were meaningful and useful to the participants. The BHP Billiton public hearing provided an opportunity to study the language and content discussed in a work situation. This helped to identify important topics and address how the topics discussed in the training could apply to the professional decision-making duties of the participants.
5.12 Know Where to Start and How to Move Forward

Participants felt that the level of difficulty and the flow of information made sense. They particularly liked how the course began with the scientific perspective of the creation of the earth and plate tectonics. “In the beginning...” became the lexis that was promoted by a Board member as an appropriate place to start. Starting “in the beginning...” allowed for a chronological account of information, without inadvertently skipping or assuming knowledge of concepts and subjects. It is often the theory and background concepts that are skipped over in so many other training courses that are confounded by time and specific purpose (such as an immediate pending decision). Always referring back to concepts discussed and conveying how each topic fits into the big picture was successful. People were able to draw connections to the relevance of every topic. Each time a conceptual layer is added, the reiteration of why each piece of information is important from a mining perspective and from an ecological view should be discussed.

Use a language that everyone can understand. The language in this research program was kept casual and not too scientific. Where scientific terms were needed, time was spent ensuring that people – and the interpreters in particular – understood the meaning and use. For example, there was some confusion around the term “processing” or “process”. Some of the participants had conducted training on the regulatory process in the north, and did not understand what this had to do with the process that was described for turning rocks into products. Time had to be spent communicating how this same word has different meanings depending on the context.

5.13 Repeat, Repeat, Repeat

Repetition has been shown to be an important component for discernment (Marton and Booth 1997). Repetition of the course itself, repetition of the participants attending the sessions, and repetition of slides and concepts during the course helped people to remember objects of learning or to pick up on new objects of learning they may have missed the first time around. Relating each topic to the “big picture” and making connections between topics was important. Participants wanted to understand the
interactions and significance of each of the parts that contribute to a greater whole. For example, the importance of mining was related to the products of mining that were pointed out in the room. Everything we discussed was related to the production of the products we were using.

At the end of each concept discussion, participants were asked questions that would provide evidence if knowledge had been acquired. The first time participants were asked about a certain topic, some of the participants would know how to answer the question. As the same question surfaced throughout the session, more and more participants were able to answer correctly. Systematic rote learning through repetitious questioning led to the ability of participants to define, identify, differentiate, and recall: all evidence of knowing.

5.14 Personality Counts

It is important to be honest about capabilities and knowledge and to try to be neutral about opinions (or be clear when it is an opinion and not a fact that is being shared). The participants respected others when they could not answer questions; this developed a trust that others would not share false information to appear knowledgeable. The personal relationship that develops has an enormous impact on the success of the training. When honesty, respect, and altruism were present, people were more willing to open up and share. Signs of appreciation for the educating demeanor included verbal affirmation and simple gestures (when the training was complete almost all of the participants came up to me on their own time to shake my hand, thank me, and depart the classroom with the phrase “goodbye my friend”). Building and maintaining trust and credibility is critical. Making a good impression helps gain acceptance outside of the classroom - I was continuously introduced to others in the community as a trustful source to ask questions.

Show humility: be willing to look weak, vulnerable, or foolish by participating in the unknown (e.g. attempting to speak the local language) to make the participants feel at ease when talking about scientific concepts that are outside their comfort zones. Mirror the attitudes and character traits that participants display. Chapter four described
important attributes in this case as: confidence, patience, respect, humour, pride, passion, chivalry, and loyalty to authority figures and ancestors.

5.15 Plan the Logistics

Feedback gathered from participants to improve logistical planning for education sessions includes:

- Talk to the “right people” to plan logistics: somebody with authority can be the link between formal support from the government (in terms of resources and directives) and informal support from community members to attend the session and find credibility in the program (both the material and the educator),
- Talk to lots of people – advertising by word of mouth, particularly from influential individuals, is often the best form of marketing and gaining support,
- Create an organized education space and situation: a blackboard or poster board for explaining concepts readily, presentation equipment set-up and in working order, a laser pointer to draw attention to slides, agendas and handouts distributed across the room, and certificates drafted for when the participants complete the training must be in order,
- Take breaks: one-hour of material followed by a fifteen-minute break during sessions, two days for an education session, and meet more regularly to allow time to reflect then come back to it,
- Serve traditional foods that suit the participants, and;
- Consider the timing of the program: never plan meetings during the weekends in the smaller communities when the ice road is open, never plan meetings when there is good caribou hunting or during times when people are traveling on the land, popular community events may attract or distract people (e.g. hand game competitions or community meetings), holidays must be considered, and always arrange “plan B” for unexpected factors (e.g. funerals).

5.16 Chapter Summary

Key directives that emerged from this education program are:

- Incorporate culture and values in education programs,
• Know the participants and be known to them,
• Teach concepts in the same or similar manner that they teach each other,
• Show information when possible - do not simply tell facts,
• Relate education to local realities,
• Break down the teacher-student barriers,
• Build educational programs with the intended learners,
• Take the education programs to the intended learners,
• Create credible alliances,
• Determine who in the community wants to know (or needs to know) what,
• Know where to start and how to move forward (do not assume people have the background knowledge),
• Repetition is important,
• Personality counts, and;
• Plan the logistics well in advance.

It is important to note however, that the process that revealed these directives is fundamental to establishing success. Every case will be different. Every case will have unique directives to consider when aiming for success. Appreciation of the contextual limitations (people, places, and time) of the lessons presented in this chapter must be considered. Thus, the directives presented here should be considered – not copied. It is the process that was used to unveil these “lessons learned” that should be replicated.
6 EVIDENCE OF SUCCESS

6.1 Introduction

The educational program that emerged from the action-reflection cycle produced more than educational materials or directives – it created an educational experience. This experience refers to how the participants engaged and responded to the use and combination of objects, people, places, stories, and conversations. It is the knowledge they acquired, the new understandings they constructed, and the developing abilities the participants attained. This chapter presents an evaluation of the success of this process to construct an educational program for this case. Interview feedback and observations were analyzed and integrated to address the second research objective: to evaluate the success of a process used to develop an educational program related to mining for this case-study.

Evidence of knowledge and understanding was extracted from participant’s verbal feedback, and from observations. Evidence of knowledge acquisition considered the ability of participants to define, identify, differentiate, and recall objects of learning. Visual recollection with oral responses are considered to be a satisfactory means to measuring knowledge, and particularly effective for group situations (Bloom et al. 1981, Davis et al. 2008). Both visual and verbal proof of knowledge was sought in this investigation.

Evidence of understanding focused on the participant’s ability to synthesize the acquired knowledge by 1) translation: putting information into different words or symbols, 2) interpretation: recognizing the interconnectivity of the separate parts, and 3) extrapolation: making inferences or predictions based on information items (Bloom et al. 1981).

Signs that indicated that acquired knowledge and understanding could later be applied to concrete situations were also sought. This level of discernment, the assimilation and integration of knowledge into one’s self, has been described in Dene culture as possessing a character trait of power exemplified by abilities to perform (Helm 2000, Nadasdy 2003, and Rushforth 1992). Evidence that abilities or that the building blocks to achieve abilities were attained, are described subjectively by the participant’s responses to the education program.
6.2 Acquiring Knowledge

The education program was divided into three modules: Geology, Mineral Exploration, and Mining. Key learning objectives, listed below, were identified for each of the modules; these are essentially what the participants would hopefully know after the session. The measures of acquired knowledge should be at a similar level of detail and should draw on the same vocabulary and context that is used in the teaching. Otherwise, previous forms of knowledge or experience are being called upon that cannot be accurately captured in the evaluation of success for the specific inquiry (Bloom et al. 1981). Effective tests for determining “knowing” are supply items (where the learner offers evidence from their memory), or choice items (where the learner chooses the appropriate answer given some alternatives) (Bloom et al. 1981).

The participants of this study demonstrated the ability to define, identify, differentiate, and recall concepts and items – all indicative of knowledge acquisition (Bloom et al. 1981, Davis et al. 2008). Attention was paid to the topics and concepts participants seemed to know or not know after the session. The objects of learning for each session were:

Module 1: Geology
- Ability to define a rock, mineral, element, and ore
- Ability to list three classes of rocks based on how they formed
- Ability to describe the basic geology of the Wek’eezhii region

Module 2: Mineral Exploration
- Ability to describe different phases/levels of exploration
- Ability to give examples of different exploration techniques

Module 3: Mining
- Ability to list various mine types
- Ability to name the key components of a mine site
- Ability to describe the general process from rock to product
- Ability to list the potential effects of mining
- Ability to describe general mine waste management strategies

Most of the participants were able to define terms such as igneous, sedimentary, and metamorphic rocks, and use these terms when describing something or asking a
question by the end of the session. Similarly, participants were able to identify various minerals and rock types. They could talk about how the rocks formed, differentiating from other rock types. For example, when shown a layered mudstone sample, a granite sample, and a shiny schist sample, participants were able to identify that the mudstone was a sedimentary rock (or a “secondary rock”), the granite was an igneous rock (or a “fire rock”), and the schist was a metamorphic rock (or a “changed rock”). They could differentiate the rocks based on the layers in the sedimentary rock, the pink minerals in the granitic rock, and the micas in the metamorphic rock. An Elder stated that he never knew that rocks came from other rocks, showing signs that the concept of the rock cycle had been learned.

Participants began to recall concepts and terms that were learned by referencing the course materials and talking about how the course content related to their lives and experiences. For example, one Elder stated that he could not read or write a single word and that he had never spent a single day in a classroom to learn about these things. He said this while holding up a copy of the periodic table that had been distributed. He proceeded to exclaim that despite not being able to read what was on the paper, he knew that these little boxes represented the ingredients that make up all matter. Participants were able to recall and repeat concepts when they were sharing stories or showing interest in the things they learned. For example, Elder Joe Zoe recalled information about rocks and glaciers:

Everything is made from rocks, from the mine site. All of this stuff on this paper [pointing to a handout of the periodic table] and in this room comes from mining. We didn’t know about this in the past - about the rocks being pushed by the glacier, water going back and forth on the rocks to make sand. There are so many different things that we see on the land.

– Joe Zoe, Elder (March 2009)

Finally, recollection of knowledge was expressed in terms of interest and disbelief. For example, one Elder expressed his disbelief that the Wek’eezhii region used to be dotted with some of the earth’s most ancient volcanoes and that some of the rocks found in the region formed from volcanic activity. He stated that he didn’t believe that I was lying – he simply shared the struggle he was having personally accepting this to be true. It was so beyond anything he had ever imagined. His fascination and perplexity of the phenomena displayed that the knowledge had stuck. Many of the participants
responded in a like manner when discussing the different layers of the earth – particularly the thought of liquid magma deep beneath our feet.

Some signs of knowledge about mineral exploration and mining were also observed, although to a lesser extent than the geology module. Participants talked about the “bird like rocket” that hangs from helicopters for exploration (magnetic surveys). They have seen these flying by. Most of the exploration discussions revolved around the influence glaciers have had on the landscape and the techniques used to find minerals of interest. They talked about the open pits and underground mines that they have seen (at Ekati, Diavik, and Con mines), the waste rock piles that now exist on the land (at Ekati and Diavik mines), the impacts that they have experienced from mining (from abandoned mine sites like Rayrock and Colomac), and the products that are produced by mining (such as watches, eye glasses, and other objects in the room).

People nodded as a sign of knowledge or understanding when they witnessed the experiments that showed how rocks and minerals could be separated based on their properties. This was especially true for the demonstration on magnetic separation (magnetite was separated from similar looking minerals by using a magnet), and on density separation (two similar stones were placed in water – one sank and one floated). The participants told stories of these two demonstrations at meetings and on the street after the sessions had ended.

The information that was not recalled often or at all was the material on waste management strategies and the details involved in each stage of exploration. Reasons for this may include: these topics were discussed later on in the sessions and in less detail, the concepts were not repeated as often, the participants did not have primary experiences to draw from, there were no demonstrations for the participants to see and experience directly, and limited stories or accounts of personal experiences where shared.

6.3 Acquiring Understanding

Evidence of understanding through translation, interpretation, and extrapolation of knowledge were explored. Kvale (1996) argues that in a communicative culture (knowledge through stories), discernment should be affirmed through conversation. To
this effect, evidence of understanding was sought via the stories, questions, and opinions expressed by the participants.

Signs of translation of knowledge occurred when participants developed their own analogies to describe phenomena. For example, one Board member who had attended the pilot session in Yellowknife came forward to help describe concepts at the following Wekweeti session. He compared the collision and uprising of ice plates when lakes freeze over to the mountain building phenomena from the collision of plates when discussing plate tectonics. He later compared the rising of lava from deep in the earth to form kimberlite pipes to the upwelling of blood from a cut in your skin.

Participants connected the concepts and themes discussed in the sessions, a sign of knowledge interpretation. Evidence of understanding is verified in Elder Jimmy Rabesca’s concern about how mining processes will affect the layers inside of the earth; connecting two separate topics that were covered independently. He said:

All this information that you shared will help us, we can use it. One thing I am concerned about is that everything is starting to be focused on mining and exploration. They always say that nothing will be damaged. They talk to everyone and say nothing will be harmed. What will happen in the future? They do know about the effects but they say nothing will be harmed. There is a life span of the mine. When they are finished, the land is spoiled. What about the inside layers of the earth – what happens under the earth?

– Jimmy Rabesca, Elder (March 2009)

Finally, participants were able to extrapolate the information to make inferences or predictions based on the knowledge acquired. This was observed by the questions participants asked, or by the concerns that they shared. For example, Elder Joe Zoe stated:

We should go on the land and look at these things. Uranium is in this rock. There is Uranium in the rocks that we don’t even know about. Our young ones get sick and we don’t know why. We need to learn about the rocks we don’t want to be close to.

– Joe Zoe, Elder (March 2009)

Elder Joe Zoe demonstrated that he could extrapolate the concepts of contamination and rock properties to experiences from the past with Uranium and the potential dangers that exist on the land with certain rocks – even though the context of discussions did not specifically address Uranium. In another instance, Mike Nitsiza (WLWB) addressed the Elders of the community and asked:
All of this research is being done, then we make decisions. Based on what Rebecca told us about rocks and metals going to the lake – are there any natural causes that you have heard about where lakes have been contaminated? How long does it happen naturally if it was a natural cause? Has it harmed people and animals in the past? Are there any past stories of this? You have seen fish that are not consumable. We need to try to control our mess and do research on the land and lakes to document contamination from natural causes.

- Mike Nitsiza, WLWB (March 2009)

He was extrapolating or inferring that the concepts discussed must also apply beyond a mining context and into the natural world. This line of questioning opened up the discussions to natural sources and processes of contamination, and examples that people had seen on the land – in isolation of mining activities.

Participant’s interpretations or extrapolations on how toxicity happens were unexpected. Many participants commented on their concern for the environment and wildlife. One Elder expressed regret that he had been touching Uranium. The quote presented above builds on this fear of Uranium, particularly the negative health effects it has on children. The routes of toxicity, the factors affecting the toxicity of elements and chemicals, and the responses to toxicity were not fully understood. Participants relied on their own experiences with Uranium. A mine was developed in their region (the Rayrock mine), it was later abandoned (it was not properly reclaimed and the community was exposed to Uranium tailings), and people got sick. The details on how or why people got sick were not experienced, not known, and hence, not understood. People’s perceptions are that Uranium causes sickness.

Elders also expressed sadness about the destruction to the land that mining creates and how companies have behaved irresponsibly in the past. They referenced waste rock piles, streams that have been re-routed, and tailing ponds that have been created. The concepts of “safe” mine waste management strategies were not understood as expected (i.e. that the movement of rocks, water, and waste can be done safely). Again, this may have been due to the lack of time spent on these topics and their lack of direct experience with waste management concepts. However, there may have been a deeper reason for the varied interpretation of safe mine waste management practices – rooted in fundamental values. More on the foundations of values and belief systems, and the challenges of integrating different belief systems are described in chapter seven.
6.4 Acquiring Ability

The *application* of knowledge and understanding refers to the ability to use abstractions in particular and concrete situations, drawing on principles and generalizations (Bloom et al. 1981). Application provides a deeper level of proof that knowledge and understanding has occurred, and leads to mastery of a subject. The effectiveness of discernment is demonstrated by the effectiveness of the resulting action (Kvale 1996). This level of discernment is most desirable; it signifies the acquisition of intellectual independence that fosters power and freedom. It facilitates the opportunity for learners to access previous knowledge and apply it to new situations or phenomena – a key component of discernment (Fraser et al. 2006). Positive indications that acquired knowledge and understanding could translate to the application of information in the participant’s daily lives are viewed as the ideal level of discernment (Bloom et al. 1981, House 1980, Kvale 1996).

The acquisition of knowledge and understanding brings forth the foundation of an individual’s power and the basis for human agency (Rushforth 1992). Nadasdy (2003) explains knowledge in Dene culture as a way of life, necessary for survival. The practical application and thorough understanding of knowledge is important for Dene people to identify their place in the world. It defines their relationships with people, places, and animals; these relationships are important aspects to becoming powerful. Power is evidenced by one’s ability to control the world around them, their success (e.g. in hunting), and their ability to demonstrate their knowledge (e.g. use of medicine to cure) (Rushforth 1992, Helm 2000). Evidence of ability or power, through control, success, and demonstration was not witnessed or solicited in this research. Mastery of topics and concepts required to achieve this level of power, and the forum to display qualities of power, can take years to acquire and evaluate, and therefore, was not used as a primary indicator for success in this inquiry. However, it is argued here that the participant’s feedback on the usefulness, meaningfulness, and overall effectiveness of the educational program suggests that new abilities were or could be attained via this educational approach. Evidence that the education program was useful, meaningful, and effective is presented here.
This lady has taught us many new things. We have never learned about this type of thing. We see rocks everyday on the land. We want to learn about the value of these rocks. Our Elders used to travel looking for caribou at Ekati. We didn’t know that this would be a mine. We talk about moving rocks. We have seen so many rocks. These rocks we have seen since we were kids. We are so happy and pleased about this training. Since the beginning of time, we like to talk about things that are important to us. Are these mines going to be good for us, or bring us harm? With this knowledge we can talk with the mining companies. I always wanted to know how these big rocks moved. I am so pleased with this.

– Jimmy Kodzin, Elder (emphasis added) (March 2009)

This feedback indicates that the participant found importance in the educational experience. To associate importance with an experience, one must be able to relate to the situation, it must have value or be of importance to values that are already established. It also must provide information that was previously not known, that can be applied in life (Davis et al. 2008). The education program was effective – he learned, “many new things”. It was meaningful – he stated, “…we like to talk about the things that are important to us” such as mining, and that he “always wanted to know how these big rocks moved”. It was useful – he claimed, “with this knowledge we can talk with the mining companies”.

Another Elder stated:

We have never seen this in the past – somebody coming to talk to us about this, to let us look at these stones. I am very happy that you came to visit us. I am personally very pleased. I’m sure the others feel the same way. You helped bring us strength.

– Louie Wedawin, Elder (emphasis added) (March 2009)

Evidence of power through “strength” gained from knowledge was expressed. The general sentiment of gratification for the education program suggests that the program was meaningful and effective. One participant expressed this gratification clearly by stating:

This was a very good course. The best course I’ve ever taken actually.

– Georgina Chocolate, TGLP (December 2008)

6.5 Chapter Summary

The education materials that were designed and used as a result of the action-reflection cycle contained a combination of learning techniques and media. The use of varied media and materials in the education strategy was meant to organize experiences to orient the learners’ perceptions to details and concepts that would prompt them to
associate or recall other details or experiences (Davis et al. 2008). The participatory/complexity educational approach of the program encouraged the flexibility to engage minds. Relating the materials to the local realities, culture, and context of the learners elevated the success of the educational program.

Both knowledge and understanding were prominent for the activities that involved direct experience or accessed memories of direct experiences. The intentional use of demonstrations and the visual components of the course materials (e.g. watching a rock float, or witnessing the separation of magnetic minerals) encouraged the development of knowledge and understanding. Narratives, stories, and personal accounts of experience also facilitated the emergence of knowledge and understanding. Evidence that knowledge and understanding were acquired took the form of the participant’s ability to: define, identify, differentiate, and recall concepts and items (indicators of knowledge); and to: translate, interpret, and extrapolate knowledge (indicators of understanding).

Evidence that knowledge and understanding could be applied to real life situations surfaced. Convincing proof that mastery of topics was attained, evidenced by application of knowledge and understanding to concrete scenarios outside of the learning environment was not observed or expected. Such mastery takes time. However, proof that knowledge and understanding were acquired and that the experience was useful, meaningful, and effective demonstrated that the educational approach could facilitate this higher-level knowledge application into the future.
7 THEMES ANALYSIS

7.1 Introduction

Perhaps the most important outcomes of this research are the themes that emerged from the activities, events, material outputs, and processes. These themes refer to predominant insights that were revealed through observational and verbal feedback from the participants. The themes provide insight on why assimilation of information occurred – or didn’t occur - in this region, with these participants, at this particular point in time. They help explain why certain activities, events, material outputs, and processes resonated with the participants. Insights gained through the interactions with people and places over the course of this research are described in the guise of these fundamental themes, and are central to how the research findings and future recommendations have been shaped. Themes are presented with rich descriptions that analyze the truths, outcomes, and effects that were interpreted from the inquiry. These themes have surfaced in other chapters of this thesis. This section specifically categorizes the significance of the most central themes to this research to address the third research objective: to gain insights on how learning happened or failed to happen for this case-study.

7.2 Referencing Discernment

What this lady is saying is the truth; I’ve seen it with my own eyes. I’ve seen that different places have different rocks than other places. There are areas where the ground is soft – where it looks like a waterbed. I’ve seen these types of things at Marian Lake where there is a chunk of rock in the middle of the land. I am always wondering why a big rock like that is there. In Great Slave Lake there are big black rocks in the water and I wonder why these rocks are there. What you are telling us is what I see, it’s the truth, it’s what we see when we walk on the land. You are telling the truth.

– Harry Apples, Elder (March 2009)

The concepts that were learned and not learned by participants provide insights on why or how knowledge and understanding are acquired. Using Rushforth’s (1992) definition of knowing - believing that something is true based on justifications – it is necessary to consider what type of justifications are required to believe. Primary knowledge, based on an individual’s experiences is the culturally preferred mode to legitimize knowledge by believing. Secondary knowledge legitimized indirectly by
primary knowledge, through myths, stories, literature, conversation, instruction, and gossip are other modes that justify beliefs (Gibson and Zoe 2009, Helm 2000, Rushforth 1992).

Deciphering the level of discernment that has taken place with learners is difficult – particularly in the short term. Attention in this case was given to the nature of questions and comments that surfaced, to get a sense of how interested people were in the various topics. Asking – internally and to the audience – “Why did you ask that?” or “Why is that of interest to you?” provided some clarity. For example, participants asked which rock types had a strong smell, which ones make a spark when you hit them, and which ones turn blue when you throw them in the fire. Through questioning it was revealed that they were interested in rocks that are used as flints. They asked about rocks that were really heavy – but what they really wanted to know was which rocks are good for weighting down fishing nets. Participants wanted to learn more about the glaciology of the region and specifically how the “ice free” corridor connects them to ancestors in New Mexico. They were interested in why “erratics” or rocks that are visibly out of place exist in certain spots such as the one on Marion Lake Island. They were interested in the scientific explanation for the shape of rocks. Essentially, learners are more engaged in topics that are useful or meaningful to them (Chouinard and Veiga 2008, McDaniels 2000).

Attention was also given to how people were trying to apply this new information to the world around them. A lot of attention was directed at specific places and around the things that existed in these places. As such, more time and interest was spent on the geology and glaciology sessions. There was also a lot of interest in the products produced by mining; many of the participants were unaware that so many products that they use were a result of mining. There was less interest expressed on the mine waste management module, perhaps because this module dealt with operations and materials that were unfamiliar or not experienced by the participants. Learners are more engaged in topics or experiences that they can relate to (Freire 1968).

The visuals used in the education program triggered questions and story telling. People talked about rocks moving, the various properties of rocks, where they had seen the rocks displayed in the sessions before, the shape of the rocks, the colour and smell of
the rocks. Questions arose about rocks that were flaky (mica), or rocks that were used as flints (obsidian), or rocks that smelled (sulphur), or rocks that were unusual colours (e.g. iron influence). Learners are more engaged in topics or concepts when there are a variety of things that they can see or visualize (Pang et al. 2004).

When knowledge could be referenced to something familiar – a story, an experience, or a historical lineage – it was easier for the participants to remember the information and apply the concepts to the mining realm. This interpretation is in agreement with Rushforth (1992) who states that the preferred mode of learning in Dene culture is through direct experience, by accessing the memory of an experience, or by tale of somebody else’s direct experience. The more the session related to their experiences, the easier it was to relate concepts and topics in a manner that was useful and meaningful to the participants. Thus, identifying what experiences to relate to in education sessions – essentially getting to know the participants – is an important element for learning to happen.

The participants displayed signs of discernment by their analogies to explain concepts (e.g. ice upwelling on the ice roads to the collision of plates or the upwelling of blood from a cut to the upward explosion of a kimberlite pipe). The participant’s own analogies to reiterate or repeat concepts indicated some level of assimilation (Bloom et al. 1981). When participants engaged in discussions with each other, helping each other understand concepts by using their own analogies, there was some indication that assimilation of information was occurring.

Connecting concepts to familiar objects or experiences helped with the assimilation (e.g. F150 trucks to waste rock piles). The Elders in the sessions almost always began speaking with the sentence “you speak the truth, I’ve seen it with my own eyes”. They followed this sentence with an account of what it was that they have seen that related to the concepts being discussed. They were excited about the connection they could make between the lesson plan and the things they have experienced or seen first hand.

Repetition in the classroom discussion – through slides, stories and demonstrations, was important. Purposeful repetition is a powerful tool to improve learning (Fraser et al. 2006). The repetition of questions and stories from participants
became a sign of assimilation – particularly when stories or analogies were re-told at another session. Often times the same question was asked in many different ways – each time the question was asked some piece of the concept was verified or made more clear. For example, numerous questions about the movement of rocks came up at all of the sessions. The concept of massive glaciers moving rocks and carving the land become clearer as the sessions moved on. People began talking about why the land might be the way it is because of glaciers, or that a certain peculiar rock must exist in some location because of glacier activity. It was the participants that linked the effects of glaciation to the massive impact it has had on the movement of people and the current settlement of their lineage across North America.

Thus, discernment was most successful when participants could reference the object of learning to an experience related to the phenomena (Rushforth 1992, Chouinard and Veiga 2008). Repetition presents multiple opportunities to remember concepts and recall concepts from experiences (Fraser et al. 2006). Presenting information in different ways, under different contexts may trigger recollection of experiences or stories that are necessary to discern (Pang et al. 2004).

7.3 The Trouble with Dualism

There is a story my father told me about a rock that looks like a human body – it looks like a man walked up onto the land and froze into a rock. So what you are saying about the different rocks, I know you are saying the truth. We know about these rocks from our stories, but why is this rock in the shape of a man? In another area there are rocks that look like steps in the shape of a mountain near Point Lake. Why are these rocks like this?

- Louie Zoe, Elder (March 2009)

A re-emergent theme was the struggle to connect this new type of scientific “classroom knowledge” to a rooted belief system traditionally passed on through oral history and story telling. Redefining our truths and reprogramming our mental maps about the world around us was at the forefront of this research, for everybody involved. The integration of knowledge systems is at question – but the framing of this question (i.e. how to integrate knowledge) is fundamentally flawed. How knowledge is viewed in Dene culture is quite different from a typical Euro-North American perspective. Knowledge in Dene culture is viewed as character traits or lived experiences that are
assimilated into one’s being, rather than an object or a product that can be grasped (e.g. Helm 2000, Nadasdy 2003, Rushforth 1992). Therefore, the struggle to integrate knowledge extends beyond the issue of learning and justifying facts, to the bigger issue of modes of assimilating knowledge into one’s self.

Philosophical postmodernists agree that reality is “a state constructed by the mind” (Wilson 1998). There is no “real” reality, or objective truth. Instead, prevailing versions of truth are expressed by ruling social groups that create codes for beliefs. If this worldview is adapted, each culturally defined set of truths is as good as any other set of truths (Wilson 1998). A knowledgeable person is someone in Tlicho culture is someone who has power that can contribute to the well being of the community (e.g. a good hunter) (Nadasdy 2003, Rushforth 1992).

Because the overall education program purposefully was not framed with a teacher (me) – student (them) attitude, the space was created for everybody to share in the role of educator and learner. Acquiring knowledge is a dynamic process that entails a selection of the critical attributes relevant to the learner (Davis et al. 2007). Encouraging the participants to share their knowledge – and in a format that was comfortable to them (style and place) – enriched the learning experience. Each individual had a unique way of expressing their selected knowledge, and will pass on some hybrid account of information for others to discern based on the new knowledge they experienced. A success of this training session was the flexibility in what and how discussions unfolded, the respect for the variation in perspectives and beliefs that were uncovered, and the reciprocity of giving the knowledge that embodied each of us. The opportunity for the participants to experience knowledge, rather than receive it like a commodity, is a fundamental point.

The question of combining new truths with past truths was confronted. For example, questions continually arose regarding the shape and placement of rocks. Ancestors have passed down a legend about a man that used to live underneath one of the local lakes. He moved back and forth with the waves, from one side of the lake to the other. One day he crawled onto the shore and turned into a rock. A rock exists on this lakeshore that resembles the shape of a man crawling out of the water. It is different from all of the other rocks around it. This is the traditional oral account used to explain the
shape and location of this rock, an example of what Rushforth (1992) describes as legitimizing secondary knowledge. At both the Yellowknife and Wekweeti training sessions participants asked about this rock. Personal perceptions or beliefs about phenomena were shared. It was important to be honest and respectful – it did not matter if everyone shared the same perceptions or beliefs. It was more important to understand the source of each other’s perceptions and beliefs; these are shaped by each person’s upbringing, personal experiences, and culture (Rushforth 1992). Acknowledging that a scientist who studied in classrooms for many years will likely have different beliefs and perceptions than an Elder who studied on the land for many years was important. Similarly, for questions that could not be answered; it was useful to describe the approach that would be taken to solve or answer the question from the “scientific perspective”. Listing the missing details needed to respond, or the approach that would be taken to respond, helped the participants understand how truths or beliefs are constructed from different perspectives.

Finding a way to compromise or make sense of different perceptions and beliefs – particularly when these were at odds with one another - became the challenge. The participants verbalized the dilemma of combining this scientific perspective with the traditional stories they were accustomed to. The previous example about the Elder who could not believe the region used to be covered with volcanoes was an instance where this was evidenced. He made it clear that his disbelief was not because he thought it was a lie – but that it was difficult to switch completely to a new reality in such a short time. By saying that he needed to take some time to think about this indicated that a new reality or mental map was developing for him – likely some hybrid account that he will pass on to others. Wilson (1998) suggests that the linking of facts, fact-based theories, and knowledge systems (across disciplines and cultures) will create a view of “how the world really is”. The utilization of various theories, approaches, and methods in this research, teamed with an attempt to involve many different people in the educational program, helped create the consilience needed to create a more balanced perspective. Great insights emerged on how truths are constructed in this case’s culture from the interdisciplinary research design.
Sometimes stories or knowledge have to be shared on the land, or demonstrated in the specific context, not expressed verbally in a course. Nadasdy (2003) argues that formal instruction is seen as a disservice to the learner in Dene culture. The learning that happened on the land, during the caribou hunt, facilitated the opportunity for knowledge to be experienced. The classroom education modules were designed with this concept of experiential learning in mind.

The “little rules” that apply to the sharing of knowledge can make the exchange of information challenging. Not everyone is a credible storyteller – there are certain people in the community that hold certain stories. For example, I was not permitted to share a story that I had heard in one of the sessions through words or writing. That story belonged to that storyteller to tell. There are knowledge keepers. Only a storyteller who has experienced knowledge first hand can share this knowledge with others (Rushforth 1992). Certain individuals have knowledge that has been communicated to them through dreams and super natural powers – this is also considered to be legitimate experience (Helm 2000, Nadasdy 2003). This translates to placing importance on who is involved in education situations. People with different types of knowledge and experiences must be together and the forum to share experiences must be provided. The education sessions in this research tried to involve people with different knowledge (e.g. knowledge of the land, geology and mining, regulatory systems, wildlife, and law).

Overall there was a very high level of interest in sharing knowledge between cultures. The lexis “strong like two people” sets the tone for reciprocal discussions and productivity (e.g. Gibson 2008). The acceptance of a hybrid knowledge system of belief was made clear; participants expressed that the community would be stronger if they were exposed to different people over time and worked together. The sentiment of capacity building and on being better in general by improving knowledge and understanding was raised.

Making sense of two different systems of belief involves how the information is shared (most effectively through experience), where the information is shared (ideally on the land where the practicality of the information can be experienced), what information is shared (something that will make the learner powerful), and who shares it (somebody
who has primary knowledge). The following section takes a closer look at who should share knowledge with an account of traditional teachers.

7.4 Traditional Teachers

We understand you. White people and Dene people are different. I am a very different person; I know how to live off the land. I learned this from my parents. They taught me where the good timber was, where the caribou are. We don’t know how to read and write. I’ve never been to school. Our parents taught us very well. That got us here – on the Board. We know the areas where our ancestors have been buried. Snare hydro flooded an area where our ancestors are buried. This is how we came to be – we’ve had many struggles and hard times. You are educated in classrooms; we are educated outside. We learn how to build snowshoes, how to repair sleds. This information is passed down from our parents. That is why we love our land. We want to be supportive of other people. Our parents were great educators. They talked about everything: how to work with dogs, about survival, good camping areas, about the land and useful tools. This is how we still use their knowledge. In the past, people were very poor. Now it is so easy. My mother made me grow up and learn. Our parents loved us, and taught us because they loved us. Our parents taught us to live and survive in very hard conditions. I hope this knowledge will help you decide on your model [referring to educational methods]. We want to know – everybody does things differently because we are not the same. We don’t all speak the same language. Thank you – I wanted to share this information with you.

- Harry Apples, Elder (March 2009)

Knowledge in this region is traditionally passed down from authority figures – usually parents. Parents teach their children on the land; they teach them how to build fires, butcher caribou, where to fish, how to sew. It is a knowledge that is passed down generation after generation. This knowledge was key for survival at one point in time – and thus, the “teachers” were greatly respected (Nadasdy 2003). When knowledge was being shared in the education sessions, it was common for the participants to acknowledge that their parents had taught them this information because they loved them.

When I referenced the knowledge passed down from my family, particularly my stepfather who is also a geologist, I was able to connect with the participants. We shared the same sense of respect for our parents, and for the family patriarch in particular. I often talked about my teachers and what I learned from them. This authority structure highlighted a similarity between how I received knowledge and how they – the participants, are used to receiving knowledge. Various participants told me that referencing parents, teachers, bosses, and other authority figures during the sessions...
resonated well with the group. It made the learning experience more personal, and helped build a sense of “sameness” with the people in the room.

Other authority figures that have historically been recognized in the Tlı̨cho culture include councils with political responsibility (the community men as a collective), leaders of community bands, trading chiefs (in the fur trading era that began in the 1970s), the war leaders, and men who possessed supernatural powers (Helm 2000). Participants in this study shared stories of prophets who have passed on predictions that have come true. Predictions and stories about the future are still prominent, and the prophets that talk about this future are highly respected. Elders, community leaders, chiefs, and Tlı̨cho government figures, are examples of other respected modern teachers. Helm (2000) clarifies the roles of authority figures such as patriarchs of families and Elders. She states that their function is to act as advisors rather than dictators. The public opinion of the community as a whole is responsible for rules and order. Animals are also perceived as being intelligent, social, and spiritually powerful teachers in Dene culture, vital to physical and cultural survival (Nadasdy 2003).

Leadership and authority on subjects however, is situational and transient. Leaders are respected based on their “power”, demonstrated by their abilities to apply knowledge by “providing for the people” (Rushforth 1992). An individual’s ability will inevitably range depending on the activity. As such, the “leader” or “authority” of a situation will vary, depending on the ability required for that situation (Rushforth 1992). In Dene kinship systems, forms of hierarchy are typically absent. Families and individuals are free to pursue their own needs and desires. Equal access to knowledge and experience is promoted (Rushforth 1992, Helm 2000). The framework for the educational program in this study reinforced this principle of shifting authority by recognizing the importance of everybody’s knowledge and encouraging people to share. Whoever had primary experience on a given subject was respected as the authority on the matter.

It was also important to have the support of community authority figures. Conducting interviews, and participating in community events facilitated opportunities to become better acquainted with some key community figures and gain their support. Being introduced at the beginning of each session by somebody who is a respected authority figure in the community immediately conveyed some sense of acceptance and
trust with the participants. Building relationships and establishing trust with key community members is important – maintaining relationships throughout the sessions and beyond is critical to ensuring the educational experience is perceived as a positive one into the future (Quigley et al. 2000).

Rushforth (1992) describes the attributes of a bad educator in Dene culture as someone who is “bossy”, “proud”, and “lazy”. He states that individuals claiming expertise in the absence of primary knowledge, or who try to “tell” people knowledge rather than allow their actions to provide others with the necessary evidence to establish knowledge are not respected as authorities. Considering the example of a typical education session that was presented in chapter two, this claim can be reflected on further. The “teacher” who did not posses primary knowledge – that is experience – in the local region or context could be seen as an invalid source of knowledge. Knowledge may also be rejected in situations where the teacher tells the students what to believe.

The participants stated that it is hard to know where to go for this “new type of knowledge” needed to survive in society today. It is hard to know who to trust. It is hard to assimilate new information in an unfamiliar context with foreign teachers. Elder Harry Apples stated with a deep sense of sadness, “we are like orphans in an empty home”. Effective teachers should have an understanding of the culturally-based systems of knowing before engaging in education. Systems of believing are deeply rooted in cultural values (Rushforth 1992).

7.5 Determining Value

The group wanted to know right away what rocks were valuable. They stated that there were cases where Elders had asked if certain rocks were valuable and the miners said they weren’t – then years later a mine was developed on top of those same rocks. We spent some time discussing what value means to different people. I explained that because I have a background in geology, I find rocks with an interesting formation history to be valuable. Others may find rocks that have a useful function to be valuable (for cutting, using as fishnet weights, as flints, etc.). Value doesn’t necessarily reflect monetary worth. This vein of discussion engaged the participants; we began talking about the names that Elders have for these rocks and the traditional uses for certain rocks. Folks began sharing stories about the healing powers some shamans use from rocks. People seemed to become more comfortable with the idea that the discussion could digress from the slides, and there was an open forum to talk and share as the group decided. The scientific stories that I shared were shared with the understanding that they were from my perspective – delivered in a way that I was taught through school and
experience. There was a feeling of respecting where people’s knowledge and beliefs came from, and each person had to take with them what they thought was valuable for them. It was not necessary to believe each other, but rather to understand how each of our different experiences led us to such beliefs.

– My Observation Notes from Yellowknife Training Session (December 2008)

Trust is a subject applicable to most of the themes discussed here. Trust was gained from the participants when somebody asked which rock in the room was the most valuable. I earnestly answered “it depends on who you ask”, and proceeded to tell the group about the two rocks I valued most: an Acasta gneiss from the NWT region because of the history it contained, and a desert rose because of the sentimental value I have for this gift from my step father. The trust gained was two-fold. Firstly, the group learned that I did not measure the value of these rocks only in monetary terms. Secondly, I displayed a strong sentiment towards family - and a father figure in particular (as described above). These are two values that I share with the Tłı̨chǫ community - value is not measured solely in monetary terms, and people respect and cherish their parents. This shared sense of value helped participants open up, share more with others in the room, and created a sense of unity within our group.

Soliciting participant values (through value-focused-thinking techniques) can help people identify commonalities that are important to understanding one another – particularly across cultural barriers (McDaniels 2000). Time spent understanding or thinking about how each other’s backgrounds shape values helped to raise awareness or compassion of different perspectives. Articulating various values in a way that everyone can understand can help foster better relationships and dialogue with mining companies, governments, and other stakeholders, and can guide and inform resource management decisions (Gerwing and McDaniels 2006). It is difficult to know if something is of value if you have never experienced its’ value. For example, a story was told about the healing value of rocks to some shamans. Without sharing the private details of the story, the point was that a different type of value – unfamiliar to most scientists or miners – exists in this region. These values may not be understood because they have not been experienced, and as such, are often discounted or weighted unequally in resource management strategies (Nadasdy 2003, Quigley et al. 2000, Gregory 2000).
There was less interest and evidence of knowledge and understanding in the waste management section of the education program (previously discussed). A discrepancy or unawareness of each other’s values likely contributed to the perceived disinterest or failure to discern. As Gibson (2008) details, in Dene culture spiritual significance is placed in rocks, land, animals, and water. To move a rock is to disrupt its’ spirit. To harm a few animals, or diminish the health of even a single animal, is significant. It jeopardizes the agreement between the animal and the community (Gibson 2008, Nadasdy 2003). Calculations on acceptable limits or practices are just that – calculations. The consideration of waste management uses compartmentalized applied sciences and does not consider social and cultural integration of information (Nadasdy 2003). Thus, the understanding of best practices in mine waste management often is not in cultural-scientific harmony. Typical resource management decisions do not consider community knowledge as legitimate (Quigley et al. 2000). The values placed in strategies to manage waste do not align.

The evolving nature of values, with age and over time, was also discussed. The formation of values depends on what you know and what you need. This changes with age as you learn more about the world around you, and with time as society and the world around you changes. A rock that is valued as a flint to start a fire may not be as valuable today with the access to matches. A diamond may not have had much value to people of the past, however; today it is a source of employment. Thus, the values held by individuals and groups should be considered in tandem with the value assigned to specific goods or functions (Satterfield et al. 2000). Values used for decision-making purposes must be revisited often (McDaniels 2000).

Values in this region are often linked to stories, culture, and needs. Sharing perspectives and learning about each other’s values builds the trust and understanding required to make fair decisions and improves the ability to assimilate knowledge. One participant stated that it is important to understand why different people make different decisions or why they do not see the world with the same eyes. They went on to say, “When each other’s values are understood we begin to understand the same language – we might not be able to speak the same language, but at least we can understand each
other”. This is essential for knowledge discernment and assimilation, and for productive decision-making.

Knowledge and understanding is essential to moving forward and working together – recognizing the role that values play is the path. In the past this type of understanding and communication did not exist. “People lied about the value of these rocks to get rich”, said one participant. The people shared stories of asking miners about the rocks – about the monetary value or the safety of the rocks – and being lied to and taken advantage of. The concept of distrust, and how this relates to a reluctance to share information, is expanded on in the following section.

7.6 Not Sharing Everything

This is a lot of information, it is not easily digested, and it is not easy to return knowledge back to you. We know of good minerals and rocks, but we cannot share all this information at this time. We will only share facts, if we don’t see it with our own eyes, we won’t say it. We travel from Whatti to Wrigley for beaver hunting in the spring. Along one of the portages we found some rocks and put them into the fire. These rocks crackled and burned completely. They are dark rocks, and they made blue flames that burned into nothing. You could carve the rock with a knife; it was very soft. When you hit them together they made a spark and you could smell the fumes. I think exploration will happen there, they will find something valuable there. But what I want to know is, what kind of rock is that? I’ve seen it with my own eyes, it’s not a story. Maybe I need to know about this rock.”

- Jimmy Rabesca, Elder (March 2009)

This cultural system has defined who is considered a legitimate teacher, the required experience of the teacher, and appropriate methods of teaching (as previously discussed); these are each relevant to the reasons for not sharing information. A respect for this system is important. Rushforth (1992) confirms this mode of legitimizing secondary knowledge passed on through stories by a storyteller that has primary experiential knowledge. A person will not talk about something that they have not experienced, and they will discount the knowledge someone claims to have if that person has not experienced that knowledge first hand. The protection of knowledge, or the desire to have the right person share knowledge in the right place and at the right time was made apparent.

Despite all of the success with respect to earning trust and sharing knowledge, there were times when participants were reluctant to share information with me (and
presumably others in the room). This reluctance stems from a history of exploitation and
conformity to a traditional procedure for sharing knowledge. It may also reflect a feeling
of embarrassment that participants had if they didn’t know, or appeared not to know, in
front of other community members or in front of me.

Participants claimed at some points that they wanted to contribute knowledge but
had difficulty doing so at that time. They claimed that they needed to be there on the land
to explain concepts, to show the knowledge rather than talk about it (agreeing with claims
argued by Rushforth (1992)). In some instances they felt they were not the right person to
share the knowledge or they weren’t in the right place to share the knowledge. One Elder
stated that he was reluctant to share information unless he was absolutely certain about
what he was about to share – and claimed he was unable to say what he wanted to at that
time for this reason. Another Elder claimed that there is a lack of confidence that has
“creeped into the community” with this new set of skills and knowledge that is not
familiar to them. He said, “We need to trust ourselves, and learn to trust each other”
when talking about the knowledge we each host. There was also evidence that
participants were concerned about what others would think of them, or of the appearance
of being unknowledgeable.

The transfer of knowledge is also very visual in this culture – there was some
reluctance or inability to articulate knowledge without the visual props or landscape or a
sense that this type of visual representation of topics was wrong. For example, when
talking about the properties of kettle lakes formed by glaciers one participant explained
that they never knew why these lakes were so deep. Instead of referencing glaciers, they
traditionally describe the properties (such as depth) of the lakes based on the water’s
colour. This is not a *wrong* way to express the depth of a lake – and it was important to
recognize the various ways to express information and the importance in having
confidence in the knowledge we each hold.

In some instances there was a desire to keep knowledge close, and to purposely
not share information. This disinclination was verbalized and the reasons were made
clear. It was almost exclusively the Elders who kept some knowledge back – purposefully
not sharing details about rocks and places. They stated that in the past they had described
and shown various rocks to outsiders – namely explorers, who then profited from these
They expressed that not all knowledge is for everyone. A history of mistrust in this region created fear of how information might be used. The Elders clearly remember accounts of the first explorers in the region. The term *kwetiji* is used to describe the “not too friendly” secretive people who wandered the land hammering at the rocks. Early explorers exploited traditional trails and local resources. They habitually abandoned their stations when they were done, leaving a trail of contaminated sites (Gibson and Zoe 2009). They also shared stories about their experiences at Rayrock mine – when the miners and government did not tell them about the danger of the Uranium mined there. This sentiment is not uncommon in Canada’s aboriginal populations – particularly for the older generations. Gerwing and McDaniels (2006) share similar findings of mistrust in British Columbia First Nations communities interacting with governments and industry. First Nations participants from their study stated that every time they begin to trust the government they are disappointed, and failures from past ventures make them reluctant to negotiate with governments and industry.

Additional accounts were told about people who had taken their traditional stories and published them for personal profit – claiming to host “traditional knowledge”. Again, as Rushforth (1992) states, this knowledge is discounted unless told by the person who has experienced it. Numerous stories were told about racism that still exists in the mines, and their uneasiness towards the industry as a whole. The participants were very polite and tactful in explaining their lack of trust – particularly in me. They meant no offense and repeatedly stated that although they felt they trusted me, time is required to watch and see if people’s actions follow their words. One Elder stated that he was “scared” to share too much information.

During a break at one of the training sessions I received a note that read:

Rebecca, I have a question. Do these rocks act as a recycle, e.g. what goes onto the land goes to the middle of the earth, then becomes lava, then with the eruption it resurfaces? Is that the reaction? Your baffled buddy

- identity protected (December 2008)

This inconspicuous form of asking for information shows signs of embarrassment or shyness when asking for help. Information may not have been shared if people were embarrassed to make mistakes, or reveal that they were unknowledgeable.
Building a trust that has been weakened over the course of history takes time. Understanding who should be involved in training sessions, defining the knowledge keepers and the acceptable knowledge receivers needs to be considered. The place to share knowledge is important. Developing relationships through true reciprocity (where everybody has the opportunity to share their authority and learn from other’s) could arguably diminish a sense of embarrassment or pride. True reciprocal intentions to share knowledge are not based on vested interests or the manipulation of information. The importance of unconditional shared knowledge is described in the following section.

7.7 Unconditionally Sharing Information

We have never seen this in the past – somebody coming to talk to us about this, to let us look at these stones. I am very happy that you came to visit us. I am personally very pleased. I’m sure the others feel the same way. You helped bring us strength.

– Louie Wedawin, Elder (March 2009)

If you educate us, we will educate you too. If you make a presentation I will listen to you, but if we work together our work will be stronger. We hear a lot of information but we don’t always understand it.

– Joe Rabesca, Elder (March 2009)

This research unveiled the concept of unconditional shared information for these participants. This refers to the education experience that happened without an immediate decision that needed to be made, or a task that had to be completed. Everybody contributed to the learning process, everybody acted as “teacher”, and everybody assimilated some form of knowledge and understanding. Unconditional shared information can be defined as the pooling of knowledge, experience, and ability for a purpose unique to each person. Objectives to include education to promote general learning over time should be raised with every resource management decision (McDaniels 2000). The participants repeatedly claimed that they had never received training like this before and that nobody talked about these concepts – from the beginning – in past education forums. Topics do not typically consider information that is important or useful to the community. One Elder stated, “all this information – we can use it”.

The sessions were intentionally designed with enough flexibility to move discussions in the direction of the participant’s interests (using methods presented by Chouinard and Veiga 2008), starting from the beginning. People asked questions and
shared knowledge about tools that they were interested in and could apply to situations of interest to them. For example, people wanted to know about contamination that could occur in the different layers of the earth from mining so that they would be able to ask mining companies appropriate questions. They wanted to learn and understand the terminology related to geology, mining, and contamination so they could communicate efficiently with mining companies and governments. They wanted to know if contamination from rocks could happen naturally, and turned to the Elders in the room to share historical accounts of sickness or toxicity from fish or water that occurred before the mines were present in the region. The significance was that they could choose what information to discuss, and were in control of how the discussions progressed (Freire 1968). This format of sharing information is very much in line with their cultural norm to share all resources to make the whole stronger (e.g. Helm 2000, Nadasdy 2003, Rushforth 1992).

Participants verbalized that this type of training, delivered by an independent party, was better received because the information was not manipulated for an immediate action or decision that was required or requested from them. The groups agreed that receiving this type of training from mining companies would not be appropriate because of a lack of trust that stems from their experienced past with miners (noted above). They even stated that receiving this type of training from their own governmental representatives would be less effective because of the risk of receiving – even unintentionally – manipulated information.

Typical education scenarios that do occur do not necessarily respect this spirit of sharing. In the example of a typical training session presented earlier, the training was being given to a specific group of people, to use the information in a specific way, and at a specific time (two weeks after the training). This exemplifies the “hidden agendas” that are often associated with education opportunities, and the exclusion to information to “all”. This education session differed because access to the information was extended to everybody, the participants were involved in what was taught and how, the education was not delivered with an impending decision or action required from the participants, and the teachers of the session were not from industry or government but rather everyone (including government workers, Tłı̨chǫ citizens, Elders, and me). All of these
observations support the philosophies espoused in the research design. The personality and conduct of an educator from outside the community is also important – as discussed in chapter five.

7.8 Chapter Summary

All of the themes presented in this chapter are related; they overlap and repeat themselves. For example, confronting the trouble with dualism when engaging in different systems of learning must consider differing sets of values, teachers, and belief systems. It also must consider a history of mistrust and motives for teaching. It is difficult to compartmentalize each of these important themes into their own categories without considering how all of these themes behave together to understand why knowledge is assimilated. Experience on how each of these themes affected the assimilation of knowledge in this case study was attained through this inquiry and is supported by the literature. The process of unveiling these themes was facilitated by the theoretical approaches used and the methodologies applied.

The main conclusions are that the assimilation of knowledge - or becoming powerful by proof of ability – is achieved by experiencing knowledge firsthand. Knowledge must be useful and it must be expressed in a manner (place and method) that is culturally significant. Methods to relate objects of learning to the participants (i.e. the ability of the participants to reference objects of learning) should be employed. Consideration must be paid to the difficulty of espousing different belief systems in a short amount of time. Respecting everyone’s beliefs and perceptions, and trying to understand the source of these beliefs and perceptions is more important than housing the same beliefs. The teaching authority should shift between participants – where everyone has the opportunity to share their expertise or primary knowledge. Respected teachers are those who have primary knowledge. It is important to identify the different values that people have in order to understand one another. History is also important; reasons for mistrust, not believing, and not sharing must be addressed with the recognition that it takes time to create new realities and build trust. Equal access for everybody to everybody’s knowledge is a principle that should be encouraged. Knowledge should be shared with the spirit of reciprocity (without hidden agendas or vested interests) and trust
(by identifying and respecting each other’s values, truths, and belief systems). All of the theories that guided this research support these claims.
8 CONCLUSION

8.1 Introduction

This research set out to address an issue that exists between the mining sector and civil society - conflicts that arise because of the unknown. This issue was considered from the perspective of civil society, and more specifically, from the perspective of the Tłı̨chǫ community in the Wek'eezhìı region of the Northwest Territories. To address this issue, strategies to promote learning were investigated. The specific research question considered in this research was: *how should education programs be designed for communities and their resource managers in a meaningful way to improve technical knowledge and understanding of the mining industry?*

The research was designed using a combination of theories, approaches, and methods to gather data and make interpretations. Influential theories and approaches included humanistic-participatory education, value-focus-thinking, complexity theory of education, Innovativedemonstrations, and culturally based education. The methods applied involved mixed-method data collection for a case study and action-reflection cycles. Conclusions were based on the integration of interview, observation, and survey data; the limitations of these data sources have been acknowledged and are presented in chapter three.

This design enriched the educational experience for both the participants of the study and the researcher. This strategy took the learning to novel places (e.g. the caribou hunt), identified key people who facilitated action and contributed to the knowledge pool (e.g. the Honorable John B. Zoe and Elder Harry Apples), and uncovered important unexpected topics and themes (e.g. their hereditary connection with the ice-free corridor during the last glaciation period, the dualism challenge with the introduction of a new type of knowledge and system of learning). The educational approach allowed for important discussions, lessons, themes, and relationships to be explored and developed in a manner that was meaningful and useful to the participants.

The solicitation and use of various data sources brought forth sets of findings that were in agreement with each other. Concrete suggestions and opinions were collected from verbal feedback. Observations provided subjective proof of “success” and led to the
formation of important themes. The survey data alone did not add anything significant to the inquiry because this communication instrument/design was not appropriate in this case. However, the activity provided information on the data collection method itself. Using this method to collect personal data in this case jeopardized the relationships that were being constructed. Perhaps by modifying the design and implementation of the survey – namely by including the community in both its design and implementation – would have produced better results.

The various tools and activities in the program, along with the action-feedback cycle, led to improvements in how the program was executed, and what was communicated. Advice on how to replicate a successful educational program was gleaned. The inquiry methods and approach facilitated heightened knowledge and understanding that surpassed, according to the participants, previous education experiences. Participants were able to recall and define complicated scientific terms; they incorporated this new vocabulary and knowledge into opinions and stories that were shared. They used this new knowledge to explain things they have seen on the land, or to ask new questions. They displayed signs that this knowledge was acquired, understood, and could be applied in their lives. Deep evaluations of the participant’s feedback and observations provided insight on why assimilation of information occurred or failed to occur.

This final chapter of this thesis presents the key research findings that satisfy the research objectives. Final conclusions are made regarding the research question. Recommendations on how these findings can be used or built upon are presented. The lasting impression this research has achieved is discussed. Final thoughts that capture the spirit of the work conducted bring the thesis to a close.

8.2 Key Findings and Conclusions

8.2.1 The Research Objectives

The three specific objectives of this research were:

1) To provide direction on replicating the development of successful mine-education programs,
2) To evaluate the success of a process used to develop an educational program related to mining for one case-study, and;

3) To gain insights on how learning happened or failed to happen for one case-study.

General directions and suggestions for the development of similar education programs were obtained upon reflection of the inquiry to satisfy objective one. Key lessons that were learned and should be considered for future program development include:

- Incorporate culture and values in education programs,
- Know the participants and be known to them,
- Teach concepts in the same or similar manner that they teach each other,
- Show information when possible - do not simply tell facts,
- Relate education to local realities,
- Break down the teacher-student barriers,
- Build educational programs with the intended learners,
- Take the education programs to the intended learners,
- Create credible alliances,
- Determine who in the community wants to know (or needs to know) what,
- Know where to start and how to move forward (do not assume people have the background knowledge),
- Repetition is important,
- Personality counts, and;
- Plan the logistics well in advance.

These directives are detailed in chapter five. The process used to derive these directives can be replicated to produce successful results.

Evidence of acquired knowledge, understanding, and ability were considered to evaluate the success of the educational process. Findings were used to satisfy objective two of this research and are detailed in chapter six of this thesis. In summary, the participant’s displayed the ability to define, identify, differentiate, and recall concepts and items as proof of acquired knowledge. They were able to translate, interpret, and extrapolate knowledge – all signs of acquired understanding. Evidence that knowledge and understanding could be applied to real life situations surfaced in the form of proof
that the program was useful, meaningful, and effective. Convincing proof that mastery of
topics was attained – a true sign of ability – takes time and was not observed or expected.
Based on the evidence of acquired knowledge, understanding, and the surfacing of
ability; the research design that led to the educational products and process was
considered a success.

The third objective was satisfied through rich descriptions of predominant themes
that emerged throughout the study that helped develop understanding of how learning
happened or did not happen in this case. Interpretations of participant feedback and
observations revealed the following key themes on learning:

- Learning happens when “learners” can reference the object of learning to a direct
  person, place, thing, or experience,
- Learning may be inhibited when concepts of learning conflict with established
  systems of belief - time is required to recreate truths and combine realities,
- Learning happens when information comes from a respected teacher – namely,
  one who has primary knowledge,
- Learning may be inhibited if values are not identified, respected, and related to,
- Learning happens when there is trust and relationships built on reciprocity - past
  histories of abuse may inhibit learning, and;
- Learning happens when information is shared based on the learner’s interests not
  on vested interests of others (e.g. governments and mining companies).

8.2.2 The Research Question

The research question asked:

_How should education programs be designed for communities and their resource
managers to improve technical knowledge and understanding of the mining industry?_

Based on acquired knowledge and understanding that emerged during the study,
the research question should be re-situated to consider “the bigger picture”. Consider a
research question that respects the emphasis this research placed on holistic approaches,
the importance of experience to learning, and the necessity of cultural considerations to
learning. Upon such reflection, the _better_ research question that should have been asked,
and the question that was essentially answered is:
How should mining education programs be designed for communities and their resource managers to experience knowledge and understanding of their surrounding environment?

The emphasis from the word *technical* is removed, and the context of the *mining industry* is expanded on. The idea of *improving* knowledge and understanding is changed to an idea of *experiencing* knowledge and understanding.

First off, assumptions associated with the words “technical” or “scientific knowledge” must be critiqued. The assumption that Euro-Canadian descendents educated in formal schools house technical or scientific knowledge and that Dene peoples educated on the land house “traditional knowledge” is biased and, as some argue, wrong (e.g. Nadasdy 2003, Malinowski 1954). Malinowski (1954) argues that everybody has “scientific knowledge” that is based on a body of empirical evidence. This type of knowledge is required for survival. He goes on to argue that all people subscribe to non-rational beliefs that are not supported by empirical evidence. Dichotomizing knowledge types as technical (Euro-Canadian) or non-technical (Dene) allows people to discount opinions and activities that go against their preconceived ideas of what “traditional knowledge” is and how it can be used (Nadasdy 2003). It does not recognize the empirical knowledge that Dene people have.

The community participant’s outlook, evidenced through questions, opinions, and stories exemplifies a holistic worldview. All knowledge is important and relevant, not solely technical scientific knowledge. The interactions of all environmental processes are what count – the mining industry contributes to this interaction. When the emphasis is placed on the “surrounding environment”, technical knowledge and mine specific topics inevitably unfold as important issues – and the space to know and understand other factors of importance are more likely to emerge. All of the factors that impact values should be available to know and understand, their interactions and connections should be considered, and the complexity of the system should naturally unfold in a successful education program (Davis et al. 2008). Everybody embodies knowledge, and everybody’s knowledge is important.

The act of improving knowledge suggests that knowledge is an object or thing that can be modified. Dene people, as evidenced by Rushforth (1992), Nadasdy (2003),
and Helm (2000), view knowledge as a character trait a person embodies. It is acquired through experiencing a phenomenon, it gives an individual power, and this power is evidenced by their productive success (Rushforth 1992). Immersion into a culture is important to understanding what knowledge means to them, what information is significant, who embodies knowledge, and how knowledge can be shared. The lessons emerge through a process of dialogue and interaction – based on the establishment of an agreement marked by relationships of reciprocity (Gibson 2008). In this case, the sharing of knowledge can be improved by situating knowledge as experience.

In summary, the combination of all of the theories, approaches, methods, activities, reflections, and analyses utilized in this inquiry has led to the following four key findings.

1) Knowledge and understanding are effectively acquired by situating information as primary experiences or through oral accounts by persons who have experienced.

2) The objects of learning for education programs must be valuable, useful, and meaningful to the intended learners. Each individual must be given the autonomy to decide what topics or concepts are appropriate for them, and thus, choice and flexibility must be built into the programs. The “I am going to teach you…” approach to education is less superior than a humble humanistic approach to education.

3) The process to develop programs should involve cycles of action and reflection, input from the intended learners, and repetition.

4) Assimilation of information occurs through the experience of knowledge that is presented in culturally based frames informed by particular stories, experiences, teachers, places, values, histories, and materials.

The spirit of what this means in terms of working together to build a learning experience was captured by one of the participants who said:

What counts is when we come from our heart, speak our own truths, and build trust. This is the foundation of any successful training program.

- Joyce Rabesca, WLWB (April 2008)
8.3 Key Research Recommendations

The findings communicated in this thesis are specifically based on the people and events that were involved in the research. The experience in this case may not transfer to other cases, or even with different participants from the region. Other researchers may not experience the same outcomes. There will be different factors to consider in different places, with different participants, and with different educators. This approach worked for me under this circumstance, which is unique. It is difficult to measure the degree that my personal strengths and weakness, and experiences affected the outcomes. Many of the natural abilities of a good educator cannot be taught or faked. Intentions must be genuine.

One of the greatest limitations of the course content and delivery was that it was not enough; there is so much more learning and sharing that should take place. It was acknowledged that all of the topics would not be fully understood in such a short time. This is to be expected – and has not been interpreted to mean failure. Rather, this feedback should be used to improve educational programs into the future. One participant stated:

Two days isn’t enough – we need to know more. It’s difficult to learn these things. I am unable to read a single letter, everything I know is in my head, all my knowledge and thoughts are in my mind. You showed us these things – and gave us these papers (referring to the periodic table) and now we can start to understand what is on these papers.

– Jimmy Rabesca, Elder (March 2009)

It must be noted that this research comes on the heels of a history of oppression and deception from foreigners. Accounts of indigenous people as the early explorers are preserved (e.g. Gibson and Zoe 2009). The relationship that developed between indigenous people and kwetiji (unfriendly mineral explorers) in the past was tarnished by deception and greed. Skepticism in sharing, trusting, and building knowledge together – across cultural barriers – still exists (as discussed in chapter seven). This limited the degree of trust and sharing that occurred - both important aspects to acquiring knowledge and understanding.

These limitations should be considered and built upon to improve the mining – community conflict; and specifically related to this research, the issue of education. Future recommendations that build on this work are separated as scholarly recommendations, and practical recommendations.
8.3.1 Scholarly Recommendations

Academic contributions from this research offer confirmation and supplementary data on successful approaches on alternative community educational programs. This research also highlighted the value of interdisciplinary research and holistic research designs. Recommendations on appropriate data collection methods have also been made.

This research complemented the works of educators and researchers such as Freire (1995) and Hodgkins (2008). Findings can more specifically be applied to conclusions about successful Tlııcho educational programs and knowledge assimilation, adding to the work done by Gibson (2008), Rushforth (1992), Nadasdy (2003), and Helm (2000).

Moving beyond the study of education, the approach of this research highlighted the value of interdisciplinary research. Combining research methods, and drawing expertise from various disciplines broadened the possibilities of the program, and as a result, amplified the possibility of diverse results. Resources were sought to address the technical mining component of the inquiry, but expertise was also sought from innovative educational researchers (e.g. Davis et al 2008, Veiga et al 2007), experts on value solicitation (e.g. Keeney 1982, McDaniels and Trousdale 1999), authorities on Tlııcho culture and values (e.g. Gibson 2008, Gibson and Zoe 2009, Helm 2000, Rushforth 1992), and from the professors of the Tlııcho land and people – the Tlııcho Elders. Adapting a holistic approach to this type of research, utilizing pragmatic methods, and respecting the complexities of systems increases the potential for emerging possibilities. Friere’s strength in adult education of the oppressed was to show humility and well-crafted articulation. He advocated the need for educators to create their own knowledge, to combine social reality and concrete experiences, to acknowledge that “the more theoretical you are, the more practical you are” (Findsen 1999). This research strongly supported this notion of human autonomy in learning, and rejected the traditional “I am going to teach you…” approach that is common in most education programs experienced by the participants.

Finally, data collection methods must be appropriate to the study in question. For this case, using surveys to collect data was inappropriate and could have jeopardized
relationships. Data collection methods should model the preferred methods of communication of the participant’s involved in the research.

8.3.2 Practical Recommendations

Future recommendations described in this section are based on feedback from the research participants. Applications of these findings are considered in a mining context, and in a governmental context.

Future recommendations for the session were to take the course on the land, to do the course again in all of the communities involving some of the same participants, to have community level meetings where local Tlitcho mine workers share their knowledge, and to focus more on the specific mines. Participants suggested creating cartoon booklets specific for each mine and to spend more time talking about specific cases. A list of other topics of interest to the participants of the research for future education programs were tracked and are listed below:

- Toxicity Lesson: to learn about harmful rocks, contaminants, routes, mechanisms, and effects of toxicity
- Identifying Toxins: to learn how to identify harmful rocks or substances
- Connect with Younger Generation: to discuss what the younger generation is learning about, assess the strength of the tools in their tool kits, and identify what is missing
- Natural History of Contamination: to learn more about how the environment has changed and evidence of contamination that Elders have witnessed
- Other Topics: to learn more about wildlife management plans, climate change, water, fish, land, legal processes, the political regime, economics, Traditional Knowledge (particularly for science staff), and regulatory process and terminology

It was communicated that receiving education from mining companies and governments would have limited success based on the bias or perceived bias that would be embedded in the delivery. The word receiving is emphasized to highlight the point that education programs must aim to create an experience, rather than deliver knowledge as an object. Representatives from mining and government should participate in education
situations – but they should not lead these sessions. The personality and character of an “outsider educator” – someone not from the community – is important. Government and mining industry representatives should consider the “lessons learned” and the process presented in this thesis when engaging in education situations with communities.

An additional recommendation is for governments and mining companies to consider how the themes presented in this thesis relate to resource management decisions. The section on dualism for example describes the difficulty in integrating different knowledge and belief systems. Integrating these epistemologies for action is not merely a technical problem. It must extend to consider how information is gathered, analyzed, and used to make decisions (Nadasdy 2003). It involves how knowledge is framed. It involves defining what knowledge is and how beliefs are justified (see Rushforth 1992). It is strongly linked to earning trust and developing relationships.

Permanency plans for educational programs must be devised to ensure continuous successful learning. This type of education needs to be incorporated into regular schedules. People suggested hosting short education sessions every two or three weeks. Avenues for formalized permanency in educational programs included policies, guidelines, Board Forum meetings, and Impact Benefit Agreements (IBAs). Methods and approaches for conducting educational programs, based on lessons learned in this research, should be included as directives in these instruments.

Friere (1968) argues that awareness and empowerment of the oppressed should not be seen as a threat to those in power. Rather, empowerment via education presents the opportunity for everyone to be better. Governments and mining representatives must recognize the importance of human autonomy not only because it is “the right thing to do”, but also because it leads to the awareness required for communities, governments, and mining industries to work together effectively. One of the participants enforced this desire to regain the power needed to make things better.

Listening to the Elders reminds me of my upbringing – where I come from. A history of hard workers. Something happened since then. We have been weakened by the new government system. The government said – don’t do anything, we will do it for you and we will give you pay cheques. But our history is of strength – we have been weakened, but we have the strength to be strong again. To roll up our sleeves and get to work.

– Alfonz Nitsiza, WRRB (April 2008)


8.4 Evidence of Lasting Program Success

The findings of this research have contributed to the practical and theoretical applications of successful educational programs. Indications that the program, as a whole, was a success have surfaced in the form of: the lasting impressions of the sessions on participants, the residual reputation of the sessions, a commitment to adapt some of the methodologies and recommendations by the Boards, and the residual relationships that have been developed.

Since the educational programs have ended, the sessions have been discussed and promoted by the participants. Community members who did not take the course have approached me on the street. They say that they have heard good things about the course. Strangers have approached me, calling me the “rock doctor”, asking questions about rocks in their neighbourhoods. This displays signs that the course was reputable, and that I am a valid source for information on rocks and mining.

I have been approached by the WLWB following the research to continue my work by developing educational strategies for the Boards, and to continue the course in the other communities. Resource managers have been organizing routine Board forums to discuss topics for investigation, and strategies to develop regular education programs to address knowledge gaps. This shows a commitment to continue the work that was done together as a team.

The relationships that developed during the course of the research provide proof of the genuine respect, trust, and inspiration that unfolded. Almost every single participant of the education sessions approached me following the research to shake my hand, thank me, and depart by saying, “goodbye my friend”. I was invited on the WLWB’s next retreat, a canoe excursion between communities. Real friendships have developed – a lasting result of a positive experience for the participants, and for myself. Honest attempts to be interested cannot be faked. Personality counts.

8.5 Afterword

Upon reflection of the last two and a half years of work devoted to communities and education I realize how much I have learned. I have witnessed and participated in the
challenges of cross-cultural communication. I have seen with new eyes. I have attempted
to understand multiple perspectives and perceptions. I have given in to the notion of
multiple realities and truths. Defining educational strategies as a means to a conceptual
idea of a learned ends cannot be absolute – nor should it be. Process is key – a process
that flexes to accommodate the people, places, and things encountered along the path to
discernment. The process will be complex and must grab hold of the systems deepest
roots – the values of the people. It is not a solo mission; the process requires the unique
tools that each individual in the group’s whole bears. To quote a respected community
leader, my friend Alfonz Nitsiza, “we need everybody’s knowledge….“.
BIBLIOGRAPHY


Appendix A: The Interview Template

Yellowknife Pre-Scoping Session Interview Questions Template

Introduction

Interviews will be conducted to gather qualitative descriptions (based on the interpretations and perspectives of the interviewees) of the top issues and areas of training needs related to mine planning and resource management.

The feedback from these interviews will help structure the content and organization of the planned Needs Assessment & Value Workshop scheduled to take place between March 31 and April 3, 2008. The goal of the workshop is to define key knowledge gaps and training needs with respect to knowledge transfer strategies for communities and resource managers involved in mine planning processes.

The interviews will follow a semi-structured approach, with a sequence of themed questions that will be open for exploration or expansion if triggered by the responses. Questions will be thematic and dynamic, short and easy to understand, and will emphasize what and how the interviewee has experienced the subject of discussion.

The Interview Situation

Interviews will take place from March 26-28, 2008 with four participants. Interviews will take place over the phone and in person, and will be recorded if permission is granted by the interviewee to do so.

Informed consent to conduct the interview and use the findings for the purposes of the workshop and beyond will be sought. The context of the interview will be described to the interviewee at the onset, and a debriefing of how the opinions and experiences obtained will be used will be reiterated following the interview. Each interviewee will be informed of the estimated time that the interview will take - about 45 minutes.

Confidentiality of the opinions obtained will also be discussed at the onset of the interview. The interviewee will be asked what level of disclosure they feel comfortable with; whether their names, titles, experiences, quotes, etc. can be disclosed for use in the workshop and/or in any follow-up reports or research papers.

The interview will commence with the following introduction: Thank you for your willingness to participate in this interview. [Briefly introduce my credentials and background]. I am interested in researching training needs and effective methods to transfer technical mine-related information to personnel (resource managers and communities) involved in mine planning processes in a manner that is useful and meaningful to them.
The interview will end by mentioning some of the main points learned from the interview and asking the interviewee if they have anything they would like to clarify or add.

Research Questions and Interview Questions

<table>
<thead>
<tr>
<th>Research Questions</th>
<th>Interview Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>What are the top areas of training needs for community members and resource managers involved in mine planning processes? (ie. knowledge gaps)</td>
<td>I would like to start off by asking you to share some information about your current position [state title/affiliation]. Can you please give me a summary of the activities you are involved in or the role you play with respect to mining/resource management? (summary of duties)</td>
</tr>
<tr>
<td>Key training needs</td>
<td>Can you describe for me some of the details of the work you conducted for a specific mine project/proposal that sticks out in your memory? [Or the details of how you were affected?]</td>
</tr>
<tr>
<td></td>
<td>What specifically is/was expected of you in your role as a [duty title]? Who are/were you accountable to, or whom do/did you feel accountable to?</td>
</tr>
<tr>
<td></td>
<td>Do you remember how you felt when you were faced with these expectations? Were you equipped/confident to fulfill these expectations? In general, how confident do you feel with your current responsibilities?</td>
</tr>
<tr>
<td></td>
<td>What skills or knowledge would (have) help(ed) you fulfill these expectations or make/made you feel more confident in conducting your work?</td>
</tr>
<tr>
<td></td>
<td>Why is your job important? What are some of the most important aspects of your job? Why is that important? Who is that important to? (How do you make a difference in the communities that you represent?)</td>
</tr>
<tr>
<td>What are the key issues of importance to resource managers or community members involved in mine planning procedures?</td>
<td>How would you describe the cultural fabric of the community/region that you represent; what are some of the key values that community members hold? Are there other areas of importance/significance (people, places, animals, lifestyles, etc.) that you can think of?</td>
</tr>
<tr>
<td><strong>Research Questions</strong></td>
<td><strong>Interview Questions</strong></td>
</tr>
<tr>
<td>------------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>Key community values</td>
<td>In terms of the community’s future, what do you perceive to be some of the main objectives of the community? [eg. preserve current state, develop economic/infrastructure, development with considerations, etc.] Do you believe there to be a large discrepancy within the community on future objectives, or is the community relatively unanimous? What has been your experience to date with the mining industry? How do you perceive the mining industry in your region? What are some of your main concerns with respect to the industry? Key benefits and drawbacks?</td>
</tr>
<tr>
<td>Key community fears</td>
<td>Earlier you mentioned some of your concerns with respect to the mining industry. Are all of these concerns being addressed through defined resource management procedures, or are there any gaps or areas where more attention is required to safeguard the things held important to you and the community you represent? There is a balance to be reached between communities, mines, and resource managers – considering the community values, what does success look like? What does failure look like? How bad is bad – what is the worst-case scenario in your opinion? What fears do you have with respect to carrying out your duties as a [position title]?</td>
</tr>
<tr>
<td>What modes or formats of training are most effective at transferring knowledge and skills?</td>
<td>Have you received any on-the-job training related to your work duties? What training experience sticks out in your mind? Why does this particular experience stick out in your mind? What made it more memorable than other learning/training experiences? Can you recall another learning/training experience that had the opposite effect (good or bad)? Why was this experience good/bad?</td>
</tr>
<tr>
<td>Research Questions</td>
<td>Interview Questions</td>
</tr>
<tr>
<td>---------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>What other training would you like to receive to help you in your work? What other training would be of interest to you? Can you describe how you would like this information to be transferred/taught (thinking about past experiences – what you would like to see more of or done differently)?</td>
<td>Do you provide any training or awareness programs to the community that you represent? Or do you discuss mining issues (other regulatory issues) with community members – or do they approach you for answers? If so, what types of issues arise in discussions? How is information communicated with community members? To what degree do they understand the types of issues that you deal with and the decisions that you make? If not, what would be the added value in engaging community members in a more pro-active manner, or is this done by some other means? How in-line are your personal/corporate values and fears with those of community members?</td>
</tr>
<tr>
<td>How connected are the resource managers/representatives to the community members?</td>
<td></td>
</tr>
</tbody>
</table>

121
Appendix B: The Acid Rock Drainage Cartoon Booklet

ARD Quest Production Notes

The ARD Quest cartoon booklet has been prepared by Dr. Marcello Veiga, Rebecca Chouinard, and Carlee Fritz of the University of British Columbia, Vancouver, Canada, 2008. The intent of the booklet is to provide some informal information pertaining to the topic of Acid Rock Drainage. The intended audience is students familiar with some basic chemistry principles. This booklet can be used to help drive discussions surrounding acid rock drainage reactions, the impacts of mining, and resource management strategies. We hope you enjoy the story and learn something about Acid Rock Drainage.
Right now I am doing very important work! I am inspecting the conditions of the water next to mines.

Look at the water coming out of this mine shaft. I am going to test how acidic the water is by using my pH meter.

Anything with a pH below 7 is considered to be acidic. When the pH of the water is below 6, there is cause for concern.

pH 3? This water is too acidic!

This water is going to end up in a river close by!

Oh! No!!

Somebody lives downstream!
Before you eat this fish, let's test it.

Hey! Give back my fish!

This fish may be contaminated.

Who do you think you are?

My name is Mr. Drill and I am an environmental robot!

This fish may have accumulated metals due to ARD.

What? ARD? What the blahblah is ARD?

ARD means Acid Rock Drainage. It is common in mines that have sulfide minerals in the rocks. Pyrite, or "fools gold" is an example of a sulfide mineral.
When water, air and bacteria get in contact with sulfides, ARD is produced!

Look under my microscope. These bacteria are the worst for creating ARD. They are called *Thiobacillus ferrooxidans*.

I can't eat my fish because of these little things?

These bacteria transform iron (II) to iron (III). This is called an oxidation reaction. The iron (III) breaks down the sulfides to create sulfuric acid. Under acidic conditions, metals are released from the rock.

Iron (II) + Bacteria $\rightarrow$ Iron (III) + Sulfides $\rightarrow$ Sulfuric Acid + rocks $\rightarrow$ Dissolved Metals

Let me analyze this fish!

UH???
This fish is a little high in mercury and lead... the other metals are below the guidelines

Oh NO! I am too young to die!

You are OK, but your wife should not eat many fish every day

These metals may affect the baby she is expecting.

What can we do to clean the river?

This cement will stop water from entering the mine.
This ditch will re-route all of the acidic drainage to this pool so it does not end up in the river.

Now I will add limestone to neutralize the drainage. This will remove the metals from the water.

Now I understand, no more drainage coming from the mine.

And no more acid drainage entering the river.

Why didn’t they think of this when they opened this mine?

At that time ARD was not well understood and people did not know about the effects.

Today mine operators must predict, prevent, and control ARD.
The first step is to predict whether ARD could occur. We take a look to see if the ARD ingredients are present.

Bacteria + Water + Sulfides + Air

Then, mine operators must prevent ARD from occurring by eliminating one or more of the ingredients. This is mainly done by stopping water or air from contacting the sulfides.

Water cover to prevent air...

Dry cover to prevent water...

If ARD is occurring, it must be controlled!

Adding limestone to neutralize the drainage

Well, thanks a lot for your help, can you join us for supper?

Sure, I am starving!
Test Your Knowledge

1. What does ARD stand for?

2. What does the pH measure?

3. What pH does acidic water have? What about basic water?

4. What are the ingredients for ARD?

5. Why are *Thiobacillus ferrooxidans* bacteria so bad?

6. Why should we be concerned if acid is produced, releasing metals into water systems?

7. What are some metals that are harmful to our health? Can you think of others?

8. How can you predict for ARD?

9. How can you prevent ARD from occurring?

10. How can you control ARD if it is occurring?
Appendix C: The Ore Exploration Booklet

A BEGINNERS GUIDE TO ORE EXPLORATION

2009 PRODUCTION NOTES

Rebecca Chouinard has prepared this guide booklet in consultation with representatives from the Wek’eezhii Land and Water Board (WLWB), the Wek’eezhii Renewable Resources Board (WRBB), and the TiiCho Government (TCG). It is part of a project that is investigating effective methods to transfer mining knowledge to communities involved in or affected by mining. This research is made possible by the generous commitments by the WLWB, WRBB, TCG, INAC, BC Government, NSERC, and the University of British Columbia (under the supervision of Dr. Marcello Veiga and Dr. Dirk van Zyl). Any questions or comments may be directed to Ms. Chouinard at bchouina@hotmail.com.
### GEOLOGISTS LOVE ROCKS

<table>
<thead>
<tr>
<th>They identify rocks</th>
<th>They determine how rocks form</th>
<th>They determine the age of rock formation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rocks are classified as being: <strong>Igneous</strong>, <strong>Sedimentary</strong>, or <strong>Metamorphic</strong> depending on how they form</td>
<td>This is a <strong>Sedimentary</strong> rock that formed in a marine environment</td>
<td>NWT has the oldest rock known on earth – it is 4.03 billion years old</td>
</tr>
</tbody>
</table>

**Granite is Igneous**

**SHALE**

**The Acasa Gneiss**

### GEOLOGISTS LOVE FINDING VALUABLE ROCKS

Rocks that have economic value are called **ORE**

- **Diamond**
- **Gold**
- **Silver**
- **KIMBERLITE ORE**
- **QUARTZ ORE**
- **GALENA ORE**

### ORE is transformed into products we use everyday.

<table>
<thead>
<tr>
<th>Gemstones</th>
<th>Electronics</th>
<th>Construction</th>
<th>Energy</th>
<th>Household Products</th>
<th>Transportation</th>
<th>Farming</th>
<th>Medicine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diamond</td>
<td>Zinc</td>
<td>Gravel</td>
<td>Coal</td>
<td>Sante</td>
<td>Copper</td>
<td>Calcite</td>
<td>Carbonate</td>
</tr>
<tr>
<td>Emerald</td>
<td>Cobalt</td>
<td>Limestone</td>
<td>Steel</td>
<td>Quartz</td>
<td>Aluminum</td>
<td>Apatite</td>
<td>Keolinite</td>
</tr>
</tbody>
</table>
There are a lot of rocks - Finding **ORE** in rocks is like finding a needle in a haystack

### STAGE 1: DESKTOP STUDY
The first step is to research your area of interest

<table>
<thead>
<tr>
<th>1) Study a map of your region</th>
<th>2) Study the rocks in the region</th>
<th>3) Study the minerals in these rocks</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Image of NWT Canada map]</td>
<td>[Image of various rock types]</td>
<td>[Image of various minerals]</td>
</tr>
</tbody>
</table>

4) **Study where glaciers existed and the direction they moved**

**Great Slave Lake Striations**

**DID YOU KNOW?**
As glaciers advance, they push rocks away from their origin. When glaciers melt away, they leave behind clues that help us determine the direction they moved. Glaciers scratch rocks along their path – these are called **Striations**. Geologists measure the direction of Striation marks and use them to trace back the location of valuable rocks. Glacial landforms also provide us with clues. **Eskers** run parallel to ice flow direction, **Moraines** run perpendicular to ice flow, and **Drumlins** are elongated in the direction of ice flow.
## STAGE 2: FLY CAMPS

Now you are ready to visit the land for the first time

<table>
<thead>
<tr>
<th>1) You need gear and a helicopter</th>
<th>2) Draw glacial land features onto your map from the air</th>
<th>3) Land and take a sample every ~10kms</th>
</tr>
</thead>
</table>

4) Sample Eskers, Moraines, and rivers; they collect material from a large area to increase your chances of finding ORE

These rocks are round because they have traveled far

Every few days you pack up your camp and fly to a new area - FLY CAMPS

- Sampling crews work in the summer
- Crews sleep, work, and eat in temporary tents
- Crews consist of about 10 people
### SAMPLING PROCEDURES

<table>
<thead>
<tr>
<th>1) Dig</th>
<th>2) Screen</th>
<th>3) Bag</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Image" /></td>
<td><img src="image2.png" alt="Image" /></td>
<td><img src="image3.png" alt="Image" /></td>
</tr>
<tr>
<td>Fill hole up afterwards so caribou don’t trip</td>
<td>1 inch mesh screen and describe the rocks that are too big</td>
<td>Fill 10-20 Litre sample bags with material</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4) Tag</th>
<th>5) Describe</th>
<th>4) Ship</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image4.png" alt="Image" /></td>
<td><img src="image5.png" alt="Image" /></td>
<td><img src="image6.png" alt="Image" /></td>
</tr>
<tr>
<td>Record the location (GPS) and describe the sample</td>
<td>Describe bedrock and measure the direction of Striation marks</td>
<td>Send hundreds of samples to the lab for analysis</td>
</tr>
</tbody>
</table>

**If an ORE clue is found, more detailed sampling will take place**

- ![Image](image7.png)
- ![Image](image8.png)
- ![Image](image9.png)

**Observation**

- Whoosh hoo! I found gold!

**Lab Results**

- Gold
- Pyrite

**Return to Site**
### STAGE 3: PRELIMINARY STAGE

You return to the region where clues were found

<table>
<thead>
<tr>
<th>You focus on a smaller area</th>
<th>1) Sample Till every ~100 Meters</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Till has not traveled far and has angular grains</td>
<td></td>
</tr>
<tr>
<td>2) Do geophysics surveys to learn what rocks are deep in the ground</td>
<td></td>
</tr>
<tr>
<td>3) Drill to collect rock core for analyses</td>
<td></td>
</tr>
<tr>
<td>4) Describe rock and send to lab for analysis</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Camps are more permanent</th>
<th>There are more people working</th>
<th>You explore in all seasons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Sleep/work in canvas/wood tents with stoves</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Camps have ~50-100 people</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Sample Till in summer Drill/Geophysics in winter</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Sample frost boils: freeze-thaw cycles push deep rocks to the earth's surface

Gravity & Magnetic surveys tell you about the rocks underground

Small diamond drills recover rock samples

Rock is extracted from the ground in cylinders called “rock core”
### STAGE 4: ADVANCED STAGE

You choose a target to drill for ORE based on your analyses

<table>
<thead>
<tr>
<th>You focus on a defined area</th>
<th>Your camps are larger</th>
</tr>
</thead>
<tbody>
<tr>
<td>McKay Lake Region</td>
<td>Snap Lake</td>
</tr>
</tbody>
</table>

**Collect 1 Tonne drill samples**

Large diameter drills grind rocks that are then collected for analyses in 1 tonne bags.

**Determine the Grade of the ORE**

The Ore Grade refers to the concentration of saleable material compared to the concentration of the surrounding rock.

Example: Diamond GRADE = carats / tonne of rock

1 carat = 200 mg

### STAGE 5: FEASIBILITY STAGE

You weigh the financial costs and benefits

1) Determine the value of your ORE

- a) Size of deposit
- b) Quality of ORE
  - Diamonds
    - Cut
    - Clarity
    - Carat
    - Colour

**Examples**

- 0.2 carats per tonne
  - a large diamond deposit
  - Kimberlite
  - Fort-a-la-Corne, SK

- 0.3 carats per tonne
  - a high quality diamond deposit
  - Victor, ON
2) Determine the cost and time required to build the mine

<table>
<thead>
<tr>
<th>a) Proximity to City Centers</th>
<th>Additional Mine Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>b) Community Acceptance</td>
<td>Reagents</td>
</tr>
<tr>
<td>c) Technology to Recover ORE</td>
<td>Equipment</td>
</tr>
<tr>
<td>d) Environmental Surroundings</td>
<td>Buildings</td>
</tr>
</tbody>
</table>

North > 1 carat/tonne

The ORE Grade must be high in the remote north to develop a mine due to the high expenses.

If the benefits outweigh the costs, you decide to build a mine...

... then the regulatory process begins

Whoohoooo

Remember – the regulatory process is expensive and time consuming and at this point you still haven’t produced or sold any ORE.

---

**DEFINITION OF TERMS**

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bedrock</td>
<td>Firm foundation/ground layer of unbroken solid rock</td>
</tr>
<tr>
<td>Carat</td>
<td>A unit of weight in gemstones equal to 200 milligrams</td>
</tr>
<tr>
<td>Drumlin</td>
<td>An elongated hill or ridge of material deposited by a glacier</td>
</tr>
<tr>
<td>Esker</td>
<td>A ridge of gravel and other sediment; deposited by meltwater from glaciers or ice sheets</td>
</tr>
<tr>
<td>Frost Boil</td>
<td>A circular uplift in soil caused by the freezing and thawing of moisture below ground</td>
</tr>
<tr>
<td>Moraine</td>
<td>An accumulation of boulders, stones, or other debris carried and deposited by a glacier</td>
</tr>
<tr>
<td>Ore</td>
<td>A mineral or rock that can be mined for profit</td>
</tr>
<tr>
<td>Ore Grade</td>
<td>A measure that describes the concentration of a valuable natural material in its surrounding ore</td>
</tr>
<tr>
<td>Striation Marks</td>
<td>Scratches or parallel grooves on the surface of a rock, resulting from a moving glacier</td>
</tr>
<tr>
<td>Till</td>
<td>Glacial material consisting of an unasserted mixture of clay, sand, gravel, and boulders</td>
</tr>
<tr>
<td>Tonne</td>
<td>A unit of 1000 kilograms</td>
</tr>
</tbody>
</table>
Appendix D: Participant Confidentiality and Ethics Approval

Key Individuals “Consent Form”
[Transferring Mine Knowledge: a Look at Complex-Value-Based Strategies in the Wek’eezhii Region of the Northwest Territories]

Principal Investigator:
Dr. Marcallo Veiga, Associate Professor
University of British Columbia, Norman B. Keevil Institute of Mining Engineering
Tel: (604) 822-4332

Co-Investigator(s):
Ms. Rebecca Chouinard, Graduate Student, Candidate for Masters of Applied Science
University of British Columbia, Norman B. Keevil Institute of Mining Engineering
Tel: (604) 725-4375

This research is in partial fulfillment of the requirements for the Masters of Applied Science Program. The findings of this research will be published as the thesis project for Ms. Rebecca Chouinard. It will be an accessible public document.

Sponsor:
The research is being funded by the following grants/scholarships offered to the investigators:
CGS-NSERC grant
Pacific Leaders Scholarship Award
Indian and Northern Affairs Canada Grant and Contribution Agreement
Wek’eezhii Land and Water Board logistical/honorarium support if required

Purpose:
Communities and resource managers in the Northwest Territories are responsible for making decisions related to mining development projects at the pre-mining stage (through the negotiation of Impact Benefit Agreements (IBAs), and participation in Environmental Assessments (EAs)), during mining operations (through regulatory reviews of required mine plans), and after mining operations (through the review of Closure and Reclamation Plans, and the participation in monitoring programs). They are typically unable to seek adequate advice from expert consultants and digest all of the information needed to make informed decisions and recommendations in the short time frames allocated. Many of the community members and resource staff lack knowledge and experience with respect to the potential impacts of mine development. Perceived expectations and ignorance of the negative effects that mining may bring to a community could result in the negotiation of unfair agreements, and/or the submittal of inadequate or uninformed recommendations. Effective mine knowledge transfer strategies are required to equip communities and their representatives to engage in negotiations and satisfactory resource management.
The objective of the research is to produce a paper that details effective methods to transfer technical mining knowledge to communities and their resource managers. A case-study knowledge transfer program will be designed and described. The approach taken, materials required, outcome, and lessons learned will be detailed. The findings of this research will be used to develop similar community training programs within the Wek’áezhíi region, and elsewhere.

You are being invited to take part in this research study because of your involvement and influence in mine resource management and decision-making on development projects in the Wek’áezhíi region of the Northwest Territories.

**Study Procedures:**
Information pertaining to your involvement of this study, should you choose to participate, are listed below:

- This study involves 6-10 key individuals (termed focus group) who will participate in interviews, filling out pre and post lesson tests, attending and providing feedback at trial-run workshops, and attending the knowledge-transfer workshop, and upwards of 50 individuals who will participate in the knowledge-transfer workshop.
- Key individuals will be asked to devote a total of approximately 55 hours of their time over the course of 4 months to this study.
- The other participants will be asked to devote a total of approximately 40 hours of their time over the course of 4 months to this study.
- Key individuals chosen for the interviews will work with the Wek’áezhíi Land and Water Board, the Wek’áezhíi Renewable and Resources Board, and/or the Tlicho Government Lands and Protection Unit and have close ties to the community members within the Wek’áezhíi region. Individuals will be identified by the organization Directors and will have to chance to decide if they want to participate.
- Participants of the knowledge-transfer program will include as many individuals as practical who are employed or involved in resource management and decision-making within the Wek’áezhíi region of the Northwest Territories.
- Two 2-hour interviews will take place with the key individuals; once before the knowledge-transfer workshop, and once after the knowledge-transfer workshop.
- The knowledge-transfer workshop will take a maximum of 40 hours over the course of 6 days. The trial-run workshops for key individuals will take an additional 10 hours over the course of 2 days.
- All interviews, tests, and workshops will take place during normal working hours. Participants will be paid for normal working days by their employers for their time. Employers will cover any expenses incurred by travel or honorariums.
- Participants will be asked for permission to tape-record conversations during interviews. If permission is granted, audiotapes will be stored by the researcher in a locked cabinet.
At the end of research period, they will either be destroyed using appropriate methods, or if requested by agency Directors, the data will be stored indefinitely for them.

- We encourage all participants to refrain from disclosing the contents of the discussion outside of the focus group (particularly for the key individuals); however, we cannot control what other participants do with the information discussed.

You are being invited to participate in this research as a "key individual" and as such, are being asked to devote a total of 55 hours of your time to this study.

**Potential Risks:**
This research could run the risk of stereotyping government resource managers, and potentially aboriginal government resource managers. The researchers will seek to describe the breadth of resource managers, the differences among them, and not hinge descriptions on ethnic lines or job titles. Interviews and workshop surveys will focus on the experiences and opinions of you, the participant, and not draw attention to your qualifications or proficiencies. All individual's names and titles will remain anonymous in the research report.

**Potential Benefits:**
By participating in this research as a "key individual" the opportunity exists to learn more about the object of learning (Acid Rock Drainage). The lessons will focus on mine-environment interactions, with guidance on how to use this knowledge to manage resources effectively. Furthermore, as a key participant, you will have the opportunity to help develop effective methods to receive, and transfer knowledge on to the communities you represent.

The findings of this research will be important and useful to communities, governments, and industries involved in mine development projects both in Canada and globally. The success and use of this knowledge transfer approach will foster fair decision-making opportunities related to benefit-sharing and environmental management with mining ventures. Furthermore, the active role that communities have in this educational approach, will lead to capacity building within the community for future endeavors. Lessons learned from this case study will be used to design improved mine-ecology education programs. The work will also create more awareness of the importance of iterative technical knowledge transfer and community involvement in mine planning. The communities specifically involved in this project will be better equipped to engage in mine planning pursuits in the Northwest Territories.

Results of the study will be communicated to participants via follow-up reports that will be delivered to agency Directors and workshops/meetings if desired. All key participants will be asked if their expressions have been accurately represented before the research is finalized.

You, and all other participants who attend the knowledge-training workshop, will be asked if they would like a report on the findings to be mailed and/or emailed to them specifically.

**Confidentiality:**
Your identity will be kept strictly confidential during and after this study. All documents will identify participants only by code number and will be kept in a locked filing cabinet. Participants will not be identified by name in any reports of the completed study. Any data records kept on a computer hard disk will be password protected.

We encourage all participants to refrain from disclosing the contents of the discussion outside of the knowledge-transfer workshop; however, we cannot control what other participants do with the information discussed.

Remuneration/Compensation:
The research will be conducted during working hours with the support of the participating agencies. Expenses incurred for travel, honoraria, or other will be covered by the agencies that employ the participants.

Contact for information about the study:
If you have any questions or desire further information with respect to this study, you may contact Dr. Marcello Vega at 604-822-4332 or Rebecca Chouinard at 604-725-4375 or email bchouina@hotmail.com.

Contact for concerns about the rights of research subjects:
If you have any concerns about your treatment or rights as a research subject, you may contact the Research Subject Information Line in the UBC Office of Research Services at 604-822-8598 or if long distance e-mail to RSIL@ors.ubc.ca.

Consent:
Your participation in this study is entirely voluntary and you may refuse to participate or withdraw from the study at any time without jeopardy to your employment.

Your signature below indicates that you have received a copy of this consent form for your own records.

Your signature indicates that you consent to participate in this study.

Subject Signature  Date

Printed Name of the Subject or Parent or Guardian signing above
The University of British Columbia  
Office of Research Services  
Behavioural Research Ethics Board  
Suite 102, 6190 Agronomy Road, Vancouver, B.C. V6T 123

CERTIFICATE OF APPROVAL - MINIMAL RISK

<table>
<thead>
<tr>
<th>PRINCIPAL INVESTIGATOR:</th>
<th>INSTITUTION / DEPARTMENT:</th>
<th>UBC BREC NUMBER:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marcello M. Veiga</td>
<td>UBC/Applied Science/Mining &amp; Mineral Engineering</td>
<td>H08-01152</td>
</tr>
</tbody>
</table>

**INSTITUTION(S) WHERE RESEARCH WILL BE CARRIED OUT:**

<table>
<thead>
<tr>
<th>Institution</th>
<th>Sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Other locations where the research will be conducted:
Interviews and tests will be conducted in government offices, or other locations as preferred by the participant (may include coffee shops, meeting rooms, or private homes). Knowledge-transfer exercises will occur in community centers and/or local schools (based on participant's preferences and availability).

**CO-INVESTIGATOR(S):**
Rebecca Chouinard

**SPONSORING AGENCIES:**
Indian and Northern Affairs Canada

**PROJECT TITLE:**
Transferring Mine Knowledge: a Look at Complex-Value-Based Strategies in the W̱o̱x̱ooseł Region of the Northwest Territories

**CERTIFICATE EXPIRY DATE:** October 8, 2009

**DOCUMENTS INCLUDED IN THIS APPROVAL:**

<table>
<thead>
<tr>
<th>Document Name</th>
<th>Version</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protocol</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Research Proposal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consent Forms:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Workshop Participant Consent Form</td>
<td>1</td>
<td>July 1, 2008</td>
</tr>
<tr>
<td>Key Individual Consent Form</td>
<td>2</td>
<td>September 1, 2008</td>
</tr>
<tr>
<td>Key Individual Consent Form</td>
<td>3</td>
<td>October 6, 2008</td>
</tr>
<tr>
<td>Workshop Participant Consent Form</td>
<td>1</td>
<td>July 1, 2008</td>
</tr>
<tr>
<td>Key Individual Consent Form</td>
<td>2</td>
<td>September 1, 2008</td>
</tr>
<tr>
<td>Advertisements:</td>
<td></td>
<td></td>
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<tr>
<td>Recruitment Letter</td>
<td>1</td>
<td>July 1, 2008</td>
</tr>
<tr>
<td>Questionnaire, Questionnaire Cover Letter, Tests:</td>
<td></td>
<td></td>
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<tr>
<td>Interview and Survey Summary</td>
<td>1</td>
<td>July 1, 2008</td>
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<tr>
<td>Letter of Initial Contact:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contact Letter</td>
<td>1</td>
<td>July 1, 2008</td>
</tr>
<tr>
<td>Other Documents:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WLWB Letter of Support</td>
<td>1</td>
<td>July 1, 2008</td>
</tr>
</tbody>
</table>

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. Laure Ford, Associate Chair
Dr. Daniel Saharian, Associate Chair
Dr. Anta Ho, Associate Chair
FILE#: 12 410 832

08-Oct-08

Ms. Rebecca Chouinard
Dept. of Mining Engineering, UBC
#8, 1645 West 11th Ave
Vancouver, BC V6J 2B8

Dear Ms. Chouinard:

Enclosed you will find your 2008 Scientific Research Licence No. 14427 as prepared under the Northwest Territories Scientists Act and approved by the Science Advisor, Andrew Applejohn. Should you require support from the Aurora Research Institute's Research Centre(s), please contact the applicable Research Centre Manager(s) to discuss your research needs.

According to the Scientists Act, researchers issued licences must provide a summary report for each year of their research. Accordingly, upon completion of your 2008 field work in the Northwest Territories, please ensure that you provide a 200-word (maximum) non-technical summary of your research findings to our office. This summary is due no later than June 30, 2009, or with your 2009 application, whichever is earlier. In addition, we require a copy of your final report and copies of any papers that you publish that pertain to research conducted under this licence. Finally, if applicable, please provide to the communities copies of any reports that you have offered to them or that they have requested as a condition of their support for your project. Such reports should be provided to the communities prior to submitting new applications. This is especially important on multi-year projects, for which it is to be expected that the communities would be particularly interested in inspecting the results of past work before approving future work.

Thank you for assisting in the promotion and development of a scientific research community and database within the Northwest Territories. The summary report and other information that you provide are utilized in our annual report compendium, which is distributed to communities and organizations in the N.W.T. as well as to researchers across Canada.

Best wishes for a successful study!

Sincerely,

Ashley Meyer
Acting Manager, Scientific Services
SCIENTIFIC RESEARCH LICENCE
Licence # 14427N
File # 12 410 832

ISSUED BY: Aurora Research Institute - Aurora College
Inuvik, Northwest Territories

ISSUED TO: Ms. Rebecca Chouinard
Dept. of Mining Engineering, UBC
#8, 1645 West 11th Ave
Vancouver, BC V6J 2B8
Tel: (604) 725-4375

ON: 08-Oct-08

TEAM MEMBERS: Marcello Veiga

AFFILIATION: University of British Columbia

FUNDING: INAC

TITLE: Transferring Mine Knowledge: a Look at Complex-Value-Based Strategies in the Wek’eezhii Region of the Northwest Territories

OBJECTIVES OF RESEARCH:
This research aims to define a recognized model for transferring technical knowledge related to mining operations to communities and resource managers in an un-biased manner that speaks to the needs and values of the community.

DATA COLLECTION IN THE NWT:
DATE(S): October 08 to December 31, 2008
LOCATION: Gameti, Wekwe, Behchoko, Wha Ti, and Yellowknife

Licence Number 14427 expires on 31-Dec-2008
Issued in the Town of Inuvik on 08-Oct-08

Andrew Applejohn
Director, Aurora Research Institute
NOTIFICATION OF RESEARCH
Scientific Research Licence No. 14427

I would like to inform you that Scientific Research Licence No. 14427 has been issued to:

Ms. Rebecca R. Chouinard
Dept. of Mining Engineering, UBC
#8, 1645 West 11th Ave
Vancouver, BC
V6J 2B8 Canada
Phone: (604) 725-4375
Email: bchouina@hotmail.com

to conduct the following study: "Transferring Mine Knowledge: a Look at Complex-Value-Based Strategies in the Wek'eezhii Region of the Northwest Territories".

Please contact the researcher if you would like more information.

SUMMARY OF RESEARCH:
This license has been issued for the scientific research application #875.

This research aims to define a recognized model for transferring technical knowledge related to mining operations to communities and resource managers in an un-biased manner that speaks to the needs and values of the community. If successful, this knowledge-transfer model will aid in negotiations, regulatory reviews, and decision-making strategies; thus building community capacity.

This study will rely on surveys and interviews within the Tlio population. The surveys and interviews will be administered in person with 5 to 10 key informants involved in mine planning decision-making and community representation. The surveys will be jointly developed with community partners, in order to ensure their research interests are met. Interviewees will be asked to sign the consent form or give oral consent, as appropriate. Everyone will be guaranteed confidentiality and privacy, and will be tape-recorded if permission is granted.

The researcher will also coordinate a survey to all resource management staff and community members that will participate in the knowledge-transfer sessions. Participants will be identified by resource agency Directors, but will target as many staff members and community leaders as possible in the Wek'eezhii region (could be up to 50 participants). The survey will take no more than 30 minutes to complete.
Knowledge-transfer sessions will also take place over the course of four two-day sessions (spread out over a period no longer than two months). Course material will rely on a complexity theory of education, using value-focused-thinking results from the interviews.

Summaries of research results will be presented back to interviewees for their review. In addition, community meetings and individual meetings will be held to provide research results, in consideration of non-literate individuals. All efforts will be made to involve community members in the process of understanding research results, reacting to them, and clarifying their perspectives. A short report on the findings will be made available to the communities, both online and in hard copy.

The fieldwork for this study will be conducted from October 08 to December 31, 2008 in Gameti, Wekwe, Behchoko, Wha Ti, and Yellowknife.

Sincerely,

______________________________
Paolo Elisei
Acting Manager, Scientific Services

DISTRIBUTION:
Yellowknife Dene First Nation, P.O. Box 2514, Yellowknife NT X1A 2P8
Mayor, City of Yellowknife, P.O. Box 580, Yellowknife NT X1A 2N4
Lands Administrative Officer, Tlcho Government, P.O. Box 412, Rae-Edzo NT X0E 0Y0
Lands & Resources Coordinator, North Slave Métis Alliance, P.O. Box 2301, Yellowknife NT X1A 2P7
Coordinator - Akaichio Screening Board, Akaichio Territory Government, Great Slave Lake Office, Fort Resolution NT X0E 0M0
Environment Manager, Northwest Territory Metis Nation, P.O. Box 720, Fort Smith NT X0E 0P0
NOTIFICATION OF EXTENSION
Scientific Research Licence No. 14427

I would like to inform you of an extension of Scientific Research Licence No. 14427 issued to:

Ms. Rebecca Chouinard
Dept. of Mining Engineering, UBC
#8, 1615 West 11th Ave
Vancouver, BC V6J 2B8
(604) 725-4375
Email: icchouinard@hotmail.com

to conduct the following study:
"Transferring Mine Knowledge: a Look at Complex-Value-Based Strategies in the
Weledeh Region of the Northwest Territories".

The licence period has been extended to February 28, 2009.

Please contact the researcher if you would like more information.

Sincerely,

Ashley Meyer
Acting Manager, Scientific Services

DISTRIBUTION:
Yellowknives Dene First Nation, P.O. Box 2514, Yellowknife NT X1A 2P8
Mayor, City of Yellowknife, P.O. Box 380, Yellowknife NT X1A 2N4
Lands Administrative Officer, Tlicho Government, P.O. Box 412, Rae-Edzo NT X0E 0Y0
Lands & Resources Coordinator, NWT Slave Metis Alliance, P.O. Box 2391, Yellowknife NT X1A 2P7
Coordinator, Aklavik Screening Board, Aklavik Territory Government, Great Slave Lake
Office, Fort Resolution NT X0E 0M0
Environment Manager, Northwest Territories Métis Nation, P.O. Box 720, Fort Smith NT X0E 0P0