

Applying Modified Participatory Video and Popular Education to Improve  
Environmental Science Learning in Northern Manitoba

by

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## Abstract

Northern Indigenous communities are confronted by many social and economic barriers as well as declines in the sustainability of freshwater which has emerged as a crucial issue in these regions. Responses to challenges are compromised by an education system that is still imported from the South and fails to reflect the rich cultural traditions of the North. It is in these remote locales that freshwater maintainability and insightful caring are felt directly, and it is within these same communities that alternative place-based learning will accomplish the most. The University College of the North has recently developed an approach that is cross-cultural in nature and grounded both in western science and the traditions of nearby Oji-Cree communities. Although culturally appropriate, the continued absence of diversity in lesson delivery and entry-level assessment of adult student performance inadvertently enforces a uni-dimensional Euro-dominant model of education. This study explores the implications of different approaches to environmental education on academic performance and experience in northern Manitoba. In addition to conventional lesson delivery, the value of non-conventional approaches using participatory video and situated education were explored. Experiences and learning outcomes of 97 incoming students from seven different academic programs centered on an exercise that calculated stream flow. Outcomes were assessed using competency-based field skills tests and ‘unsolicited’ student interview responses. Non-conventional approaches were characterized by improved academic performance, raised environmental consciousness, and overt acts of engagement creating global context at a personal level concerning freshwater supply. Situated in-stream opportunities and participatory video not only stimulated transformative moments, but significantly increased ( $p=0.003$ ) mean test scores by 26%, raised Indigenous student technical skillset scores by 12% ( $p = 0.05$ ), and significantly improved ( $p=0.07$ ) conceptual understanding. Increases in performance were exhibited by students who were Indigenous, female, and those registered in the natural resource program, supporting the importance of participatory video and experiential learning in postsecondary education. The results of this study show implementation of ‘alternative’ non-conventional lesson deliveries will increase student awareness and ‘individual advocacy’ regarding freshwater conservation while also helping improve the success and retention of postsecondary students across northern Manitoba, and for that matter Canada.

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I am also thankful to Dr. Marlene Atleo as she thought it would be great if I could articulate an Indigenous research paradigm in my thesis and that doing so would be of great practical assistance to both remote educational institutions and contemporary Indigenous researchers. I am appreciative of Dione Peech who donated many hours of her personal time and extend my full gratitude and admiration. And, from the beginning, my parents, Eleanor and Gordon Stepaniuk, who have obviously been the most influential persons in teaching me, and sharing with me, real insight. I will always wish my dad was here to see me graduate. My mom will. Lastly, I am grateful to Dr. Emdad Haque, Dr. Ian Mauro, and Dr. Jean-Paul Restoule for their support. As a participatory effort, and reflecting back, everyone made my dissertation an unusually enjoyable experience.

## TABLE OF CONTENTS

	Page
ABSTRACT.....	i
ACKNOWLEDGEMENTS.....	ii
LIST OF TABLES.....	viii
LIST OF FIGURES.....	x
LIST OF PLATES.....	xii
PREFACE.....	xiii
CHAPTER 1: FRESHWATER AND THE ANTHROPOGENIC FOOTPRINT.....	1
Context and Educational Challenge.....	1
An Integrated Global to National Freshwater Context.....	3
Global Freshwater ‘Value’.....	4
A Canadian Perspective.....	8
A Provincial to Institutional Freshwater Context.....	10
A Northern Regional Perspective.....	12
An Institutional Perspective.....	18
My Northern Manitoba Educational Perspective and Positionality.....	22
The Research Question, Objectives and Purpose.....	25
Thesis Organization.....	29
CHAPTER 2: CRITICAL LITERATURE REVIEW.....	31
Popular Education Theory and Northern-Living Culture.....	31
Situated Learning Theory and Indigenous Relationality.....	34
Assumptions and Principles of Adult Learning.....	37
Canadian to Provincial Indigenous Education and Attainment.....	40

Northern Cross-cultural Dialectics .....	45
Multi-stable Perception and Realities .....	48
Ecological Andragogy and Socio-Cultural Relevance .....	51
Community-Institutional Role in Fostering Watershed Education and Awareness .....	53
CHAPTER 3: APPROACH, METHODS, STUDY DESIGN AND PHASES .....	58
Situated Pre-requisite Assumptions .....	58
Study Design.....	59
Protocol Submission and Data Collection: (Phases 1 through 5) .....	61
PHASE 1 - Community Focus Group Survey - Searching Motives for Methodological Practice.....	62
PHASE 2 - Student Recruitment Strategy and Sample Size.....	65
PHASE 3 - Modified Participatory Video (in-field) Approach .....	71
PHASE 4 - Empirical Knowledge and Skills Acquisition Test.....	72
PHASE 5 - Open-Ended Video Interviews and Unsolicited Response .....	73
Data Analyses – PHASES 6, 7 and 8.....	76
PHASE 6 - Data Integration, Open-coding, Mixing PV Insight and Test Scores .....	80
PHASE 7 - Conceptualized Axial and Selective Coding.....	81
PHASE 8 - Factor Analysis and Model Conceptualization .....	85
An Additional Source of Information for this Research.....	88
CHAPTER 4: EMBEDDED LEARNING, PARTICIPATORY VIDEO AND SCHOLASTIC ACHIEVEMENT IN NORTHERN ENVIRONMENTAL EDUCATION.....	91
Abstract.....	91
Introduction.....	92
Situated Learning in Education.....	97

Situated Learning and Participatory Video Technology.....	99
Participatory Video – History, Application and a Quantitative Examination .....	99
Need for Transforming Instructional Methods at UCN .....	103
Methods.....	107
Data Analyses .....	111
Results.....	115
Quantitative Test Findings .....	115
Cursory Qualitative Findings Surficially Related to Test Scores .....	132
Discussion.....	137
Implications.....	145
<b>CHAPTER 5: GREATER SUCCESS IN NURTURING ENVIRONMENTAL TRANSFORMATION IN NORTHERN POSTSECONDARY PROGRAMMING .....</b>	<b>150</b>
Abstract.....	150
Introduction.....	151
Participatory and Collaborative Approaches to Cross-cultural Learning.....	155
The Opportunity to Define a Northern Student Learning Model .....	156
Northern Bi-cultural Dialectics and the influence of TEK .....	158
A Rationale for using technology - Participatory Video .....	161
Methods.....	164
Protocol Submission and Qualitative Data Collection.....	164
Study Design.....	165
PHASE 1 - Focus Group Survey – Searching Motives for Methodological Practice.....	169
PHASE 2 - Recruitment Strategy and Stream Activity .....	170

PHASE 3 - Modified Participatory Video Approach .....	173
PHASE 4 - Knowledge and Skills Acquisition Test.....	174
PHASE 5 - Open-Ended Interviews and Unsolicited Response .....	175
PHASE 6 – Data Integration, Open-coding, Mixing PV and Knowledge Acquisition.....	177
PHASE 7 - Operationalization - Axial and Selective Coding .....	179
PHASE 8 - Factor Analysis and Model Conceptualization .....	182
Results.....	185
Exploratory Factor Analysis .....	185
Three Factor Condensation.....	188
Coding Development, Construct Definition and Model Conceptualization .....	191
Model Level 1 - A Naturalistic Base .....	195
Model Level 2 – Eureka! (Inward) and Awareness .....	201
Model Level 3 – Split Route – Knowledge Acquisition.....	204
Model Level 4 – Overt Behavior Change .....	206
Discussion.....	211
Situated Learning and Non-Conventional Contexts .....	211
Factor Ordering of Condensed Student Variables .....	212
Participatory Video used as a ‘Process’ – not a Product .....	217
Model Conceptualization – situated and working collaboratively (Model Level One).....	222
Being aware and the potentiality for eureka! (Model Level Two) .....	226
Knowledge and Skill Advance (Model Level 3) .....	230
Overt Behavior Change ‘Transformation’ (Model Level 4).....	231
Implications for UCN and northern Manitoba.....	234

CHAPTER 6: DISCUSSION.....	238
Restatement of purpose and findings.....	238
Motives for Methodological Practice.....	241
The Northern setting, imbalance, solution, turning point and climax.....	241
Summary of my Main Findings .....	246
Situated learning and modified participatory video.....	246
Modified participatory video findings .....	248
Relevance to Manitoba’s North and the UCN .....	251
Limitations of the Research .....	255
Contributions.....	256
Autobiographical reflection - Gord’s Gap and the ability to problematize .....	258
CHAPTER 7: CONCLUSION AND RECOMMENDATIONS .....	267
Concluding Thoughts.....	267
Recommendations.....	272
REFERENCES .....	281

## List of Tables

<b>Table</b>		<b>Page</b>
3. 1	Four instruction types delivered to research participants: didactic, didactic plus participatory video (PV), situated, situated plus PV. ....	69
3. 2	Activities organization and participant time requirement. ....	75
3. 3	Selected independent quantitative and qualitative variables for factor analysis and variable reduction. ....	86
4. 1	Four instruction types delivered to research participants .....	110
4. 2	Definition of and descriptive statistics for the explanatory variables used in the ordered logit analysis of total test score achievement. ....	116
4. 3	Ordered Logit Analysis (Dependent variable <b>Total Score</b> ) of total test score achievement. ....	117
4. 4	Ordered Logit Analysis (Dependent variable <b>MFP</b> ) of total test score achievement. ....	118
4. 5	Ordered Logit Analysis (Dependent variable <b>NFU</b> ) of total test score achievement. ....	119
4. 6	Total, MFP and NFU test scores with respect to self-declared culture. ....	120
4. 7	Total, MFP and NFU test scores with respect to student gender. ....	121
4. 8	Total, MFP and NFU test scores with respect to student culture and gender. ....	123
4. 9	Total, MFP and NFU test scores with respect to program choice .....	124
4. 10	Total, MFP and NFU test scores with respect to Lesson type. ....	125
4. 11	Total, MFP and NFU test scores with respect to Lesson type as affected by culture. ....	125
4. 12	Mean test score interaction between gender and lesson delivery. ....	126
4. 13	Mean test score as an interaction between culture and participatory video. ....	128

4. 14	Mean test score interaction between gender and participatory video. ....	129
5. 1	Selected independent quantitative and qualitative variables for factor analysis and variable condensation. ....	183
5. 2	Three dominant factors underlying variability on quantitative data. ....	187
5. 3	Hierarchically structured interview codes and attribute clusters listing associated total number of the 97 participants that responded to each. ....	197

## List of Figures

Figure	Page
3. 1 Hierarchical illustration of candidate sample size(s) via availability sampling.....	67
3. 2 Segmentation of the research design ‘phase’ sequence outlining relationships between eight component phases. ....	79
3. 3 Mixed data conceptualization and construction of an emergent conceptual model.....	83
4. 1 Total test score percent as related to culture and question type. MC-Multiple Choice; SC-Sentence Completion; BA-Bullet Answer; LA-Long Answer; and CA-Calculation.....	121
4. 2 Total test score percent as related to gender and question type. MC-Multiple Choice; SC-Sentence Completion; BA-Bullet Answer; LA-Long Answer; and CA-Calculation.....	122
4. 3 Total test score percent related to lesson type and question type. D-didactic; DPV-didactic + PV; S-situated; SPV-situated + PV; MC-Multiple Choice; SC-Sentence Completion; BA-Bullet Answer; LA-Long Answer; and CA-Calculation.....	127
4. 4 Profile interaction between participatory video and program. To convert TS-squared to percent, take the square-root. ....	130
4. 5 Profile interaction between participatory video and lesson type. ....	130
4. 6 Profile plot for the interaction between lesson and video.....	131
5. 1 Segmentation of the research design sequence outlining relationships between eight component phases and this Chapter’s integrated analysis. PHASES 6-8 are highlighted as they form the empirical basis of this chapter.....	168
5. 2 Integration of qualitative findings (Phases 6, 7, and 8) following data collection and empirical test score assessments.....	178
5. 3 Mixed data conceptualization and construction of an emergent conceptual model. ....	182

5. 4	Posited model of code interrelationships, hierarchical attribute evolution, and associated total participant interview response numbers listings (n=97).....	200
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## List of Plates

<b>Plate</b>	<b>Page</b>
3. 1 Student in action demonstrating and measuring in-stream water flow.....	68
3. 2 Students participating in a didactic lecture session.....	70
4. 1 Student and equipment in action demonstrating and measuring in-stream water flow. ....	107
4. 2 Student actively integrating situated indigenous knowledge interviews with technological skills gained from participatory video workshop. ....	109
4. 3 Participatory video field opportunities to voice experiential concepts. ....	111
4. 4 Students working together positively and achieving success by sharing knowledge and building consensus within the working groups. ....	133
4. 5 Student participant documenting the stream experience. ....	135
5. 1 Participating student addressing on-site questionnaire regarding the capturing of three to five immediate impressions of their situated stream learning experience. ....	173
5. 2 Student group preparing for stream velocity and discharge measurements and calculations.....	186
5. 3 Student interaction encouraging behavior that is healthy for individuals as well as ecological sustainability.....	192
5. 4 Students from the Business Administration program engaged in didactic learning. ....	199
5. 5 Monitoring providing increased awareness and potential for elevated level of consciousness.....	202
5. 6 Students incorporating experiential and traditional knowledges. ....	208
5. 7 Kenanow Education program student cohort following stream calculation. ....	210
5. 8 Law Enforcement program student cohort following video review process. ....	210

## **PREFACE**

This thesis is submitted in partial fulfilment of the requirements for a Doctor of Philosophy in education and ‘resource’ preservation. It contains work done from 2008 to 2017. My supervisor has been Dr. Stephane McLachlan from the Natural Resources Institute, University of Manitoba. Research design has been created solely by myself, with help from Dr. Marlene Atleo, Dr. Emdad Haque, and Dr. Ian Mauro (who all put in many hours and showed great patience with my obsession for detail) and is aimed at the University College of the North, its educators, and students attending courses in The Pas. All involved in this project inclusive of Dr. Wanda Wuttunee and Brenda Grabowski of the Faculty of Graduate Studies helped in the analysis and therefore directly shaped the process and the outcome of my research. My thesis is a better one because of their contributions. And in an unusual starring, my own parents; like most souls not likely to be preserved in print, and because the flame that brings the light of their hearts into my face and mind every moment, I include both in this body.

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## Chapter 1: Freshwater and the Anthropogenic Footprint

### Context and Educational Challenge

There is a growing recognition the anthropogenic footprint is placing intense pressure on useable fresh water supply. Yet in the next half century, the global population is projected to rise three times faster than accessible fresh water runoff (Malik, 2013). As Earth's population numerically increases by 142 thousand daily, each individual is replaced by three every thirty hours (Graff & Bremner, 2014). Given global population is predicted to double every forty years, realistic options remaining for a planet supporting a 2050 posited twelve billion people must now include educational advance and scholastically-driven meta-ethical thinking (United Nations, Department of Economic and Social Affairs [UNDESA], World Urbanization Prospects, 2015).

For instance, perceived fresh water requirement per person is 1200 m<sup>3</sup> per year; the average Canadian citizen presently consuming double (Leahy, 2014). In context, the accepted global minimum required for human survival is 5 litres per capita per day, or 2 m<sup>3</sup> per year (Allan, 2011). To achieve anything resembling '*perceived*' per cubic metre fresh water need for population estimates hypothesized will require not only an increase in *awareness* and agentic engagement, but a consequentialist preparedness and notion beginning with an *academic axiology* that shares with students what things are valuable.

Worldwide to remote northern household faucet, responsible fresh water use is fundamental to economic, cultural and social justice. According to Pulido (1996, p. 57), the struggle is only ours, but as a species we are silent. Cumulative effects of present (mis)use are modulating habitat capacity to sustain biological and physical viability

(Bakker, 2007; Glennon, 2009). These same effects are impacting aesthetic appeal, social-ecological resilience, ecological psychology, and heuristic curriculum reform regarding notions of worth (Allan, 2011; Breitenstein, 2017; Gifford, 2007; Leahy, 2014; Millenbah, Wolter, & Taylor, 2011; Waller, Scott, Gates, & Moore, 2009). To curtail impending impacts, environmental educationalists must examine an array of techniques for generating a language and dialect spoken by ordinary people to develop a germane and conscious comprehension of this 'resources' sustainability and limit.

Preemptively, can academic societies achieve a segue through awareness while educating to preserve in remote educational institutions that warrants a national and liberal focus? In answering this question, fundamental evidence includes the fact that rural and remote training mandates a significant resource investment, imposing social stressors on northern adult learners who stereotypically leave studies before program completion. Achieving some semblance of strategic engagement will depend on more. It will be contingent on the development of new paradigms inclusive of non-traditional knowledge and skill deliveries, respectful cultural perceptions, mediating technologies, the use of local metaphors, and behavioral goodness. Educational research must consider inspiring targeted curriculum design, dissemination strategies, and evaluative accountability; a return to academic integrity and relevance of place.

This is the audience to whom I am writing - and it is these ideas that led to the creation of this research gelled from community-based echoes for a relationship change with a northern adult learning populace, anomalies in cross-cultural learning styles, a challenge to certify 'non-formal' knowledge and skills, and an Indigenous residency grounded in a desire for self-sustainability. Unfortunately, remote northern Canadian education presently begins where Indigenous students are not (Atleo, 2012). This

statement has encompassed my northern personal narrative for the past twenty years. Accordingly, there is an urgent relevance in exploring local context and implications of a northern Manitoba Indigenous student-centered learning model mediated using land-based experiential science in facilitating academic performance and student experience while capturing local behavioral expressions.

As there are a multitude of circumstances surrounding this query, there are as many contexts with which to view these narratives. Resultantly, this associated and dynamic process of meaning-making involves many links. The first, an integrated global-to-national freshwater context; and the second, a funneled provincial-to-institutional value-laden integration between situated/experiential learning and existing didactic erudition - as each relates to monitoring fresh water stream discharge and provincial fresh water 'resource' sustainability behaviors.

### **An Integrated Global to National Freshwater Context**

Providing a 21<sup>st</sup> century global context, two billion people are affected by water shortages every year, 1.2 billion people live with chronic water scarcities, and 263 million people spend more than 30-minutes per day collecting fresh water – ultimately meaning less education for too many (Leahy, 2014). It has only been during the last century that the human population has tripled (likely reaching eight billion by 2030); and that recent data provided by the United Nations reports that water consumption has multiplied six-fold (Malik, 2013). By 2050, one-fourth of the world's population may suffer from the lack of fresh water (Allan, 2011) and some two-thirds of its population may be negatively affected if current rates of consumption and ill-conceived subsidies

persist (Cech, 2005; Godrej, 2003). A 2012 Millennium Ecosystem Assessment concluded that globally, 60% of all ecosystem services were degraded and used unsustainably, and that fresh water had already been depleted far beyond levels required to sustain demand (Krcznak, 2007).

The era of abundant low-cost and accessible fresh water is over. Scientists now believe the human impact on the Earth has become so great that we anthropomorphically have ushered in a new geological age characterized as the Anthropocene – the Age of (*hu*)Man (Crutzen, 2002). Recognition that *Homo sapiens* are now the most powerful and demographically-transient force of nature on the planet should be drawing focused attention to these impacts. One driving force for global change is firmly centered in situated land-based engagement revealing an educational fracture and desperate need for an integration of quantitative and qualitative approaches to environmental education (E. Schreyer, Manitoba Premier 1969-77, personal communication, 2013).

### **Global Freshwater ‘Value’**

Illuminating ‘*worth*’ globally, fresh water has habitually been considered ‘free’. But, fresh water’s monetary value, especially the services provided, is enormous and by no means easy to monetize. Richards (1997) noted two decades ago that degradation of watershed services represented not only a loss of capital assets but that significant ‘*gaps*’ remained in terms of education. Two decades later, Jeffrey, Hasler, Chapman, Cooke, and Suski (2015) ripple the unrelenting need for improved investigative academic inquiry into the growing recognition and importance of research *using mature students*.

Within the context of global fresh water sustainability, accounting ‘schemes’ for ecological service should hold only a ‘secondary’ capacity to relay results. For instance, in 2003, the United Nations Statistics Division (UNSD) developed the ‘Handbook of National Accounting: Integrated Environmental and Economic Accounting’ highlighting mechanisms through which a nation could measure economic impacts of their federal fresh water basin policies (United Nations Statistics Division, 2003). Yet, currently, there is no unified framework through which policy-makers can access best practices with regard to the evaluation of water as a ‘resource’ (Jeffrey et al., 2015; Krchnak, 2007). Inappropriately and because of the perceived complexity in measuring the economic value of fresh water, the non-pricing of watershed services perpetuates a vicious behavior and an asphyxiating eddy in which degradation and meta-ethic reform are seldom considered as domestic components of functional academics and true cost.

To further complicate valuation, watershed systems are comprised of both ‘direct’ and ‘non-use’ values. *Direct-use* tenets consist of values people derive from directly utilizing a watershed-related good or service (e.g., household water). But, *non-use* values (i.e., the present and future value people may derive from goods and services independent of any direct use) also comprise a significant portion of a watershed’s ‘economic’ value. And in some capacity, non-use values including *pure non-use values*, *bequest values*, and *option values*, present a marvelous possibility for the pondering and interpreting of academic engagement and mixed assessment. For instance, *bequest values* arise from the desire of individuals to preserve watersheds for use by future generations, and *option values* arise from the uncertainty about future demand or supply. Neglecting either holds the potential to result in fresh water depletion causing an overall loss of engaged blue

prosperity and philosophical fields that depend crucially on notions of aesthetics, and what elements can contribute to the intrinsic value of our present state of affairs.

Accordingly, these values constitute the logic and objective quest behind my dissertation's movement toward improved mature student awareness regarding monitoring northern boreal river flow, using mediating technology and situating non-conventional lesson delivery. My formulated purpose is to lessen the imbalance between content and relevance uncovering a 'northern' academic fulcrum as low enrolments, foreign metaphors, and poor scholastic cross-cultural performance are regional disconnects that confront postsecondary enrollees. As the University College of the North (UCN) seeks environmental and cross-cultural traditions borrowed from surrounding Indigenous communities in ways that are student centered and culturally appropriate, identifying integrated strategies for lesson delivery and heuristic assessment are expected to increase academic performance reducing high attritions that plague postsecondary education in rural Manitoba - and elsewhere.

To exemplify, a Latin America case study in which several valuation techniques were successfully used to estimate a water-user fee to support non-market watershed benefits was spearheaded by the Nature Conservancy to amass increased investment for the preservation of the Sierra de las Minas Biosphere Reserve watershed (Goldberg, 2007). The study calculated watershed degradation and reduced stream flows would lead to an annual loss of \$15,000 to \$52,000 in terms of net profits, and that a water user fee of only \$0.38 to \$1.99 per cubic metre would generate sufficient funds to initiate projects in upstream regions while enforcing practices to prevent future watershed degradation.

These findings prompted immediate action *at the community level*. To address upstream challenge, 14 municipalities in and around the reserve fronted funds to provide

for 15 municipal Park Guards. Funds collected from the water fee were allotted to compensate Park Rangers to monitor upstream flow quantity of downstream freshets. By increasing *awareness*, involved agencies were able to accrue the financial resources needed to compensate Guatemalan Park Rangers to regulate non-market benefits. With a 2013 budget of \$387,000 US, the reserve now employs 35 Park Guards and 58 foresters (J.M. Monzon, UNESCO Biosphere Reserve, personal communication, 2014). It is imperative to note, however, that successful application requires a level of awareness and technical expertise that is often not available in many localized and remote settings educationally (Mayrand & Paquin, 2004). Northern Manitoba is no exception.

In global review and emphasis of a ‘research gap’, the principal challenge facing worldwide watershed erudition and management includes not only awareness and a technical ability to monitor quantity, but a value-laden approach to assessment. Whether brokered internationally or locally, educational awareness studies that account for total quantity provide crucial information for academic options in which the livelihoods of downstream communities may be sustained. In order to internalize non-market values tied to watersheds and achieve the required agentic behavioral transformation, stream discharge monitoring studies must be considered a crucial first step in conveying a need for increased awareness. Without such study, federal (and provincial) water agencies lack the leverage to justify continued calls for investment in research and sustainability.

Clearly, growing interest in fresh water quantity awareness and valuation shows engagement can be a potent catalyst to political action and proactive education. Looking to what the future holds for natural water basins and realizing fresh water is a commodity that cannot be replaced, humanity must realize the value of fresh water cannot be known

and nowhere can it justifiably be assumed zero. Sadly, it seems no change in global 'value' is accepted into current convention until dire events take human lives.

In using global context (and value) for my dissertation's headwaters, the north simply does not know how much water it uses. Classically perceived as cheap, water rarely accounts for more than 2% of a household's income (Brooymans, 2011). The challenge is obvious; the incentive (and model) to learn in 'developed' countries (Allan, 2011) and the remote north is weak. Regrettably and without an informed academic and interdisciplinary conservation imperative, little will be done in these distant districts.

### **A Canadian Perspective**

From a national perspective, Canada holds 2.6% of an estimated 9000 km<sup>3</sup> world supply of fresh water (Bakker, 2007, p. 25), and by the close of the last century, Canada was one of only 10 countries in the world that enjoyed 'surplus' fresh water. Annual renewable volumes seem large at 2,850 km<sup>3</sup>, but that is only 9% of the world total (Leahy, 2014; Schindler et al., 2010). Boyd (2001) indicated Canada is "*hugely wasteful, using more water per capita than any nation in the world, except the United States*" (p. 43). Scarcity is increasingly affecting Canadians and by 2050, three in five citizens may be living with water shortages (Leahy, 2014). Statistics Canada (2009) results corroborate this national water crisis, indicating Canada is one of the highest per capita consumers of water in the world (e.g., 275 litres [72 gallons] of water per capita per day for residential use). As Canada has yet to see this crisis get the attention it deserves, it pays the least among the world's developed economies per cubic metre. Nationally, municipal prices average less than 50-cents per cubic metre (Brooymans, 2011).

In surveying Canadian water management funneled from global to national crises, the myth of abundance and contemporary demographic propensity is presently exhibiting an unconscious but opposing awareness - that fresh water necessity is increasingly difficult to sustain at – even local levels (Bakker, 2007; Environment Canada, 2006). As early as 1984, forecasts projecting water use in Canada’s five major regions and 47 major river basins were commissioned by an Inquiry on Federal Water Policy (Tate, 1985). Methodologies were based upon structural modeling employing water use practice at the time. In addition to the omission of educational development initiatives, limitations of the models were unable to examine sub-regional and ‘remote’ areas, with the result that local detail was lost. It is at these local and remote levels that national fresh water ignorance regarding quantity and imbalance challenges are felt directly, and where land and place-based environmental educational advances will accomplish the most.

Henceforth, that some regions of Canada can be termed as areas where fresh water is in unknown and short supply, there can be no doubt. Environment Canada (2006, p. 27) reports “*approximately 25 percent of [Canadian] municipalities experienced water shortages due to increased consumption, drought, or infrastructure constraints between 1994 and 1999*”. In a report on water management by the Senate Standing Committee on Energy, Environment and Natural Resources, the state of fresh water management at the federal level has been described as “*shocking and unacceptable*” (Senate, 2005). As of October 31<sup>st</sup>, 2013, more than 120 First Nations communities were under a drinking water advisory (Harden & Levalliant, 2008; Health Canada, 2013) and besides the mistaken belief in water’s unlimited abundance and the cavalier assumption that fresh water resources can be diverted to suit human purposes, apparent contradictions

in Canada's approach stem from a lack of data, inadequate understanding, and poor water basin education (Bakker, 2007; Environment Canada, 2009).

In a global to national summary, Canada falls behind other countries in accounting for water quantity, *“data are less widely collected, and the number of hydrometric stations has been dramatically reduced in recent years, thus straining information-gathering capacity and raising concerns that network density in some provinces does not meet international standards”* (Bakker, 2011, p. 6). In terms of quantity, Canada's hydrometric network providing basic information to support informed decisions and formulate defensible policy was reduced by 21% in 2000. Loss of this component was viewed as ‘highly problematic’ (Lilley, 2004). Canada's Senate (2005) claims *“the information gap is unacceptable and stems in large part from the Government of Canada's retreat from water management issues and from funding relevant research”* (p.5). A better job of training northern students to meet this fresh water monitoring and academic dilemma nation-wide, is urgently required.

### **A Provincial to Institutional Freshwater Context**

Scoped provincially, water governance has been under intense debate regarding delegating citizen participation towards fresh water management. In 2003, attempting to meet the challenge of practice, the Manitoba Water Strategy (the only province with a ministry devoted to water issues in Canada and analogous to the United Nations declaring 2003 the “Year of Fresh Water” - a declaration coming at a time when fresh water represented a scarce resource in many parts of the world and in 25% of Canadian

municipalities (Leahy, 2014)), similarly envisioned the need for an effective method of implementing a strategy crucial to ensuring long-term provincial watershed monitoring. The declaration states, “*development of an implementation framework will be a [participatory] process that considers both present and future demands on [our] water, while ensuring the protection of ecosystems*” (Government of Manitoba, 2003, p. 19). In sustainability literatures (Brooymans, 2011; Gifford, 2007), however, a somewhat homologous and uninformed notion of ecologically intelligent citizenship persists.

The Honorable Steve Ashton, 2003 Minister of Conservation, presented the ‘idea’ of engaging Manitobans to determine sustainable goals and techniques for the management of water within its provincial borders stating “*any strategy dealing with water must include a cooperative approach that involves all citizens who depend on, as well as benefit from water resources (p. 7)... It is up to all of us (p. 3)*” (Government of Manitoba, 2003). And in a June 23, 2009 Province Release of the Blueprint for Healthy Watersheds, Christine Melnick (Water Stewardship Minister) stated it was her “*honor to work closely ... to build a strong program in Manitoba and to set a clear vision for the future to achieve healthy watersheds and clean water*” (Manitoba Conservation Districts Association, 2009). The report entitled ‘Framework for the Future’ outlined goals and objectives for Manitoba’s 18 conservation districts but made no mention of affected remote northern Indigenous communities. Among the objectives was affirmation the resource “*be governed by strong local participation and that residents of [provincial] watersheds will be involved in decision-making*” (p. 6).

On December 1, 2017, the Manitoba government introduced new legislation aimed at strengthening watershed management in the province. Proposed measures to face flooding, nutrient loading, and quality challenges suggest modernizing inspection

to ensure benefits for all Manitobans (Squires, 2017). No mention of a foundation to implement educational programming that would incentivize students to become more aware is made. Essentially, supporting water management through sound education and incentives-based programming remains poorly conceived. Alternatively, and in some instances, community-based monitoring and educational initiatives could represent radiating constructivist efforts to address gaps in monitoring a local populace who typically use 200 liters of fresh water per capita per day (Leahy, 2014).

### **A Northern Regional Perspective**

Northern Manitobans in particular are facing an overwhelming number of socio-cultural, economic, environmental, and educational crises. Responding constructively to these issues is a struggle for most remote communities and levels of government. Challenges are complicated, and in many instances beyond the comprehension of local residents ‘and outside observers’. To exemplify, on September 11, 2009, The Pas (on my ‘home turf’ with a population of only 4000) considered municipal water assessment expecting to cost \$100,000, of which 50% of that cost would be covered by the Manitoba Water Stewardship Board – essentially taxpaying citizens (Allen, 2009). According to Town Councilors, *“there is a big problem so let’s get on with it; it has to be done no matter what. The issue has been discussed several times as the current system is under increasing strain and needs to be expanded to facilitate the large influx of people”*. This municipal upgrade was finished in 2012 with a total project cost of more than \$2.5 million dollars (2012 Annual Report – Town of The Pas). Local governance is real, educational value is real, and the costs globally, nationally, and locally are great.

In essence, northern communities are some of the most disadvantaged in the province, and lacking resources to organize effective resistance, situated place-based engagement and non-traditional lesson delivery examination is paramount. According to an Aboriginal Affairs and Northern Development Canada (AANDC, 2011) Community Well-Being Index measuring community health based on labor, housing and education, Manitoba's 63 reserves which comprise a large and ever-increasing percentage of the northern populace are close to the bottom of the list. Of more than 5,400 communities measured, remote northern Manitoba First Nations communities do not make an appearance until the 4,040 mark (Welch & Rabson, 2012).

Regarding education and provincial demography specifically, funding is about 30% less per reserve student than in provincial schools. Moreover, most reserve and rural students do not receive the same number of instructional days and follow a disorderly mass of curricula. Former First Nations Chief, Shawn Atleo (2012), stated the one place where more funds would make the biggest difference is in education as First Nations populations have grown 161% since the 1960s. According to the 2016 National Household Survey (i.e., representing one-third or 4.5 million households across Canada), Aboriginal people from more than 600 bands now comprise 4.9% (1,673,785) of the Canadian population, increasing 20.1 percent (232,385 people) faster during the previous half decade than the general population at 5.2 percent (Statistics Canada, 2016).

Of the three Aboriginal groups (i.e., First Nations, Métis, and Inuit), First Nations is the largest (927,230) and fastest growing population (22.9 %). In 2011, the median age was 27.7 years, 13 years younger than non-Aboriginals (Statistics Canada, 2013). Interestingly, Aboriginal youth aged 15 to 24 represent 18.2% of the total Aboriginal population, and 6% of all youth in Canada. Academically, 50% of this Indigenous

population aged 25 to 64, have less than grade twelve in contrast to 23% of the general population (McLachlan, 2015, unpublished). Today, the Cree are the largest and most widespread Canadian Native group, many living within northern Manitoba and the University College of the North's service area.

In response, the Federal Government spends nearly \$1 billion on Manitoba First Nations alone (Milke, 2013). In 2010-11, Ottawa spent \$956 million in Manitoba, nearly 98% on direct grants to the 63 First Nations (Welch, 2012). Researching the Winnipeg Free Press series on the lack of water in northern Manitoba, Welch (2011) specified that over the next few years, Ottawa will budget about “\$40 million for big water projects on Manitoba reserves ... to solve the problem once and for all”. Winnipeg New Democratic representative, Pat Martin (as cited in Rabson, 2011) stated Canadians do not realize just how bad conditions are in this province rurally, “*maybe it's because the sheer scale of the problem in Manitoba is too overwhelming*”. But, Anna Fontaine, Aboriginal Affairs' and Manitoba's Regional Director in 2011, stated there is a “*very strong focus on water in this province ... it is one of the government's priorities*” (as cited in Welch, 2011). No matter which perspective is considered, there are 31 *Treaty Five* reserves in northern Manitoba; 18 are remote and each is scrambling to grab scarce federal capital dollars.

As study progresses toward integration and prediction of stream flow conditions from basin to provincial scales, the need for seasonal pattern depiction of stream flows has become pressing. Flow variations must be catalogued to understand interdisciplinary linkages across time no matter which government is in power. According to the World Water Development Report (United Nations World Water Assessment Programme, 2015), contemporary water challenges stem from people issues: a situation attributed to the general lack of awareness, poor understanding, and increased pressures placed on

existing fresh water supply. Given declines in government support, implementation of alternative ‘non-conventional’ academic platforms presents a viable strategy - particularly in the rural north. As Bakker (2003) emphasizes, fresh water crises stem from an absence of framework. To make matters worse, little attention has been afforded to northern cross-cultural learning modalities regarding the integration of educational programs among remote Indigenous populations affected and their educational inabilities to sustain their contemporarily-blended existence.

Reflecting a Canadian experimentalistic and student-based model ‘framework’, the Durham region in Ontario utilized an off-campus water efficiency study employing students in a community-based social marketing program collaborating with homeowners to reduce residential water consumption. The result netted a 32% reduction in peak water demand over a three-year period demonstrating ‘non-conventional’ education programming focusing on situated activity shows success in addressing barriers to ‘behavioral’ change (Maas, 2003; McKenzie-Mohr, 2013).

To situate fluvial monitoring and educational importance in ‘Manitoba’s’ north, stream discharge calculation skill sets, are in part, vital to document remote diversion and control structure impacts on fresh water levels and stream flows related to preventing: 1) flooding of southern cities and agriculture; and 2) the harnessing of hydroelectricity. Diversion and development causing flooding and disruption of Manitoba’s remote and Indigenous communities (e.g., Chemawawin, South Indian Lake, Nelson House, and the lower Nelson River) provides a reoccurring crown-dictated narrative where these ‘uninhabited’ spaces have been designated as ‘sacrifice zones’ in a contemporary paradigm of settler capitalist Canadian society (Ford, Berrang-Ford, King, & Furgal,

2010). As isolated communities have limited capacities, impacts are profound and undocumented.

Lake St. Martin is the latest chapter in this provincial saga. As recent as 2011, provincial officials lowered water levels in Lake Manitoba by flooding this reserve of 140 years. The decision saved cottages, agricultural areas, and 'southern' communities by flooding three 'northern' First Nation communities (i.e., Lake St. Martin, Little Saskatchewan, and Pinaymootang). Providing intended guidance through community workshops, Thompson, Ballard, and Martin (2014) showed that community members of Lake St. Martin First Nation were negatively affected, but a sustainable livelihood framework provided only ill-studied impacts of flooding and dislocation on families. At the height of the 2011 'super flood', there were more than 7,100 evacuees. The entire Lake St. Martin First Nation community (n=1,158) remains evacuated almost seven years later (i.e., 2017) with no land base, no hope for return, and no land to call home. As well, residents from other First Nations around Lake St. Martin are still displaced including inhabitants of Little Saskatchewan (n=405) and Dauphin River (n=225) First Nations (Paul, 2014).

Regarding hydroelectric generation, Manitoba has a long history of fresh water regulation negatively impacting First Nations and Indigenous northern communities in order to provide power and its associated economic benefits to the provincial whole (Loney, 1995). Depicting contemporary need, the interim license for Lake Winnipeg Regulation is now under review by the Clean Environment Commission, and as set out in the Water Power Regulation, a full license for Lake Winnipeg regulation would run until 2026; which is 50 years from the completion of construction in 1976. This license will require surveying and mapping, river monitoring, negotiation of complex agreements,

remedial works, and ongoing programming for remote and impacted communities – many within the University College of the North’s region (Paul, 2014).

On the eastern side of the province, a Winnipeg Free Press investigation ‘No Running Water’ (Welch, 2011) revealed that 45% of the homes (n=1400) on Canadian First Nations without running water are in Manitoba, even though Manitoba has only 15% of the country’s reserve housing. Most of these un-serviced homes (n=800) are in the four Island Lake First Nations (i.e., St. Theresa Point, Wasagamack, Red Sucker Lake, and Garden Hill), where rampant health issues (i.e., influenza, diarrhea, H1N1, overcrowding, viruses) are common - and in an area where the population is expected to grow from 10,000 to 16,000 by 2025 (Paul, 2014). As population rates increase, thousands of northern Manitoba Indigenous residents haul water in pails from community taps as families of twelve get by on 3 pails of water a day in challenging living conditions.

Federal government solutions related to accessing less than 15 litres of fresh water per day are ‘archaic and degrading’ while the average daily residential water use per person in Winnipeg amounts to 180 litres (Welch, 2011). Placing use and livelihood factors into perspective, the United Nations Educational, Scientific and Cultural Organization (UNESCO, 2015) estimate of basic fresh water need includes: five litres for drinking; 10 litres for food preparation; 15 litres for bathing; and 20 litres for sanitation. Medical professionals in these northern Manitoba communities state they “*would like to spend more time on [fresh water] ‘education’ ... but we can’t because we’ve got to take care of what needs attention right now*” (Fallding, 2010, p.3).

In a northern regional summation, human assets represent the knowledge and skills that contribute to the capacity to manage local fresh water. Present lack of

contextual educational assets is adversely affecting rural and remote communities. Even without recognizing that Indigenous communities have ‘special’ rights to waterways or some right to accommodation (Cave, 2012), a northern regional goal has for more than a half-century pouted its authority and mandate to leak, drain, and tilt provincial water regimes. As provincial policies play a role in determining the risk these northern communities are subjected to by flooding, livelihood dislocation, and unavailable fresh water supplies - educational institutions disseminating engagement, knowledge, skills and behaviors provide a situated solution – particularly if anchored in the region.

### **An Institutional Perspective**

Since 1966, Keewatin Community College (now University College of the North - UCN) has worked in northern Manitoba for a unique demographic and culturally pluralistic community spread across a vast and unique landscape. The geography is rich in resources and economic potential. The economy is based on the extraction and utilization of natural resources, hydroelectric development, and tourism. Government, education, and service industries represent major employers in the region. Consequently, the university’s service area is distinct, setting the institution apart from sister colleges and universities in the province where 65% of the population is of Aboriginal ancestry scattered throughout University College of the North’s estimated 325,000 km<sup>2</sup> provincial share of the post-secondary service area (UCN Faculty Handbook, 2016/17).

University College of the North provides education and training to approximately 2500 enrolled students and is the only post-secondary educational institute physically located in the region with an established network of two campuses and 12 regional

centers – nine in First Nations communities and three in the larger towns of Churchill, Flin Flon, and Swan River. In this region, there are 33 First Nations communities, 34 Métis communities and seven diverse urban communities (i.e., Churchill, Flin Flon, Swan River, Thompson, The Pas, Wabowden and Snow Lake).

University College of the North is a publicly subsidized institution mandated to provide post-secondary education within this provincial expanse, and is uniquely integrating ‘college and university’, thereby offering the region access to a breadth of post-secondary programming. The new 2015 Provincial University College of the North Act (C.C.S.M. c. U55) intends to ensure culturally inclusive development to people and communities in the region. Emphatically, the ‘new’ institute’s intent is to support a cultural responsiveness that reinforces the integrity of local culture, and cultures that students bring with them – and then to grow synergistically from specific (i.e., situated) contextual learning experiences that follow the *Kenanow* (see Chapter 2) philosophy.

Fundamentally, the 2002 institutional and paradigmatic shift in focus from a vocational technical college (Keewatin Community College) to a university (University College of the North) – from training to education – represents a mandated shift from assimilation to accommodation of Aboriginal paradigms in this northern region of Manitoba (Cook, 2014). As well, as a result of provincial land coding and Treaty-Lands and Trust legislation, there has been an increase in participation by Indigenous communities requiring a capacity in natural resource sustainability monitoring that contains the best of environmental studies knowledge and skills with an integration of Indigenous research perspectives and regional Indigenous knowledge in local contexts.

The new University College Board is governed by a tri-cameral system that intends to reflect cultural inclusiveness. Consequently, University College of the North

Elders have a unique role (an *Elders Council*) to nurture this remote learning environment with a *Governing* and a *Learning Council* to co-create curriculum content by sharing Elders' Indigenous traditional cultural expressions in a respectful and caring way. Although Indigenous-oriented programs have been created at various universities allowing Indigenous applicants to gain entrance to schools under conditions 'different' from those of non-Indigenous students, such programs typically begin as Contract Training initiatives (e.g., Aboriginal Natural Resource Program). Vulnerability, however, is exacerbated by the fact that few transient academic administrators are prepared to lobby for paradigmatic and program continuance. Essentially, the present challenge facing northern Indigenous communities is to generate some control over the formal education process (Martin, 2014; Manitoba Education Research Network [MERN], 2017; Stonechild, 2006).

As such, culturally inclusive curricula aspire to 1) reflect the diverse cultural learning styles of students; 2) help learners understand that conflict between ideals and 'realities' always exists in human societies; 3) help learners develop decision-making abilities, social participation skills, and a sense of political efficacy necessary for effective citizenship in a pluralistic and democratic nation; and 4) maximize the use of experiential learning in local communities. Competence must include a mixed environment for learning that uses as its basic underlying philosophy and critical andragogy (challenging discrimination) – 'culturally inclusive curriculum'. Howard (2012) suggested this cultural competence is key to ensuring relevance of curriculum.

The 2015 University College of the North Academic Plan notes the "*key driver of all UCN strategic planning is the objective to recruit and retain students currently enrolled in all its programs to successful completion*" (p. 6). The Plan also sets forth a

number of outcomes including that it will create and promote opportunities for learners to develop academic and technical skills needed to develop abilities. Yet, enrollments have been on the downswing over the last five years, decreasing from 2593 in 2011 to less than 2085 in 2016. More than one third of the students (and graduands) are enrolled in academic preparation courses.

Unfortunately, criticism of education is hardly a novel concept. Disparagement has fostered many initiatives to create curriculum, adjust instruction and improve assessment standards worldwide (Jang, 2008; Martin, 2014; Salinas, 2008). Provincially, James Allum, Manitoba's 2015 Education and Advanced Learning Minister, was cognizant of even the University College of the North's attempts to improve abysmal education for northern remote students (Martin, 2014). Ian Wishart, the New Progressive Conservative MLA, agrees stating there is a need to take a very careful look at the lack of accreditation and issues of ineffectiveness presented in this northern region.

Hence, in survey of an educationally-skewed global to institutional perspective, and while the impetus and mechanisms of postsecondary education, fresh water basin governance, and knowledge dissemination differ throughout the World, Canada, and Manitoba - there is a common acceptance that situated human beings 'of place' influence, and are influenced by, the challenges imposed by watershed sustainability and *awareness* (Glennon, 2009; Jeffrey et al., 2015). New influences of transient societies and cultures on the natural world, nation, and region, are impelling only an ephemerally interested student constituent to forge a more responsible alliance and ethic with the environment. Maintaining a 'decision space' (Ruggiero, 2013) and not 'wanting' to know and learn, leads to a citizenry not doing anything (Scalet, 2007). Geographically anchored

educational institutions must play several roles in responsibly shaping the ecological integrity inherent in a local 'lay' reform (Leung, Yen & Minkler, 2004).

### **My Northern Manitoba Educational Perspective and Positionality**

As remote communities in northern Manitoba are characterized by low levels of fresh water supply, community organizations have identified the improvement of fresh water as an objective as early as 34 years ago (Gillies, 1975). These concerns are nothing new. For instance, a 1973 provincial planning document titled "Guidelines for the Seventies" proposed that "*promotion of public participation in the process of government and in development decisions will affect all Manitobans in the years ahead*" (p. 9). As a developing goal, Gillies (1975) suggested that attention be directed toward incorporating "*ongoing training, education and evaluation components into a water service improvement program*" (p. 69); and that such components would be essential for successful regional management and program adjustment guidelines to future conditions.

So, to weave my dissertation's premise and meet challenges of shifting (i.e., vocational to university) demands for instruction, I enrolled in the Natural Resources Institute (NRI) doctoral program at the University of Manitoba in 2008 to further my interdisciplinary knowledge. My interest in adult and Popular Education Theory stems from 20 years of Natural Resources Management Technology Program facilitation in The Pas, and 12 years of employment experience, generated perspectives, and biases related to resource management in this same northern Manitoba region. It is here that I have observed first-hand the nature of crises facing adult learners and the sometimes

ineffectiveness of community development, tax incentives, limited technology, and traditional Euro-dominant educational approaches aimed at empowering local residents intended to take action on regional fresh water issues that are perceived to, and should concern them most.

In effect, even the prediction of fresh water availability regionally underscores its finite nature. Access to fresh water, more than any other factor, determines the maximum population capacity of a region (Glennon, 2009). Subsequent educational challenges take on a serious aspect in remote northern Manitoba because the educational mechanisms to monitor freshwater use are ill-developed and demand fundamental change. Participatory epidemiologies are rare in communities where perceptions of empirical data are dominated by distrust and small population sizes that limit cross-cultural interpretation (McLachlan, 2015, unpublished). In essence, this northern provincial region is facing a ‘disconnect’ in ecological strategy, regional employment, and inclusive curriculum delivery related to respectful assessment. Consequently, my research is intended to not only expand on these provincial, regional, cultural, educational, and behavioral thoughts, but give interdisciplinary contribution to the field of popular adult education.

A great deal has been written about participation and improvement-oriented change and it could very well be relevant to practitioners working hand-in-hand with the disenfranchised adult learner in remote northern locales (Avrich, 2006). Unfortunately, little has been written about the implementation, evaluation, and practical application of place-based methodology as it pertains to a remote northern Manitoba and educational context, and this is the research gap my thesis addresses. Hence, the results of this dissertation are expected to be tremendously relevant to practitioners here in the north, in other parts of Canada, and the Global populace.

Finally, in national, provincial, regional, and institutional examination studies, post-secondary enrollment in natural resources programming is in decline and northern attrition rates continue to soar (Sims & Falkenberg, 2013). Contemporary demand for experienced resource professionals, however, increases – a negative and correlated trend that presents the entire discipline with an urgent and critical challenge as world economy is predicated on the wise use of fresh water and the conceptual links between environmental context, content, and educational challenge framed by need, response, and solution related to evaluative and behavioral accountability.

Who benefits and who loses from chronotopic (i.e., of time and place) educational priorities is really the question. No one should be left in a position without a high level of literacy regarding fresh water sustainability and limit. Such literacy should be part of everyone's basic education and "*it's definitely time for an attitude adjustment*" (Leahy, 2014, p. 117). As usable fresh water may become increasingly scarce for this millennial generation, responsible situated experience must become increasingly ubiquitous for this "*generation of gratification without sacrifice*" (E. Stepaniuk, my Mom, personal communication, 2014). Reflecting these sentiments, at the 1968 General Assembly of the International Union for the Conservation of Nature and Natural Resources, Baba Dioum forwarded the much anthologized statement:

*"In the end, we conserve only what we love. We will love only what we understand. We will understand only what we are taught".*

## **The Research Question, Objectives and Purpose**

Converging from issues above, I have developed a research project I believe will improve remote northern post-secondary student success and cross-cultural learning modalities while reducing student attrition. My study's purpose posits: how can a remote northern educational programming framework integrating quantitative and qualitative approaches improve environmental learning and fresh water awareness required for academic success? With a focus on an integration between situated/experiential learning and didactic erudition, an ancillary question is: how do educational institutions, available technology, and lesson delivery relegate remote Indigenous students to what some consider a peripheral academic position? I expect by conceptualizing Indigenous communities as remote learning populations in vast geographies that it will be possible to look beyond individual student factors and focus on provincially-accommodating arrangements between situated theories, didactic erudition, and mediating technologies.

As suggested by Dewey (1938), educational research must begin with a 'concern' arisen because of a need, an interest, or a requirement. In concert with views expressed by Goble and Brooks (1983), educational research should not remain the exclusive domain of experts. Rather, research must draw extensively from efforts of 'place-based' educators and students. Accordingly, research opportunities provided, examine purpose, structure, and local paradigm(s) of those northern residents and students included.

Hungerford and Volk (1990) state such 'problem-based' situated engagement (Lave & Wenger, 1991; Rule, 2006) truly contextualizes knowledge while promoting development of greater skills and confidence in self-directed legitimate peripheral participatory (LPP) learning. Davidson-Hunt and Berkes (2003, p. 4) confer suggesting

learning does not occur in the abstract, “*it emerges through individual action situated in a social-ecological environment*”. Hence, my research evaluates instructional outcomes in two basic contexts: 1) a didactic classroom lecture; and 2) a social and situated learning field exercise integrating a modified participatory video (PV) method as a communicative technology to channel paradigmatic perspectives and traditional cultural expressions from quantitative testing and then to integrate these empirical findings with qualitative open-ended unsolicited interview response and assessment.

Conceptually, my research is closely related to live-in community training and local university recruitment providing opportunities for legitimate peripheral engagement: students learning from, and working in cooperative skills-based designs to monitor fresh water availability related to survival. As aspects of cultural plurality and foreign metaphors have led to this mixed quantitative and qualitative research design and data collection; germane review of triangulated agentic concepts was a first step.

For instance, I have incorporated perspectives of Creswell (2003), Guba and Lincoln (1994), and Thomas and Brubaker (2000), who have all written extensively on competing world views (i.e., strategies of inquiry) in mixed-methods research and overlapping euro-dominant research paradigms. From a complementary ‘Indigenous research’ perspective, I also considered research-related beliefs of Atleo (2012), Cajete (2000), Tafoya (1982), and Wilson (2008). Like these Indigenous scholars, I believe ontology and epistemology are based upon relationality, while methodology and axiology are based upon maintaining some form of relational accountability. Suspicion aside, my perspective of a traditional knowledge (TK) and science knowledge (SK) merge is recognized as a valuable source of data. As the relationship between technocratic science and TEK play out in my academic life, it is increasingly apparent that the diversity in

everyday classroom experience means there are multitudes of association regarding student learning and cultural preservation. Assumptions are diverse and ingrained, but fascinating to ponder.

Culturally, differences between dominant society and traditional Aboriginal world views seem equally irreconcilable, but like Berkes (1993), I believe the question cannot be settled by reference to any one homotopia (*sensu* Foucault). It may be that traditional knowledge (TK) and scientific knowledge (SK) are simply “*the result of the same general intellectual process of creating order out of dis-order*” (p. 3). Unlike Wilson (2008, p. 111) however, I do not believe the answer is a handbook of Indigenous research methods. Methodologically, my core intention has been that all mixed program and culture participants of this research and ‘their’ associated paradigms experience identical instructional opportunity and evaluative clarity. Subsequently, choice of any and all strategies that were selected depended upon what I could do well in my northern setting while linking these narratives to reflect a regional research *gap*.

Unfortunately, the literature remains underdeveloped regarding cross-cultural integration and assessment of psychic structures, learning modalities, and extra-rational perspectives in this region. Missing from andragogy discourse is a focus on assessing mixed and qualitative ‘constructs’ (i.e., beliefs, feelings, values, and emotions as meaning systems) including overt transformative behavior and critiques of extraordinary events or ‘aha’ or ‘eureka!’ moments (Dirkx, 2006; Mezirow, 2000), and the affirmation of non-formal and experience-based knowledge and skills.

Justifiably, there is dire need for adragogical undertakings that promote multi-stable reflection on cultural epistemologies and beliefs while supporting opportunities to learn about (and take part in) educational improvement. It is my assumption following

two decades facilitating and researching in this region that multi-cultural insertion, knowledge of learning modality, and competency in skills acquisition will help foster an opportunity to bridge perceptual interconnections and search for unity in multiplicity (Giri, 2002; Puligandla, 2000). Failure to accurately assess and target strategic educational sectors using non-conventional deliveries will without doubt result in uninformed local opposition to fresh water conservation initiatives.

A significant **imbalance** exists in northern Manitoba. Institutional-based training mandates a significant Euro-dominant and academic investment imposing social stressors on learners who tend to leave studies before program completion. Natural Resources Management Technology graduation rates between 2002 and 2016 were as low as 12% (UCN statistic). To counter this imbalance, institutional resources must be allocated to those who will play a role in environmental decision-making and cross-cultural program implementation. A potential solution exists in skill transfer and engaged overt behavioral advance that is achieved effectively: training provided as and when needed, minimizing socio-cultural stressors while positively affecting local learning outcomes.

Here sits the research gap and synergistic opportunity for my research; an educational curriculum development *perestroika*. As defined by David Orr (1994, p. 17) “*perestroika*” refers to; “... a general rethinking of the process and substance of education, beginning with the admission that much of what has gone wrong with the world is the result of education that alienates us from life”. Assuming combined resource-related educational programs and strategic provincial aims (i.e., 2003 Manitoba Water Strategy) seek to build understanding in engaged fresh water monitoring, this research suggests an unexplored northern and educational gap.

## Thesis Organization

This first chapter (**Chapter 1**) has comprised a brief but fundamentally urgent ‘context-preview’ and posited purpose for my research - clarifying global, national, provincial, regional, and institutional perspectives on the importance of, and threats to, fresh water by highlighting the nature of the educational crisis in northern Manitoba, and more generally Canada.

**Chapter 2** summarizes relevant background literature including a review of Popular Education philosophy in the context of Situated Learning Theory and ‘northern-living’ culture. Additional background review includes: assumptions and principles of adult learning; Canadian to provincial Indigenous education and attainment; northern Manitoba bi-cultural dialectics; socio-cultural relevance in post-secondary curricula; and community roles in fostering watershed education and awareness. The latter represents a rationale for development of agentic engagement in a northern Manitoba - UCN context.

**Chapter 3** offers a method framework for Chapters 4 and 5 conceptualized as an eight-phase research design sequence including field-based activities involving an interpretive and naturalistic approach, first to observe holistic student action in a natural in-stream setting, and second, to code the outcomes of ‘unsolicited’ open-ended student interviews. Exploratory factor analysis is suggested in this chapter to map new and unknown domains, examining correlations among eight independent quantitative variables (used in Chapter 4) and 19 surfacing qualitative themes for each of the four different non-traditional lesson types (used in Chapter 5).

**Chapter 4**, explores the role of participatory video and situated learning in facilitating ‘academic’ performance by comparing the impacts of a didactic classroom

lecture to three non-traditional educational methods. Outcomes of quantitative testing focus on *concepts* and *applied learning* skills related to monitoring stream discharge and an increased awareness about the importance of fresh water in northern Manitoba.

**Chapter 5** extends University College of the North's search for cross-cultural and environmental traditions from surrounding Indigenous communities in order to better understand and enhance northern Manitoba's postsecondary education and associated assessment by providing learning strategies and improved student understanding while honoring local expressions. Objectives characterize learning experience regarding fresh water management, and assess how these experiences result in changes not only in academic scholastic efficacy performance (Chapter 4), but in awareness and behavior according to lesson type while assessing cultural modalities and qualitative integrated insight into the demands of ecological training in the North with an *affective* dimension. Emerging latent constructs provide a unique measure of verification to 'unsolicited' northern student response combined with academic test scores.

**Chapter 6** provides an informing discussion summarizing concluding thoughts surfacing from heuristic and mixed investigation of non-traditional situated lesson deliveries and holistic assessment while **Chapter 7** forwards recommendations that advocate lesson delivery and integrated quantitative and qualitative assessment be set within the context of the learner's past, current, and future experiences.

## Chapter 2: Critical Literature Review

Because global-to-local scale challenge to educate adult students may be examined from a variety of disciplinary perspectives, several bodies of literature were considered. Critical review is based upon three specific themes raised in Chapter 1. These include: 1) popular educational theory and northern living cultures; 2) ecological andragogy in socio-cultural relevance; and 3) institutional roles in generating watershed awareness, apprenticeship, and northern technical skill. This critical review pays special attention to ‘northern’ gaps in the literature related to fresh water and each of these narratives.

### Popular Education Theory and Northern-Living Culture

Within the discipline of adult education there exists a wide range of strategies for inquiry regarding the purpose of knowledge and skill acquisition. *Popular Education* is one such learning orientation that is cross-culturally inclusive and the paradigmatic direction selected for this northern Manitoba inquiry as my intent is to maximize the context of environmental learning making sure my research is about consciousness-raising and truly making a positive academic difference with students in the North.

Popular Education (PE) emphasizes learning for the purpose of enabling people to participate. The notion of ‘popular’ refers to the idea of education ‘*by*’ and ‘*with*’ those seeking knowledge and skills to prepare a self-reliant and economically viable graduate capable of living industriously within the local status quo (Silver, 1965, p. 236). Johnson (1981) defines PE as that which “*starts from the problems, experiences, and*

*social position of the excluded*” (p. 813), a statement underpinned by a belief that community residents should be leaders in deciding what developments are needed in local institutions. At the center of PE theory lies the challenge of helping learners come to know and tell ‘their’ stories to others. This translates into education which is learner-centered rather than vocationally-didactic and local skills that are situatedly assessed. It builds on issues and experiences of learners rather than materials designated by experts. In so doing PE: 1) helps participants understand ‘their’ chronotopic (i.e., of time and place) situation; and 2) helps them act strategically for the purpose of realizing timely and local awareness regarding responses to *their* agentic concerns.

Popular education advocates promote “*innovative learning intended to foster change*” (Buttedahl, 1985, p. 95). Advocates reject the notion of education as didactic transmission or ‘*banked learning*’; they stress a dialogic model between educator and student, and they pursue PE channels as the main device of collective emancipation with topic sessions tweaked practically and focused on daily life matters. Simply, PE is defined as an educational technique designed to raise participant consciousness allowing awareness of how personal experiences are connected to larger societal problems.

Popular education is rooted in the real interests and struggles of the ordinary. It has everything to do with the knowledge-struggle for a more ‘just’ social order (Crowther, Martin, & Shaw, 1999, p. 4). Curriculum comes from concrete experience and material interests of ‘at-risk’ participants in communities of ‘resistance’ and isolation. Its andragogy is collective, focused primarily on group learning and, wherever possible, forges a direct link between education and democratic access to a debate about what counts as worthwhile. Consistent with *purpose* in Chapter 1 and my triangulated narrative presented here in Chapter 2, PE theory seeks to connect the local with the global

- and a wider international struggle for educational awareness and the architectural design for environmental justice (Flowers, 2004).

Pragmatically, PE highlights the value of examining agentic questions related to place-based paradigms and perspectives. To exemplify, an Indigenous focus group may state they want to learn to calculate how much fresh water is flowing in a river. Training providers could respond with pre-packaged courses. But in such a case, the content and andragogy of the ‘packaged’ course may reflect the interests of external, foreign, and non-Indigenous trainers and not those of a regionally-situated interest. If, on the other hand, residents were given andragogical support structures to develop the content and control the local challenge (and responses) themselves, this would become an exercise in PE – and emphatically a sincere personal goal of my doctoral research.

With respect to ‘northern Indigenous living’, the link between PE and ‘culture’ is longstanding (Steele, 1999, p. 97). Popular education is not simply about making education more accessible, it is about designing education so that skills, cognitive templates leading to changed values, and learning modalities of regional participants are provided the opportunity to shape and participate in a curriculum. Neuburg (1971) posits we should continually remind ourselves how education privileges the interests and knowledge of certain groups of people - at the expense of others. Provincially, Martin (2014) believes everyone thinks pursuing northern Indigenous values and beliefs is a great idea, “*but no one has defined what it means. University College of the North needs to discuss with its broad community exactly how it can best be applied to academic programming, student recruitment, employment and career progress*” (p.6).

Distinguished from education concerned principally with social change, Cadena (1984) and Vio Grossi (1981) suggest PE seeks only to implement an alternative to adult

education in aiming to promote ‘critical consciousness’. This is done by diligently expanding *engagement* and assessment of individuals apprenticing. Interestingly, science in particular has triggered many PE transformations throughout history, but in order for a participant to gain membership, they must engage in ‘*requisite role enactments*’. Hence, as students come to know this world, they will act on it in order to change it. Freire (1970) aimed to shift learners from passivity to a critical and active ‘awareness’ using the term “*conscientization*” to describe this same transformation. He argued that community and youth should avoid standardized curricula and use local knowledge and agentic issues as the basis of all educational initiatives.

Despite debate in adult education domains, PE as an approach has been widely accepted by educational practitioners seeking learning advantages for the empowerment of ‘disadvantaged’ learners (Arnold, Barndt, & Burke, 1991). And, although there are various approaches used for implementing aberrations of PE, the most recent advancements in the literature are by the means of community-centered and *situated* action research-based approaches to sharing power which emphasize support communications, information transfer, and the creation of local power (Ribot, 2016).

### **Situated Learning Theory and Indigenous Relationality**

The model of situated learning (SL) has likewise met with much acclaim, interest and censure. The literature reveals a wide diversity of case studies, but voluminous research suggests the SL approach can be used successfully as a model of instruction (Barab & Roth, 2006; Bransford, Vye, Kinzer, & Risko, 1990; Davidson-Hunt & Berkes, 2003; Griffin, 1995; Oakes, Riewe, & Kinew, 1998). Optimistically, Farnham-Diggory

(1992) proposed the theory “*be recognized as a genuinely new educational model ... I believe it is where contemporary scientific principles lead us*” (p. 558).

Credit in providing the research base for ‘bridging apprenticeships’ (Resnick, 1987) and SL theory includes Bronfenbrenner (1990), Dewey (1938), Lave and Wenger (1991), and Vygotsky (1978). These approaches are viewed as a means of *bridging* the normative gap between theoretical learning in the context of formal instruction and in-vivo application of knowledge in the apprenticing environment. Hence, a means of achieving authenticity is thought to be inherent in these models of cognitive apprenticeship approaches designed to “*enculturate students into authentic practices through activity and social interaction, and based on the successful and traditional apprenticeship model*” (Brown, Collins, & Duguid, 1989, p. 38).

In relation to classroom practice, Brown et al. (1989) were the first to incorporate SL in an instructional model with classroom implications. In developing their model, they identified effective examples of learning in a specific context *and culture*. Examples were located in traditional school subjects (e.g., reading, writing, and mathematics), as well as other areas of instruction (e.g., skiing and meat cutting) in which learning time was decreased from two years to two weeks (Burton, Brown, & Fischer, 1984). An analysis of common features across successful models revealed six critical factors including: *apprenticeship, collaboration, reflection, coaching, multiple practice, and articulation* (McLellan, 1991). No mention of integrated assessment was noted.

Regarding Indigenous relationality and cross-cultural learning, SL research for Indigenous peoples has been described by Wilson (2008, p. 8) as a “*ceremony that brings relationships together*”. Indigenous epistemology then, is about ideas developing through a circling formation of relationships. As such, an idea (or learning) should not be

taken out of its relational context and be given isolated definition (Lave & Wenger, 1991; 1998). Everything needs to be seen within the contexts of the relationships represented (Dewey, 1966; Steinhauer, 2002).

As in a Euro-dominant constructivist paradigm, there are multiple realities in an Indigenous ontology. The difference however, is that rather than the truth being something ‘out there’ or external, reality ‘is’ in the *relationships* (Wilson, 2008). It is important to recognize that northern based epistemologies include the combination of entire systems of knowledge and relationships (e.g., interpersonal, intrapersonal, environmental and even spiritual) (Wilson, 2008, p. 74). Some of these include developing values and rich insights (or eureka! moments) that reduce cultural segmentation. The question becomes; how can the same lesson ‘space’ be delivered, examined, and evaluated methodologically in different ways?

Without showing respect to an Indigenous concept of place, results are simply ‘information’ without integrity (Berkes, 1998; Cajete, 2000; MERN, 2014). Hence, ideal education must involve an awareness of the importance of ‘place’ (Oakes et al., 1998, p. 93) and there must be the same kind of relation between humans and the environment as there is among humans (Wilson, 2008). In an Indigenous paradigm, there is no distinction between relationships made with students and those perceived with the environment – both are equal. Logically, then, the environment is knowledge; as knowledge itself is held in the relationships and connections formed within the surrounding environment and participants (Berkes, 1998; Davidson-Hunt & Berkes, 2003; Wilson, 2008). This paradigm is inclusive of fresh water availability and sustainability.

Interpretation of this ‘context of knowledge’ is necessary for situated (and didactic) knowledge delivery to become lived and part of the “*web of relationships*” (Wilson, 2008, p. 102). Such firsthand experiences are vital in connecting new students to ‘their’ primary learning modalities in the natural and social world. Moreover, such *constructs* must be considered together in the moment, as no researcher or student can exist without relation to time and place. Situated provincial diversion of rivers, displaced northern communities, high attrition rates, and unemployment are contextual justification – and the University College of the North’s importance of place with respect to adult learning, apprenticeship, and these local constructs is paramount.

### **Assumptions and Principles of Adult Learning**

For decades, theorists have sieved generalizable concepts of andragogy that aid PE and SL theories of Indigenous relationality for ‘real’ practice. Offerings suggest all kinds of desirable practices while *conditions*, *concepts*, and *observations* advocate that learning must be problem-centered, experience-based, and meaningful. Initiates are assumed to: 1) be adults; 2) be purposefully searching to engage in knowledge and skill acquisition; 3) be aware that exploring experiences will be collaborative; and 4) bring a ‘two-or-more decade’ collection of experiences gelled from their own unique histories.

As early as the turn of the century, Anderson and Lindeman (1927) declared that *adulthood* was a growing awareness of self, and a readiness to make existential choices. A half-century later, Miller (1964) identified motivation as a ‘*condition*’ for learning. In a review of applicability, Kidd (1973) identified ‘*concepts*’ changing in an adult’s life span that were directed by evolving societal imperatives, emotion, and attitudes that

surrounded aging. And from ‘*observations*’, Knox (1977) posited personal characteristics were encompassed by context, and a pace required for achievement.

Mezirow’s (1981) interpretation of ‘knowing’ navigated a ten-item inventory of educator practice from observation. James (1983, p. 132) reported that: 1) adults were highly diversified with widely differing preferences, needs, backgrounds, and skills; 2) experience was a major resource in learning situations; and 3) that self-concept moved from dependency to independency as individuals grew in responsibility, experience, and confidence. Analogously, Conti’s (1985) research yielded ‘*clusters*’ stating that learning was best acquired when educators function as ‘facilitators’ rather than didactic instructors, and when learning activities are deemed to have direct utility to the learner. Parrish (2010, p. 88) similarly described learning as happening in ways that decenter the educator, placing her or him “*on the periphery of the learning process*”.

Chronologically, and for all intensive purposes, the field of adult education has seemingly long-relied on theories of development grounded in concepts of *behavioral* progress (Schwandt, 2007). Unfortunately, the literature remains underdeveloped regarding the integration and assessment of psychic structures and extra-rational perspectives (particularly so in the remote north). Missing from andragogy discourse is a focus on assessing qualitative ‘constructs’ (i.e., beliefs, feelings, values, and emotions as meaning systems) including overt transformative behavior and critiques of extraordinary ‘eureka!’ events or ‘aha’ moments (Dirkx, 2006; Mezirow, 2000). Simply, integrated assessment of scholastic efficacy and affective development remain ill-addressed.

Inopportunately, the notion that empirical quantitative evidence is hierarchically more important than constructs of cultural and qualitative belief has spread through western philosophies (Atleo, 2008; Hampton, 1993; Oakes et al., 1998). Circular

dialogues are considered disorganized and the ‘ideal’ of linear logic and empirical quantitative study in research is dominant in most post-positivist science teachings (Lincoln & Guba, 2000; Phillips & Burbules, 2000). Unfortunately, and in reality, this linear delivery is facilitated in many remote northern areas. Tafoya (1995) and Kanu (2011) explain this empirical western method *disconnects* complexity and relationships which allow the student and researcher to function ‘optimally’. Alternatively, circular and culminating actions are what ‘ceremony’ is about –as searching similarity and coupling participants with the environment in which they live prevents such loss of resilience, “*not only social but social-ecological in nature*” (Levin, 1999, p. 33).

Dominant written discourse (i.e., didactic delivery) has not helped this process. Because an idea is formed by relationships within a specific context, knowledge of what the adult brings to a relationship – or ‘*their*’ understanding of context – is needed in order to transmit an idea in addition to the content in the methods. As fixed objects, foreign metaphors and didactically presented ideas lose the ability to grow, change, and be assessed – they lose relational accountability (Wilson, 2008, p. 123). As a result, local experience enabling transparent expression followed by fair evaluative assessment have a great deal to offer. For instance, according to Steinhauer (2002), “*Indigenous peoples think and interpret the world and its realities in differing ways to non-Indigenous peoples because of their experiences, histories, cultures and values*” (p. 8).

Irrespective of an ‘extra’ intellect, Dei, Hall, and Rosenberg (2000) explain Indigenous knowledges are unique to given localities and societies, and are “*acquired by local peoples through daily experience*” (p. 19). The teachings must therefore come from the people, and it is the *teacher* who must extract this information from the students (S. Harper, personal communication, 2017). Consequently, developing these literature-

amalgamated paradigms, focus group core concerns, and northern living resident data collections increases the possibility that my research with Indigenous participants and students will, according to Graveline (1998, p. 57) and Weber-Pillwax (1999, p. 38), be “*a source of enrichment to their lives and not a source of depletion or denigration*”.

In light of these methodological concepts, Indigenous scholars make clear lists of criteria so that ‘dominant-society’ universities and researchers can examine and adopt appropriate procedures and methods (i.e., research approval, fidelity) (Atkinson, 2001). And resultantly, by incorporating ‘blended’ functions and deliveries, like those reflected in this chapter and the next, Indigenous worldviews can be honored as an ‘activity’ rather than “*university students sitting around talking about it*” (Wilson, 2008, p. 122). It is in this Chapter, that critical methodological justification provides validity for my research and methods.

### **Canadian to Provincial Indigenous Education and Attainment**

Adult education, northern-living, and Indigenous scholastic issues are presently a burgeoning area of study in Canadian universities. One reason is that in Canada’s history, Indigenous populations have displayed spectacular shifts in numbers (Statistics Canada, 2011). According to Stonechild (2006), Europeans are generally indifferent to Indigenous education, and as a product of colonization, a two-level system has developed: 1) colonizers owning; and 2) the colonized providing an unskilled, seasonal work force living at (or below) subsistence levels (Frideres & Gadacz, 2008, p. 4).

As of the 2016 Statistics Canada National Household Survey (NHS), Aboriginal peoples of Canada totaled 4.9% of the national population. Piche and George (1973), as

demographers of more than 30 years ago, estimated the registered Indian population would approach 700,000 as we entered the 21<sup>st</sup> century; a result coinciding with Statistics Canada (Projections, 2005) information indicating a Registered Indian Population for Canada equal to 977,230 (Squires, 2017). Indeed, 14.2% (or 223,310) of that total is found in Manitoba. Accordingly, contemporary demographers predict that status Indians will continue to have higher growth rates than the Canadian population for decades to come (NHS, 2014).

Such population profiling permits national analysts (and educational researchers) to understand the kinds of programs that may be shaped to deal with pedagogical and andragogical challenges facing Canada's culturally pluralistic society as resultant change in social milieu is having a serious disruptive academic influence. Since the 1970s, educational pedagogy and andragogy have fundamentally been dominated by an assimilationist curriculum. Even today, the curriculum used in Aboriginal schools is regulated and designed by a Provincial standard unaccommodating to multiple cultures.

While there has been a dramatic increase in the number of Indigenous students attending post-secondary institutes since the early 1960s, it is estimated that 80% are in a college program working toward a certificate or diploma being prepared for jobs at a semi-skilled level or lower. In 2001, only 23% of registered Indigenous people had attained a post-secondary certificate, diploma or degree; but for non-Aboriginals, the rate was almost 40% (Frideres & Gadacz, 2008, p. 22). Moreover, this statistic is associated with all the 'technological advance' of the past two decades - inclusive of University College of the North's student service. Grippingly, Manitoba's demography is posited to significantly change between 2018 and 2040 resulting from an aging population, the influx of international immigrants, rural-to-urban migration, and the growth of a northern

Indigenous residency forecasted to reach 335,000 (or 22% of the provincial population) by 2036 (Wixon, 2017).

Complicating social policy dilemmas further, is the educational challenge concerning academic attainment between Aboriginal and non-Aboriginal Canadians. Fracture is particularly prevalent in Manitoba (Richards, 2008). Data collected since 1981 illustrates evidence of this educational gap between Aboriginals and non-Aboriginal Manitobans at every level of attainment, including post-secondary education (Frideres & Gadacz, 2008; Atleo as cited in Simpson, 2009). Current data reveals no change in the Aboriginal/non-Aboriginal gap for the past 20-years. In fact, recent (2014) census data show a widening Aboriginal/non-Aboriginal fracture (NHS, 2014).

While younger Aboriginal people are indeed seeking more education than previous generations, they have not kept pace with the increase in education among other Canadians. Completion results have remained static at 40% over the last three, five-year censuses (NHS, 2014; Simpson, 2009). Mendelson (2008) suggests that improvement in curriculum development is the key to (pre-tertiary) reform as it is almost always the case that 'low' education levels condemn learners to fail 'academically' in present economies. Regrettably, effective cross-cultural approaches to learning and technical skills training remains ephemeral in this northern region, and Manitoba's academic profile (specific to certificate, diploma and degree) provides an unfortunate graphic portrayal of this disparity between northern levels of educational attainment (13%) compared to the wider province (27%) (Wixon, 2017).

Foundationally, an even more disturbing statistic is the provincial on-reserve high-school completion rate in Manitoba (NHS, 2014). For those aged 20 to 24; completion is below 30%. Corresponding University College of the North Natural

Resources Management Technology program enrolments and graduation statistics from 1993-2015 indicate somewhat similar results showing totals of 680 and 209: a 30% graduating success at best. But, as Martin (2014) states, graduation data are ‘*mushy*’ because University College of the North has not translated course registrations very well. Further, what in-house statistics do not show (nor defend) is elapsed time for program/diploma completion – in some cases between four and seven years.

In recent decades, the importance of a ‘formal’ education has become even more pronounced (Wakefield, Sage, Coy, & Palmer, 2004). Indicators include employment rate and successful competency of *knowledge and skills* imparted by a good education. The 2014 First Nations, Inuit and Métis Essential Skills Inventory Project (FIMESIP, 2014) identified five relevant ‘markers of promising practice’ through its literature review and case study including: 1) control and ownership; 2) working with and in the community; 3) holistic and learner-centered approaches; 4) principles focusing on Indigenous learning, and 5) employer involvement providing direct workplace experience. This community and competency-based educational philosophy is continuing to gain favor across higher education because of its ability to get students to degree completion faster, cheaper, and on a flexible learning schedule.

Ultimately, successful participation in modern Canadian economy not only requires that Aboriginal education levels converge with non-Aboriginal levels (Richards, 2008), but that successful competency of knowledge and skills is imparted as all students must be flexible to participate in an increased and typically non-permanently-structured engagement and apprenticeship in remote regions. Many northern-living students however, simply do not perceive themselves as represented in Euro-Canadian curriculum (Dickason, 2006; Wilson, 2008). Lack of education and technical expertise continues to

keep northern Manitoba's remote learners out of the new knowledge and skills-based economy (Archibald, 2008; Tafoya, 1982). As stated by Atleo (2012), and Mendelson (2008), Indigenous people, as a marginalized community, can only escape poverty through an educational transformation.

Shawn Wilson (2008, p. 35), and Doris Young (personal communication, 2016), both Cree scholars from The Pas, Manitoba, question even the paradigmatic strategy of inquiry. Granted, Indigenous peoples have played an important role in Canada's development, but "*as the 20<sup>th</sup> century has emerged, lack of technological skills (has) relegated Aboriginal people to second-class citizens*" (Frideres & Gadacz, 2008, p. 8). This fact is particularly significant regarding provincial education when six of Canada's 20 largest bands are in Manitoba. The unfortunate reality is there are northern cultural groups and demographic cohorts who do not accept or who are otherwise unable to take advantage of conventional programming (e.g., mismatched with curricular structure, geographic isolation, foreign metaphors, scheduling, and teaching process).

Moreover, across the country and province, student debt levels are rising. Public student debt owed federally is more than \$15 billion (NHS, 2014). An additional \$73 million is owed to the Manitoba provincial government, where the average student loan is more than \$25,000 (Arte, 2014). In 2011-12, loans increased by 18% signifying there were 20% more students who met the provincial financial needs assessment criteria and who, essentially, were unable to afford education without financial assistance. This is yet another clear indication the education system (not access to information) is becoming increasingly inaccessible. Marginalized northern communities, First Nations in particular, are debt averse and are unable to qualify for equity-based loans, causing them to self-select out of post-secondary education. The real choice for those who responsibly

need financial assistance isn't whether or not to go to school, but whether to take a huge financial risk to do so while wage increases are ill-to-negatively correlated with local prospect and employment is temporal.

Hence, the provincial University College of the North Act of 2016 proclaiming a somewhat unique two culture (i.e., college and university) hybridization; as well as a governance structure that is both unique (i.e., an Elder's Council) and increasingly common in Canadian universities (i.e., Learning Council and Governing Council) gives good reason for reflection regarding my research purpose, in part because: 1) the present economy demands increased skills-oriented graduates; 2) community apprenticeship and assessment are desperately needed; and 3) northern cross-cultural dialectics hindering post-secondary matriculation and retention of remote learners are still widespread.

### **Northern Cross-cultural Dialectics**

Once dependent on Indigenous mindfulness for food preparation, travel routes, fishing and survival skills, Cree traditional cultural expression (TCE), 'mindfulness', or 'traditional ecological knowledge' (TEK) was historically integrated into new euro-Canadian ways of life across this northern region. When perceived as 'useful', each was 'welcomed and assimilated' into provincial culture. Traced anthropologically (Stevenson, 2004), the TEK phenomenon is again of keen interest. Current awareness coincides with environmental consciousness (McKenzie, 2002), activism for rights (Phare, 2009), resource use (Kennedy, Beckley, McFarlane, & Nadeau, 2009), educational preservation (Atleo, 2001), educational design (e.g., *Kenanow*), and research growth due to "*the presence of a dedicated group of core scholars producing not only*

*academic material but feeding information into international policy* [Berkes, 1999] *legitimizing knowledge research in Canada*” (Oakes, Muir, & Joseph, 2000, p. 12).

Alternatively, there is suspicion of TEK’s ‘scientific’ merit (Berkes, 1993; Grosheide, 2002; Nadasdy, 2005; Steckley & Cummins, 2008; and Sutherland & Henning, 2009). As Bocking (2005) submits, TEK results in millions of dollars being spent on ignored studies that contribute little-to-no understanding of northern ecology. Widdowson and Howard (2009) propose that even the social scientist tendency of “*wanting to believe TEK has value*”, misappropriates funds towards institutes inclusive of the Natural Resources Institute (NRI) at The University of Manitoba.

Hence, in the wake of post-positivist research paradigms that still flourish in multi-stable cultural examination and education, there has been, and continues to be, a great deal of thought regarding the appropriateness of differing research paradigms, methodologies, methods, and theoretical models (Wilson, 2008). Fortunately, new ways are ever-evolving in favor of models and frameworks grounded in paradigms of participatory collaboration (Zandvliet & Sammel, 2002), apprenticeship (Ricard, 2017), and affective competency philosophies (Brown, 2004).

In times of rapid local technological and cultural acceptance, however, ‘traditional ways’ are often seen as incompatible with the requirements of contemporary educational order. At the same time, remote community survival is particularly dependent upon becoming more adaptive to such paradigms. Unfortunately, increasing complexity necessitates the relay of a greater amount of ‘knowledge’ to new students. Progressive just-in-time specialization of education must ensue. The lack of ‘accepting’ new educational models is at the heart of cultural and scholastic underdevelopment and the ability to participate gainfully in an isolated northern Manitoban workforce.

Traditionally, and framed from a deficiency perspective, resultant learning by remote adult Indigenous students in formal euro-Canadian classroom settings has historically been, and continues to be, labeled a performance problem (Atleo, 2001); but cognitive style, emic curriculum development (Malley, Smith, & Watts, 1992), and context must be realized as valuable (Lave & Wenger, 1991; MERN, 2014). The consequent challenge is that culturally different learning orientations and frameworks have not been systematically or fully acknowledged, assessed, nor considered in the construction of reciprocal model enterprise. Consequently, typical questions generating local TEK-SK debate at UCN include: 1) how to integrate two knowledge systems when one is perceived to hold power over the other?; 2) is TEK evolving into just an educational compendium?; and 3) how does UCN gain knowledge from an Indigenous Elders' Council and incorporate it in a manner understandable to respective University and College level learners without escorting an Aboriginal President from the property?

Humbly, there is a need to understand how Indigenous learning beliefs are similar to theoretical concepts that underpin Euro-dominant curriculum and model development, requiring direct input from the local community as the rate and pace of change is rapid and formal knowledge production increasingly lags for pragmatic utility (Atleo & Fitznor, 2010). Similar to Fitzpatrick and LaGory's (2000, p. 200) interrelationships among social and environmental challenges, the confluence of poor secondary education, injected urban program parasitism, and graduate unemployment, promote a metaphoric 'remote [educational] penalty' at UCN – an institution that does have a real local option.

## Multi-stable Perception and Realities

At first glance, and in bringing this first section of Chapter 2 to a close, this regional dialectic of Traditional Knowledge (TK) and Science Knowledge (SK) understandings of ‘mindfulness’, appears as opposites; whatever TK is, technocratic science is not. However, Harman (1989) posited an earlier bicultural notion emphasizing participatory and experiential research would help ‘bridge this perceived gap’, producing a super-holistic model that would build on the strengths of each cultural world view. Fludernik (1999, p. 30) likewise identified ‘blending’ as developing an active ground and a *method* of ‘cross-mirroring’ (that counteracted cultural perceptions of simultaneous absence and presence) based on individual and collective life experiences. More recently, Sutherland and Henning (2009), argue both these forms of knowledge should be valued and should contribute ‘equally’ to decision-making.

In a sense, each of us creates our own ‘reality’ by perceptual acts that we engage in, and thus, our perception of reality is best understood as a constructive process by which our brains build useful world models (Atleo & Fitznor, 2010; Restak, 1979). This theory of knowledge is the branch of education that studies the scope of knowledge and belief (Fishbein & Ajzen, 2010). Illustrating this principle with respect to application in the north is a century-old experiment using distorted goggles reported by Stratton (1897) that permitted him to see the world both upside down and reversed from side to side.

Initially, ‘memory images’ brought from normal life continued and objects were seen in one way but thought of in a *different* way. Stratton’s goggled-impressions between what he ‘knew’ and ‘saw’ made even the simplest task difficult. After one week, Stratton’s ability to function suddenly improved and he was able to walk

‘normally’. At this point, Stratton became accustomed to an upside-down, and right-to-left shifted world. Anxiously, he brought the experiment to a close and removed the glasses to find the reversal of everything from the order to which he had grown accustomed to. Fascinatingly, the bewilderment lasted several hours. Stratton’s experiments were the first to suggest perceptions are capable of profound modification, and we may still be able to adjust them ‘as adults’. Interestingly, the reason he could do so depended on his active exploration of the ‘new’ world by *touch* and *movement*.

From such experiments, educational psychologists have modified theories about learning and behavior (Fishbein & Ajzen, 1975). For centuries, scientists thought behavior was a product of our senses, but Stratton’s experiment led to the opposite conclusion: behavior can be determined by attention to knowledge that is perceived. By reaching out and interacting, perceptions and attitudes can revert toward stability. In essence, conception of reality may be explained as a construction based on statistical probabilities; and when these probabilities are skewed, perceptions can be demonstrated as wrong. But, we can correct for ‘errors’ if we *interact* with the stimulus; in a sense, we ‘see’ the world best after we have ‘felt’ it (Ajzen, 2005; Restak, 1979).

Regarding narrative commensuration in my thesis with respect to educational delivery and regional fresh water use, it is essential that knowledge and skill be locally ‘explored’. Posited by Atleo (2001), exploration of these processes “*requires us to move through several levels of analysis in the development of metaphoric blends so that the synecdochal activity, which weaves the native and non-native worlds together, may become more visible*” (p. 37). Interestingly, Gestalt psychologists are similarly adept at discovering phenomena concerning the way we behave in the world. Gestaltism refers to the form-forming capability of our senses. In fact, the word Gestalt means a unified or

meaningful whole; “*the whole is greater than the sum of the parts*” is a phrase used to explain Gestalt theory. Gestalt theorists state we are built to *experience* the structured whole as well as the individual sensations.

But Gestalt principles are by no means restricted to perception. *Learning* was something Gestalt psychologists were particularly interested in. One thing noticed is that we often learn, not the literal things in front of us, but the ‘relations’ between things (Atleo, 2011). For instance, gestalt theory is well known for its concept of ‘insight learning’; the idea we learn is to solve problems, and that the world we are experiencing is meaningfully organized. When we learn to solve problems, we are essentially recognizing ‘meaning’ in the experience (Lew & Hardt, 2011).

Consequently, all knowledge(s) must be considered from strategies and relationships that give meaning. For instance, if Indigenous peoples are not succeeding in “*number-based mathematics*”, how will they become the “*natural resource specialists*” that are so desperately needed (Phare, 2009, p. 196). Conversely, as Seager (1993) posits, if ‘technocrats’ continue to exploit from afar, how will moral traditional cultural expression develop when capitalist culture rationalizes environmental recklessness when it looks to the North? Indigenous and Euro Canadians alike need to acquire reciprocal ‘Louis Necker-like perceptual rivalry and understanding’ to self-actualize in the current world, all while making a ‘good living’ in modern society.

Regrettably, Euro-dominant development and technocratic education in the north remains ephemeral and contemporary academic action is soon irrelevant to the student and community, knowledge generation, and local employment (i.e., high dropout rates, negative attitude towards education, multi-program graduation, and the teen exodus from close-knit remote communities). Unfortunately, theories in educational agreement that

claim to ‘integrate’ TK and SK remain locally (and institutionally) skewed since the end-products so rarely have application or success in northern remote communities.

### **Ecological Andragogy and Socio-Cultural Relevance**

The premise underlying this next, and second section of my critical literature review is that decisions impacting regional, provincial and even global environmental concerns rely on data typically gathered by skilled technicians and technologists. In many instances, data collection demands would be well met with basic skill sets and training delivered as needed (or just in time), rather than a foreign knowledge base eclipsing job task requirements.

The reasoning and socio-cultural relevance is simple. More than 13% of Canada’s fresh water enters into and drains through Manitoba before emptying into the Hudson Bay (R. Weaver, personal communication, 2012). In total, water from a portion of three provinces, all three Canadian territories and four U.S. States, drains directly into Manitoba. Hence, as the drainage basin for much of western Canada and a portion of the Plains states, it is easy to understand how remote activities can exert significant impacts on the waterways that eventually flow into, and through, this province.

Impacts were recognized as early as a century ago. Stream gauging work began in Manitoba when the Dominion Water Power Branch organized the Winnipeg River Power Supply in 1911 (Journal 1914-147, No. 2, unpublished). One year later, in 1912, the Manitoba Hydrographic Survey originated to embrace all of Manitoba and the Lake of the Woods in Ontario. Following the transfer of Manitoba’s natural resources from Federal to Provincial control on October 1, 1930, a cooperative agreement was arranged

for the continuance of the Hydrometric Survey by both Governments. Today, the Water Survey of Canada is the main collector of hydrometric data in the nation, operating and maintaining approximately 2200 gauging stations across the country.

Primary data collected at these 2200 sites include water levels (stage) and river discharge. The ever-increasing demands for hydrometric data are reflected in the many, and diverse uses of fresh water to meet contemporary requirements and to ensure beneficial and wise planning (direct) for future (non-use) need (Government of Manitoba, 2003). Equally important is the need for awareness, knowledge, and behavioral insight regarding drought flows for effective and safe management of fresh water supply projects (Haque, 2005), irrigation systems, pollution control, floodways, storm sewers, culverts, bridges, economical design of control structures, and long-term watershed sustainability.

The 2003 Manitoba Water Strategy also envisioned the need for an effective and transparent method of implementing a strategy crucial to ensuring long-term conservation of water resources stating that the *“development of this implementation framework will be a participatory process that considers both present and future demands on our water, and ensures the protection of ecosystems”* (Government of Manitoba, 2003, p. 19). The strategy identifies six interrelated policy areas first introduced in 1990 including: 1) quality; 2) conservation; 3) use and allocation; 4) supply; 5) flooding; and 6) drainage. Each of these policy areas recognizes the important need for water ‘education’ but neglects to provide an engaged and generationally-traversing (mimetic) action plan. Simply, the proposed goal is to support and maintain Manitoba ecosystems while meeting the fresh water needs of all Manitobans – a holistic approach and vision. The government, through its commitment to sustainable development, has made it clear that all Manitobans share responsibility for water management and, *“any approach dealing*

*with water must include a cooperative approach that involves all citizens who depend on, as well as benefit from, our water resources”* (Government of Manitoba, 2003, p. 7 – *emphasis added*). Yet, in reality, strategic curricular development and the support of northern and tertiary educational aspects present as rhetoric rather than an objective.

### **Community-Institutional Role in Fostering Watershed Education and Awareness**

Besides the significance of northern living cultures, ecological andragogy, and socio-cultural relevance, the meta-ethic role of communities themselves in fostering environmental practice is paramount (Karkkainen, 2002). In concert with Charles and Mertler’s (2002), FIMESIP (2014), and Hands (2010) operating rules of research, the ‘community’ must be included as a central institutional goal for research (i.e., beneficence, importance, generalizability). Hence, community development partnerships with educational institutions can provide an authentic, credible, valid, and temporally sustained adjunct to this philosophy (Epstein et al., 2009). The Popular Educational perspective of a ‘situated’ learning theory thus plausibly links (i.e., relational accountability) my research objectives with community goals and environmental apprenticeship (Charles & Mertler, 2002; Lave & Wenger, 1991; Wilson, 2008).

Community-based participatory research is recognized as an effective response to shortcomings of *outsider* research when working with Indigenous northern locales (Mitchell & Baker, 2005). Elements include more equitable partnership, development of acceptable research protocols, opportunities for capacity building and employment (Minkler & Wallerstein, 2011), and Indigenous ownership-control-access-and possession (OCAP) of cultural knowledge and any ensuing research outcomes (Schnarch, 2004).

From an educational perspective, the issue is not which segments of the populace are deemed responsible for fresh water awareness, sustainability and governance. Rather, the focus is to devise better mechanisms to acculturate post-secondary students into authentic curriculum practices that incorporate ‘hands-on’ naturalistic activity while socially interacting with one another (Stringer, 2008). The question for Opaskwayak Cree Nation’s education director in The Pas, is whether or not it is possible to balance an educational system that can achieve academic excellence while also passing on cultural values and expectations (Wilson, 2013).

Related to geographic context, University College of the North’s *Kenanow* Program is the first Faculty of Education to envision, plan, and operate based on the guidance of a Council of Elders. Its foundations in Cree pedagogy disseminating identity, belonging, community responsibility and the process of handing down this knowledge to future generations is based on the kinship system which envisions ‘*all of us who are here*’. Interestingly, Lave and Wenger (1991) have suggested that engaged environmental efforts are most effective in reaching and bridging cognitive apprenticeship goals if designed to incorporate students into a ‘*community of practice*’.

Because the public school system is perceived to have failed to meet Indigenous student educational needs and to facilitate teaching methods that engage all students, the *Kenanow* education program was established to ensure its graduates fully understand teaching to bring a renewed sense of commitment and passion which creates a new foundation that looks to the past, present, and future for the education of northern and Indigenous students.

From experience, it is recognized that a participatory approach will improve the ability of graduates to conserve fresh water, respect socio-cultural-psychological values,

and develop personal environmental advocacy behaviors (Ajzen & Fishbein, 1977; Curnow & Spehr, 2011; Gifford, 2007; Walter, 2013). Concurrent to the significance of fostering environmental awareness and fresh water sustainability, a community outreach shift into resource co-management is increasing provincially (Wright & Shindler, 2001). This contemporary trend towards greater public involvement and increased fresh water management complexity underscores a parallel need for an ecologically intelligent educational strategy (Gifford, 2007; Wilson, 1999). For instance, even with agency communication and public involvement programs in place, environmental naiveté and conflict among stakeholders seems undefeatable (Stewart & Sinclair, 2007).

Conflicts typically arise from inadequate information dissemination, limited citizen knowledge (Lester & Hutchins, 2013), poor understanding of stakeholder concerns, inadequate government financial and staff resources (Cox & Armour, 1997), tangentially relevant personal and political mandates and public education strategies, transient administration, lack of engagement, and ill-expertise in remote post-secondary locations (Chawla, 1998; Orr, 1994). Improvements in abilities begins with standardized technical skill sets integral to student education and livelihood, as opposed to ‘on-the-job’ revelation, and inexpert mimicking. Also self-evident in a sense, consideration of theoretical ‘value’ and ‘extra-rational’ *construct* implementation must be incorporated.

To exemplify these concerns, regional participants frequently perceive traditional DAD (i.e., decide, announce, and defend) models as ineffective (Walesh, 1999).

Conservation representatives acting as disseminators or ‘facilitators’ usually attend meetings to provide biological, local-administrative, and trivial information relating to specific resource management issues. **Sadly, local extension educators - in any facet - are seldom present.** Provincial authorities, in contrast, seemingly consider the DAD

approach to be a highly effective means to ‘teach’ resources-related topics, set objectives, and alleviate concerns of potentially affected public. McKay, Jacob, and Ross (1997) noted one of the most frequent criticisms of public involvement programs is that those who become involved represent a ‘citizen elite’, rather than the majority.

Moreover, while DAD meeting participants generally emerge from the process as apparently well informed, the broader population of stakeholders (including students) remains largely ignorant of, or peripheral to, significant issues and are almost always unaware (Fiorino, 1990). Curtis et al. (2000) encouraged further experimentation with, and use of, a *variety of participation mechanisms* to obtain engaged representative and democratic student input (Chowdhury, Hambly Odame, & Leeuwis, 2014; Chowdhury, Van Mele, & Hauser, 2011).

Educational institutions, non-conventional andragogies, and available technologies afford an option in choosing how to mediate, invest and target expenditures and outreach efforts. Assuming community-based groups constitute the conservation wave of the future, it is necessary to amiably welcome knowledge factories (i.e., post-secondary educational institutions) and their amalgamated contribution potential in northern situated learning contexts. Collett and Karakashian (1996), Fedler, Seimer, Knuth, and Matthews (2001), and Knapp (2000) state favorably the student movement for an environmentally sustainable future is large. This interdisciplinary University College of the North and University of Manitoba -Natural Resources Institute environmental and educational research paradigm represents such a bridging link.

In a syntopical summary of my critical literature review, I have pronounced Popular Educational Theory inclusive of Indigenous history and attainment, ecological pedagogy in socio-cultural relevance, and agentic community role in watershed education

and *awareness* relative to northern living and educational issues. The goal of the next *three* chapters is to link this critical literature review to my Methods and Results chapters - nudging you as a reader from narratives of *adult education* and *fresh water sustainability* into non-traditional facilitation and evaluation of student performance using outcomes of quantitative scholastic efficacy (Chapter 4) and (quantitative AND quantified-qualitative) assessment (Chapter 5) using exploratory factor analysis related to monitoring stream discharge. By searching and identifying proposed strategies for cross-cultural improvement in northern environmental education, positioned tertiary level institutions can increase academic performance and ideally help mitigate high attrition rates that plague postsecondary adult education and fresh water sustainability in remote Manitoba.

### Chapter 3: Approach, Methods, Study Design and Phases

#### Situated Pre-requisite Assumptions

Acknowledging Euro-dominant oriented paradigms, Thomas and Brubaker (2000) and Creswell (2003) have written extensively on competing world views in research *methods*. Likewise recognized are Indigenous methods as reflected by Archibald (2008), Atleo (2008), Cajete (2000), Tafoya (1982), and Wilson (2008). From each of these scholars, the first priority in justifying any one cross-cultural methods perspective is to integrate a linkage between community knowledge and conventional science, ‘a coordinated and systematic action to protect the rights of peoples and to guarantee respect and integrity’ (ILOCCITP, 1989, Article 2). As a result, I accepted these ideas of ‘multiple realities’ including the assumption that learning must lead to knowledge supporting local reflection and training for Indigenous northern students that would ultimately reduce attrition and the ‘notion of failure’ (United Nations Declaration on the Rights of Indigenous Peoples [UNDRIP], 2012).

Hence, my philosophical approach and methods first required minimizing the ‘objective separateness’ for understanding what UCN, its surrounding communities, its Elders Council, and students would offer. According to Koutouki, Watts, and Booth (2015), situating a ‘*methods*’ perspective accepting to cross-cultural knowledge and skill transference is the most comprehensive challenge addressing Indigenous rights and multicultural research propositions to date as perception ‘is’ reality. For instance, local poverty conditions are prevalent, tensions regarding resource use are elevated, there is a

lack of environmental awareness and understanding, there is a regional lack of qualified labor, perceived Indigenous student ‘failure’ is frequent, and attrition rates are high and have not changed in decades.

## **Study Design**

This methods Chapter provides an overview of my study design as some discussion of ‘*methods*’ will be specific to, and repeated in following chapters (Chapters 4 and 5) as each will apply to different ‘phases’ in the collection and analysis of community and UCN student test ‘and’ interview data. A total of eight ‘phases’ are divided into two main parts each of which reference data collection in turn but are then separated into two different ‘Results’ chapters regarding analysis. Part 1 offers foundational ‘data collection’ procedures consisting of the first five study design phases: 1) PHASE 1 – community focus group surveys searching motives for methodological practice; 2) PHASE 2 – student recruitment strategy and sample size; 3) PHASE 3 – a modified participatory video approach; 4) PHASE 4 – an empirical knowledge and skills acquisition test; and 5) PHASE 5 – an open-ended 20-30 minute video-documented student interview following the completion of previous four study design phase requirements and responsibilities.

Part 2 describes specific but chapter-segregated conditions for ‘data analysis’ consisting of the remaining three study design phases including: 1) PHASE 6 – the mixing and open coding of in-stream and classroom participatory video insight and the empirical knowledge and skill acquisition test score totals; 2) PHASE 7 – conceptualized axial and selective coding of unsolicited student participant interview responses; and 3)

PHASE 8 – exploratory factor analysis of integrated quantitative (i.e., scholastic test score totals) and quantified-qualitative findings (i.e., coded and quantified unsolicited student interview response) culminating in model conceptualization.

I base my subsequent Results (Chapters 4 and 5) on the types of queries and agentic concerns theorized, conceptualized, and empiricalized from integrated collections of mixed data. Calculations range from quantitative descriptive statistics and ordered multinomial logistic regression of student test scores related ‘only cursorily’ to unsolicited qualitative statements arising from classroom and in-stream participatory video (Chapter 4), to exploratory factor analysis of amalgamated test scores ‘and’ integrated qualitative video interview coded response categories (Chapter 5).

Conventionally, my interest was whether or not the performance of University College of the North (UCN) students would vary across the different instructional types (i.e., didactic lecture versus situated or experiential delivery). The role of Participatory Video (PV) in facilitating not only scholastic improvement but affective transformative learning was also explored. Two fundamental questions emerged; 1) which lesson type delivery would best facilitate environmental knowledge and skills empirically to culturally pluralistic adult learners in remote regions of Manitoba [Chapter 4]; and 2) which methods would describe ‘sets’ of numbers AND integrated qualitatively gathered ‘thick’ commensurate data (and constructs) via exploratory factor analysis to make accurate inferences about different lesson types, student learning modalities, and affective fresh water advocacy based upon presently unavailable information [Chapter 5]?

The four effective lesson deliveries subsequently represented in this work are: 1) didactic lectures; 2) didactic lectures plus PV; 3) situated exercise; and 4) situated exercise plus PV. A distinct question was developed for each learning group.

Question 1: *are there empirical differences in either knowledge and skill (Chapter 4), or overt environmental behavior related to increased awareness, advocacy, and the calculation of stream discharge (Chapter 5) between **didactic lecture** learners and **situated in-field exercise** (or experiential) learners?*

Question 2: *are there empirical differences in either knowledge and skill (Chapter 4), or overt environmental behavior related to increased awareness, advocacy, and the calculation of stream discharge (Chapter 5) between **didactic lecture plus PV** learners and **situated in-field exercise** (or experiential) **plus PV** learners?*

Question 3: *are there empirical differences in either knowledge and skill (Chapter 4), or overt environmental behavior related to increased awareness, advocacy, and the calculation of stream discharge (Chapter 5) between **didactic lecture** learners and **didactic lecture plus PV** learners?*

Question 4: *are there empirical differences in either knowledge and skill (Chapter 4), or overt environmental behavior related to increased awareness, advocacy, and the calculation of stream discharge (Chapter 5) between **situated in-field exercise** (or experiential) learners **and** **situated in-field exercise** (or experiential) **plus PV** learners?*

### **Protocol Submission and Data Collection: (Phases 1 through 5)**

Although University of Manitoba's Policy 1406 on *The Ethics of Research Involving Human Subjects*, and the University College of the North's *Ethical Conduct of Research Involving Humans* exposed unique cross-cultural challenges regarding protocol review in this northern Manitoba region, 'mixed data' collection offered exciting dimensions to assess traditional cultural expression, research design, and methodology. Scholastic quantitative 'test' scores (Chapter 4) and integrating evaluated student experience and 'qualitative' inquiry (Chapter 5) as informed by 'unsolicited' responses to

the experiences in each of the above four questions would provide student participants with considerable control over the interview process (Corbin & Morse, 2003).

My proposed ‘non-leading’ integrated methodology and mixed-methods assessment was accepted as sensitizing the University College of the North (UCN) to vital challenges in cross-cultural scholastic achievement, participatory video, and video-interviewing methods providing fair enrollee insight into assessment. Although Glesne and Peshkin (1992) suggest research that examines ‘*your own backyard*’ is politically risky, Creswell (2007) posits that when it is important to study one’s own organization, multiple strategies of data collection and validation help ensure any account is insightful and accurate. Subsequent concerns and considerations were clarified according to UCN’s Governing, Learning, and Elders Council directives, and this mixed methods research protocol was ultimately approved by the University of Manitoba Joint Faculty Research Ethics Board (Protocol #J2008:110).

### **PHASE 1 - Community Focus Group Survey - Searching Motives for Methodological Practice**

Numerous ethnographic techniques have been applied to create ‘stories’ of how ‘researched’ respondents view, understand, and categorize their surrounding world. As such, the purpose of my pre-study *community* survey was to identify key *regional* themes and then to margin code local issues (Bertrand, Brown & Ward, 1992). Focus group sampling itself was designed around Husserl’s (2012) concept of ‘bracketing’ social assumptions, and a Colaizzi (1978) and Moustakas (1994) phenomenological approach in

which I set aside my beliefs to welcome new perspectives while exploring a northern socioeconomic and environmental phenomenon centrally.

My pre-study community focus-group approach provided a way to identify agentic concerns, local stressors, and an unbiased research direction (Banyard & Graham-Bermann, 1993). I first used a *maximum variation* sampling philosophy that differentiated local groups (Creswell, 2007, p. 75; Miles & Huberman, 1994). Following Fetterman (1998) and Polkinghorne (1989), I also included ‘outlying’ individuals (e.g. Town Mayor, UCN President, and Academic Supervisors) via a ‘*big net approach*’ which I would ultimately use to ground my study design and forthcoming student-focused research at UCN. Community participants in these focus group gatherings were asked open-ended questions probing perceived *regional* fresh water needs, significant local challenges, fondest memories, regional frustrations, northern examples, personal experiences, and contributions to personal outlooks (Greenbaum, 1998).

Participatory community focus group data consisted of 20 hours of collected video that documented the perspectives of eight community groupings (i.e., *Sapataweyak*, The Pas-*Opaskwayak*, Thompson, Norway House-*Kinosawi Sipi*, Grand Rapids-*Misipawistik*, Easterville-*Chemawawin*, Snow Lake and Gillam-*Makaso Sakikan*). This foundation for data collection rested on non-ordered, group recommendations derived from the ideas of Lovett (1983) who declared “*people need to think about the nature of society in which they live*” (p. 5). Based on this intention, these eight community gatherings produced heuristic themes around the importance of watershed awareness, technical inability, community displacement, flooding, river diversion, hydroelectric

power, education, culture, and the northern availability of fresh water which would ultimately guide student assessment procedures.

An additional, 12 *unstructured* one-to-one follow-up interviews were video-documented upon request so that some community participants could better share what was important to them free from within-group pressures and disturbance. Questions focused on sequencing, probing, prompting, and asking whether anything had been missed. Through this process, video-recorded group and individual ideas were simplified and bracketed to create a set of meaningful and local taxonomies around northern place-based issues that made, and would make, a difference in community life. Digital video record left little doubt that considerable latitude was maintained to permit a free discussion of issues. It was these community-generated opinion categories that would guide expression of (overt) student behaviors during video review and analysis.

Audio-visual information from these eight focus groups were viewed several times to obtain insights into what was perceived as local concerns which then provided a base context for informal decisions regarding forthcoming student test question design; what student groups should be sampled; and how research should progress with prospective UCN student participants. Finally, from free, prior and informed consent (FPIC) at the UCN Elder's Council level, Elders suggested three primary guidelines related to UCN student questioning, test construction, and assessment (UNDRIP, 2012). These included that test questions: 1) be expressed in a language clear to all students; 2) focus on field skill experience and categorizations in 'student' terms; and 3) that questions would also elicit local knowledge and qualitative evidence supporting local

study. Analysis of these 20-hours of community focus groups, 12-hours of individual resident interviews, and Elder's Council dialogue is not described in this dissertation.

In accordance with UCN Elders and regional community focus-group bracketed outcomes, students 'outside' Natural Resources Management Technology (NRMT) were deemed desirable and would be included in order to represent diverse perspectives. Most important, UCN students would be individuals who all experienced the didactic and experiential phenomenons and who would ideally articulate their experiences through participatory video activity, testing, and post-activity interview (Miles & Huberman, 1994). Creswell (2007) and Gergen (1994) advocate that focus must be on emergent stories, recognizing all student candidates (related and otherwise) have stories to tell.

## **PHASE 2 - Student Recruitment Strategy and Sample Size**

In order to develop a theory and prospective model originating from pre-study core resident and community focus group concern, a heterogeneous sample of UCN student participants was recruited to contribute place-based criteria for studying instructional outcomes at a tertiary-level (Charmaz, 2006). Student sampling strategy benefited from conceptualizations by Marshall and Rossman (2014) who suggest sampling aspects of: the **event**; the **setting**; and the **participants**. According to Creswell (2007), "*in a good plan for study, one or more of these levels need to be identified*" (p. 127). Subsequently, I collected data in terms of 'levels of sampling': 1) at the stream site level – *evaluation of knowledge and skill* – Chapter 4; 2) at the event or process level — *observation and participatory video* - Chapter 4; and 3) at the participant level –

*qualitatively coded unsolicited open-ended interview responses* – Chapter's 4 and 5.

Focus group survey, resident and community motives for methodological practice and student participant recruitment led to an additional six phase strategy and study design that would begin during September's enrolment.

An approximate 60-minute period during the first week of September 2008 disseminating introductory information and the promise of academic incentive (i.e., 10%) to 348 entry-level tertiary students, would initiate the process (Figure 3.1). Following an action research methodology (Denscombe, 2009), all students would be instructed in the calculation of stream discharge, either in the classroom or in the field as per posited propositions. *Stream discharge* is defined as the volume of water flowing through a given cross-section of a stream over a given period of time (expressed in cubic meters per second) requiring several measurements of depth and velocity to yield an average discharge calculation. In the stream, velocity calculations would be obtained using the Price No. 622 Type AA Current Meter and metric conversion chart (equipment commonly used by federal and provincial water resources agencies) (Plate 3.1).

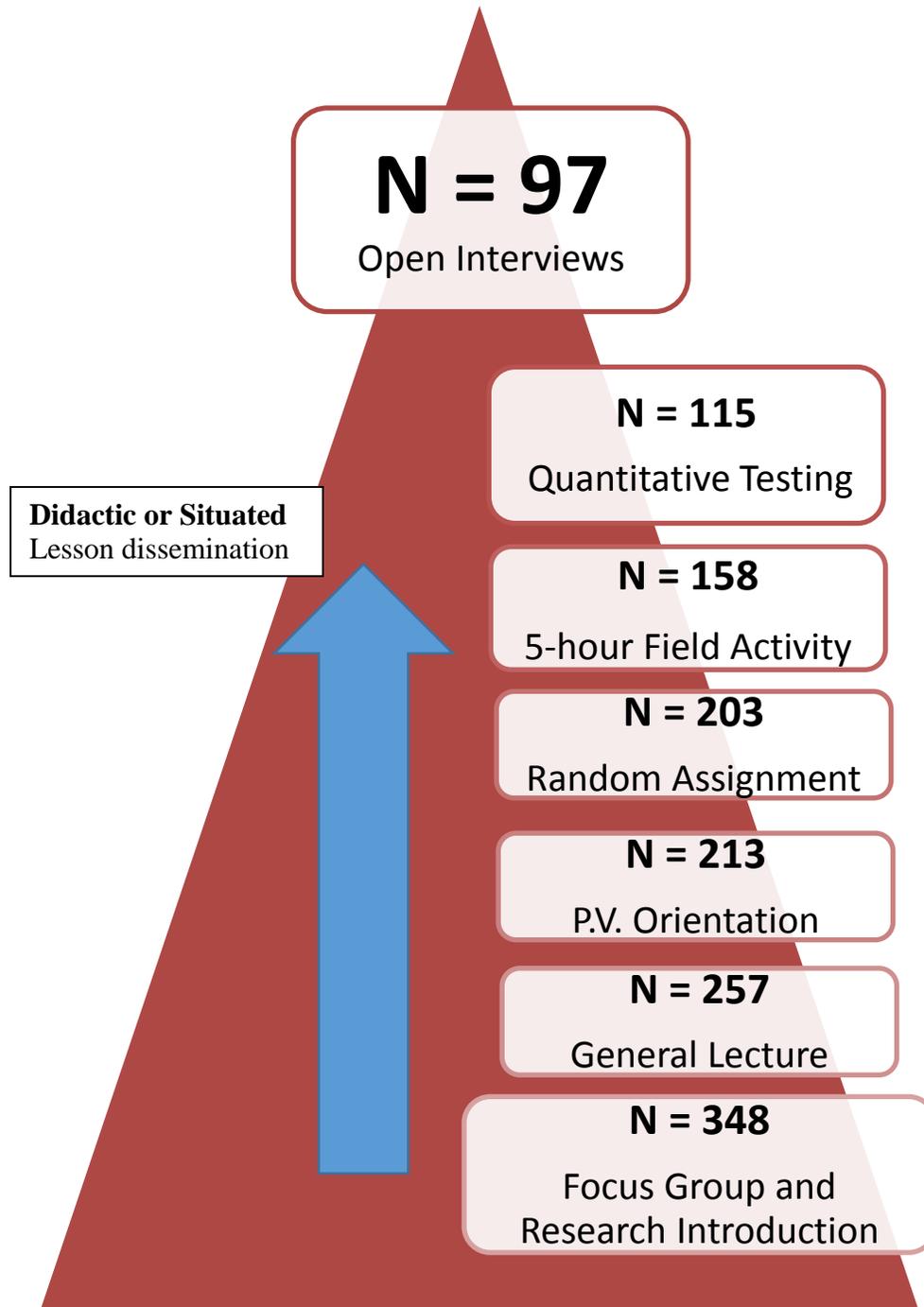


Figure 3. 1 Hierarchical illustration of candidate sample size(s) via availability sampling.



*Plate 3. 1* Student in action demonstrating and measuring in-stream water flow.

From an initial student participant group of 348, 257 of these new student enrollees attended a 90-minute follow-up didactic Power Point lecture linked to historic and contemporary provincial fresh water resource issues inclusive of a broad-spectrum lecture note set. Subsequently, 213 candidates attended a secondary 60-minute introductory session to participatory video (PV) including operation of a video-camera and PV orientation activity (Lunch & Lunch, 2006). Ultimately, 203 student participants voluntarily showed for random assignment to one of the four different ‘lesson-type’ group designations proposed and posited (i.e., didactic lecture = 33; didactic lecture plus participatory video = 56; situated exercise = 41; and situated exercise plus participatory video = 73) (Table 3.1).

Table 3. 1 *Four instruction types delivered to research participants: didactic, didactic plus participatory video (PV), situated, situated plus PV.*

	No PV	PV
Didactic	<ul style="list-style-type: none"> <li>• Classroom Lecture (90-min) no In-field Demonstration</li> <li>• Participatory Video Workshop (60-min)</li> <li>• Stream Activity Participation</li> <li>• No Camera Use</li> </ul>	<ul style="list-style-type: none"> <li>• Classroom Lecture (90-mins) no In-field Demonstration</li> <li>• Participatory Video Workshop (60-min)</li> <li>• Stream Activity Participation</li> <li>• Video Camera Use</li> </ul>
Situated	<ul style="list-style-type: none"> <li>• In-field – (15-min) Demonstration (No Classroom Lecture)</li> <li>• Participatory Video Workshop (60-min)</li> <li>• Stream Activity Participation</li> <li>• No Camera Use</li> </ul>	<ul style="list-style-type: none"> <li>• In-field – (15-min) Demonstration (No Classroom Lecture)</li> <li>• Participatory Video Workshop (60-min)</li> <li>• Stream Activity Participation</li> <li>• Video Camera Use</li> </ul>

Of these 203 students, 89 didactic and didactic plus participatory video (DPV) participants next attended a third 90-minute classroom (pre-stream activity) traditional (conventional) lecture on the selected field research exercise (i.e., the calculation of stream discharge) (Plate 3.2). Participants in didactical lectures were provided with a second set of lecture notes related to the stream discharge calculation method.

The remaining 114 situated and situated plus participatory video (SPV) candidates received no didactic lecture but only a 15-minute ‘on-site’ pre-activity demonstration of the identical field activity (i.e., the calculation of stream discharge), and the identical second set of lecture notes related specifically to the discharge calculation method (but only following completion of the on-site exercise). This note set would ensure that

students in all four lesson types would in effect have the same groundwork and materials necessary for future test preparation and quantitative evaluation (Chapter 4). Of this remaining sample (i.e., the 89 didactic and 114 situated), a total of 158 students participated in the ‘stream-based’ five-hour field science activity.



*Plate 3. 2:* Students participating in a didactic lecture session.

Each student participant used a Sony Digital Camcorder (DSR-PD170) to video-document ‘their’ involvement (Plate 3.3). Upon completion, each student was asked to address an on-site questionnaire capturing 3-5 immediate impressions of their experience, which encouraged feedback, retention for post-activity interviews, and which reduced any bias that would otherwise favor participants with greater writing facility. All participants had the opportunity to watch the video after the in-stream activity.



Plate 3. 3 Student engaged in participatory video documentation.

### **PHASE 3 - Modified Participatory Video (in-field) Approach**

Field-based ‘data collection’ also involved an interpretive and naturalistic approach to observe student participant action in the classroom and this natural setting while interpreting ‘their’ in-stream phenomenon and associated calculations as related to ‘their’ experiences regarding either lesson delivery together with and without the supplemental participatory video activity itself (Denzin & Lincoln, 2005; Stringer, 2008). Students were informed that *participatory video* values local knowledge and builds decision makers thus enabling participants to gain greater control over their own academic development. In this aspect, participatory video was meant to provide students with a mediating technology and opportunity to reflect on *their* training experience and to share *their* insights regarding personalized learning helping to guide future model design.

In contrast to Johnston (2002) who reported that participants experience discomfort in multiple-evaluation group feedback situations, a ‘modified’ single-frequency participatory video reporting procedure was used in my work. As some participants in Johnston’s study were compelled to ‘lobby’ on behalf of their own observations and others were too ‘generous’ to colleagues or experienced tacit pressure to support the comments of others (i.e., the researcher, or dominant personalities) based on real (or perceived) status, I sought to avoid this possibility of introducing bias.

As Reed (2008) suggests, many participants state they are more comfortable with verbal expression rather than providing written feedback. Hence, this study design and procedural side-step allowed these 97 northern students to comment on their individual and collective perspectives, using their own words to respond to classroom and in-stream exercise-related questions, confusions, and awareness of lesson types on video (Figure 3.1). Chase (as cited in Denzin & Lincoln, 2005) suggests such access to methodological performance situates individual stories within the participants’ personal experiences (i.e., their home life and prior education, culture, learning frameworks, and context). Procedurally then, participatory video was used in-situ, not to create a *product*, but potentially to generate meaningful lecture and field evaluative criteria that would be combined with forthcoming one-to-one interviews, codings and analyses.

#### **PHASE 4 - Empirical Knowledge and Skills Acquisition Test**

Upon completion of the field activity, a 22-question ‘knowledge and skills acquisition test’ was administered to each participant. For purposes of research integrity,

specific structurally-balanced test questions were not provided prior to assessment. Only pre-prototype questions considered for skill acquisition were verbalized when participants were first recruited in September (i.e., at what depth must the current meter be placed in a stream column more than 1.0 metre deep?). The time needed to complete the test was 1-2 hours. The test contained 22 questions: six multiple choice; 10 sentence completion; four short answer; one essay answer; and one multi-segmented mathematical calculation question. Test questions were separated into those: 1) necessary for understanding – NFU - {12 questions/23 marks}, and 2) mandatory for procedure – MFP - {10 questions/ 34 marks}. NFU questions referred to underlying *theory* and *concepts* whereas MFP questions generally referred to *applied techniques* and *skills*. It took most students 45-90 minutes to complete the quantitative test, which occurred approximately two to three weeks following the on-site and in-stream exercise. These quantitative outcomes and scholastic achievements are detailed in Chapter 4. No student group had access to test questions prior to examination.

### **PHASE 5 - Open-Ended Video Interviews and Unsolicited Response**

A general guideline in qualitative research methods is to study as many individuals as possible, and to collect extensive detail about each as the intent is not to generalize information, but to extract the specifics (Pinnegar & Daynes, 2006). Consequently, it was important to elicit specific meaning of the phenomenon from all northern UCN students who would experience the ‘classroom’ or the ‘day in the stream’ lesson deliveries (Miles & Huberman, 1994).

To acquire any affective or cultural meaning, and to supplement scholastic ‘knowledge and skill’ testing (phase 4), an ‘*unstructured*’ follow-up interview was conducted with these same 97 students. To learn ‘more’ from these participants (from different programs) with different levels of involvement in the natural environment (including individuals with whom the environmental movement was peripheral to their lives), interview procedures were open-ended in nature. They consisted of video-documenting an interview with each student, gathering ‘thick’ data through the collection of answers and stories, reporting individual experience, ordering (coding) the meaning of these experiences, and considering each for scholastic inclusion. I used a pre-designed questioning format and Final Cut Pro (version 6) to record all interview responses. To better obtain a wide diversity of experiences and thoughts, each student was asked to use their in-field notes if desired, and to respond to the following two open-ended questions:

- 1) How did participating in this exercise affect you - can you provide an example using some aspect of how the process (or exercise) unfolded?
- 2) Were you aware of any consequences (i.e., benefits or dis-benefits) of your participation – what was central to the exercise or process for you and why?

Greater depth and diversity in questioning was achieved by asking two additional open-ended questions on the ‘back end’ of each interview, thereby inviting interviewees to focus their attention on generating input that would lead to a richer description of the experience, ultimately providing an understanding of ‘their’ experiences during the class-based and in-situ stream-side calculation activity:

- 1) Is there anything else that you can tell me to help ‘me’ understand ‘your’ experience?
- 2) Is there anything you would like to ask (or add) regarding the project and your participation in this experience?

To further reduce procedural bias, my interview approach included: asking the same question at different times during the interview and in different ways; and providing an unrelated example to encourage response and/or re-align any ‘wandering’ student responses. Student interviews were video-recorded and lasted 20-30 minutes, generally proceeding until no new information emerged. In total, ‘academic’ involvement and experiential engagement required a personal commitment of 12 hours for didactic lecture participants and 11 hours for situated exercise participants. In sum, this amounted to a collective investment of 2377 student hours in the project (Table 3.2).

Table 3. 2 *Activities organization and participant time requirement.*

Organized Activity	Didactic Lecture (D) ( <i>minutes</i> )	Situated Exercise (S) ( <i>minutes</i> )	Didactic and Participatory Video (DPV) ( <i>minutes</i> )	Situated and Participatory Video (SPV) ( <i>minutes</i> )
Study Introduction	30	30	30	30
Consent Signing	15	15	15	15
Verbal Pre-test	15	15	15	15
General Information Lecture	60	60	60	60
Participatory Video Orientation	60	60	60	60
Stream Discharge Lecture (D)	60-90		60-90	
Stream Discharge Demonstration		15		15
Situated Field Activity	180-300	180-300	180-300	180-300
Knowledge Test	60-120	60-120	60-120	60-120
Open-ended Interview	30	30	30	30
<b>Total Activity Time (hours)</b>	<b>8-12</b>	<b>7.3-10.8</b>	<b>8-12</b>	<b>7.3-10.8</b>

## Data Analyses – PHASES 6, 7 and 8

Proceeding these five study design phases and methods for ‘data collection’, a split strategy for *data analysis* was used, incorporating both quantitative (Chapter 4) and qualitative data (Chapter 5) (Creswell, 2007). First, upon completion of the field activity, quantitative learning outcomes were assessed for 97 (61%) of the 158 field participants using a test that evaluated written knowledge and skills acquisition (Chapter 4).

Total test scores as well as MFP and NFU scores were examined and used as the primary measure of scholastic or academic performance. In addition to analysing the absolute test scores, these data were also ordered into three relative score categories and analysed: 1) low score (0 -33%); 2) medium score (34-66%); and 3) high score (67-100%). Finally, test scores were categorized as pass (>60%) or fail (<60%) and analysed, this second evaluative scheme according to UCN criteria for pass-fail grading. As response variables were categorical, ordered logistic regression was used to explore, detect, describe, and test the predictive power of a naturally occurring set of independent variables, to assess the relative contribution of each, and to provide an indication of the adequacy of my chosen model (i.e., set of predictor variables) by assessing ‘goodness of fit’ (Stastica, 2013). All test scores were evaluated for subsample normality using Kolmogorov-Smirnov and Shapiro-Wilks tests. Equal variance of variables including PV and lesson context (situated vs. didactic) as well as gender, ethnicity, program (NRMT vs. other), theoretical skills, and practical skills were evaluated using Levene’s tests (Levene, 1960; SPSS 2014).

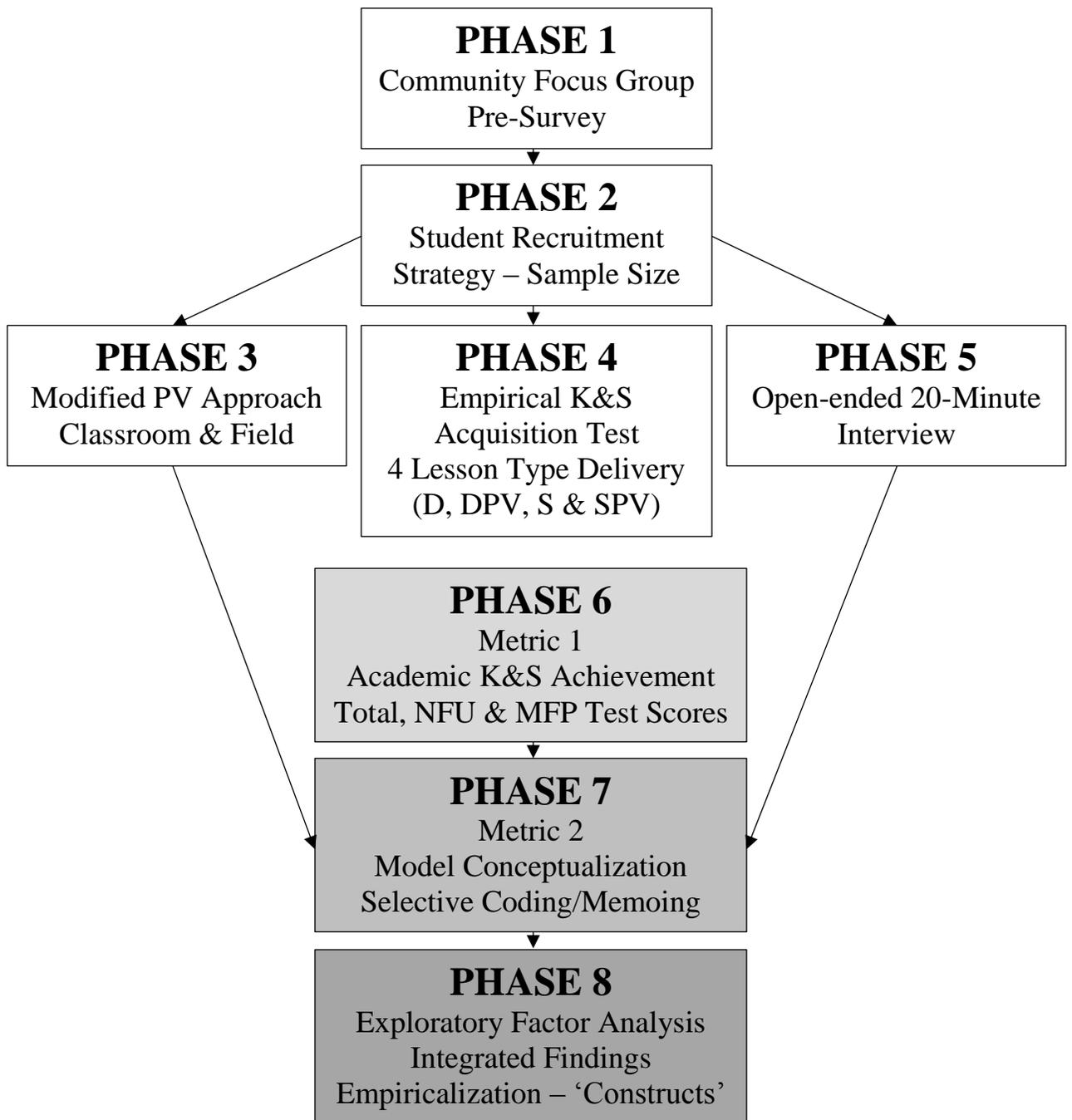
To supplement the quantitative knowledge and skill acquisition test (Chapter 4), I also conducted ‘unstructured’ open-ended qualitative interviews using only ‘*unsolicited*’ candidate responses during interviews with each of these 97 participants. Interviews typically focused on what students had learned, what had facilitated their learning, and what had hindered their learning.

Categorized for what participants had in common as they experienced standing in the stream, *unsolicited* and emerging themes were labeled, coded, and archived in Final Cut Pro for repeated review and re-examination. Examination was inductive, forming broad theme categories and then reconfiguring them into new, narrow and revised codes (Cortazzi, 1993). Inspection consisted of: 1) viewing the footage several times to obtain an overall understanding; 2) identifying significant statements pertaining directly to the involvement of how each participant experienced the situated phenomenon; and 3) formulating open theme meanings and clustering them into axial *constructs* common to all participants (Moustakas, 1994; Strauss & Corbin, 1990).

Criteria for status included: 1) the frequency of a theme’s occurrence; 2) its inclusiveness and the ease with which it related to other theme categories; and 3) the clarity of its implication as a *construct* in an emerging hierarchical model developing propositions that could be related with the outcomes of the quantitative and qualitative analysis. Final lesson-type sample size breakdowns were: didactic (n=22); didactic plus participatory video (n=30); situated (n=24); and, situated plus participatory video (n=21).

In sum, research and sampling design was conceptualized as an eight-phase sequence that includes data collection and two separate data analyses integral to method assumptions, my proposed research questions, and this integrated methodological design

(Figure 3.2). Connection between these phases and each of the thesis' results Chapters 4 and 5 and their respective analyses is documented.



*Figure 3. 2:* Segmentation of the research design ‘phase’ sequence outlining relationships between eight component phases.

## **PHASE 6 - Data Integration, Open-coding, Mixing PV Insight and Test Scores**

Phase 6 signals exploration (i.e., open coding), the amalgamation of quantitative test score findings (Chapter 4 and the previous 5 phases), and integrated and ‘*quantified-qualitative*’ unsolicited interview themes (Chapter 5) hypothesized to provide a unique measure of verification and holistic assessment related to the ‘non-conventional’ situated and participatory video lesson delivery methodology rather than drawing insight into student learning solely from academic (scholastic) test scores or subjective video-recorded perceptions and qualitative survey alone (Strauss & Corbin, 1990). As assumptions are prevalent in adult educational assessment, non-conventional lesson delivery was expected to promote ‘surfacing’ student *awareness* and *reflection*, even though the discharge calculation activity would not necessarily bring about future personal action and/or scholastic achievement, nor ‘playing in the stream’ necessarily involve social change regarding fresh water sustainability (Collins, Brown & Newman, 1989). Ultimately, this integration of evaluative concepts was expected to permit a more progressive examination and open coding of each student’s learning modality.

In order to solve the stream discharge calculation challenge at the field level and to promote student *engagement* in this research, each UCN student participant was provided multiple opportunities to reflect upon the fresh water resource-based exercise and its lesson delivery in its entirety - predicting, hypothesizing, and experimenting on-site in order to provide a self-realized solution in real time (Folke, Colding, & Berkes, 2003). Similar to Bronfenbrenner’s (1979) person, process and context approach, Lave and Wenger (1991) conceptualize situated problem-solving as centered on the whole

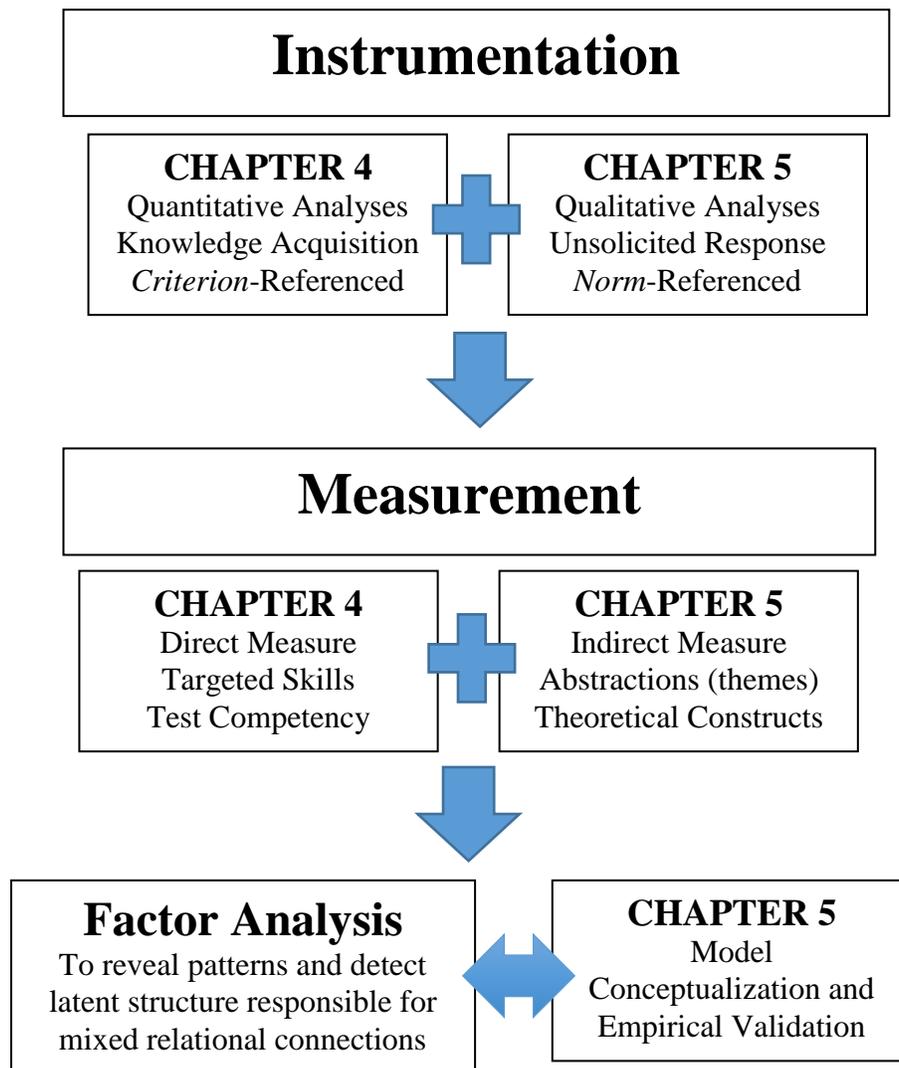
student (i.e., the interaction of the learner, the activity, and the world – essentially the event, the setting, and the participant). Hence, in this mindset, the ‘situated’ participatory video method assessment would, in this aspect, speak to all mixed program students using a common idiom (i.e., cross-culturally and perhaps using no language whatsoever via the video-camera) when dealing with the challenges of cross-culturally direct relevance and incorporating a ‘chronotopically’ fair student assessment in northern Manitoba at a postsecondary educational institution and Indigenous student level.

### **PHASE 7 - Conceptualized Axial and Selective Coding**

At this developed *conceptualization* phase, I posited potential themes and a conceptual model, which would enable me to better understand northern student learning modality and behavior. This methods *abstraction* was also used as a procedural map to navigate and amalgamate quantitative data (Chapter 4) and qualitative data obtained (Chapter 5). Method and phase purpose was to determine qualitative attributes and response-clusters considering indicators that would ultimately signify surfacing and integration potential for open codes, themes, and emerging *constructs*.

To *operationalize* this conceptual model, I targeted emerging video clip themes, attributes, and *constructs* in such a way that each could be identified, measured, coded and intuitively explored for relationship to test scores (Figure 3.3). Observable *empirical indicators* from test scores and amalgated quantified qualitative findings were the end-product of this process, becoming items that permitted declarative statements about emerging theme clusters that in turn reflected a theoretical framework for an evolving

‘model’. Coding subsequently described what student participants had in common in the class-bound lectures and as they calculated river discharge while standing in the stream. The integrated focus was thus on ‘participant meaning’. Model design, being a reality, was therefore a northern inductive process, working through multiple levels of abstraction, forming categories but then reconfiguring them into new and revised inter-related themes, that ranged from the narrow to the broad. Cortazzi (1993) suggests that such a ‘restorying’ process links ideas to a chronology of real student experience.



*Figure 3. 3: Mixed data conceptualization and construction of an emergent conceptual model.*

Building from the four open-ended questions and *theme-searching* through the ‘unsolicited’ student responses, analysis of student video interviews consisted of: 1) viewing the footage several times to obtain an overall understanding; 2) identifying ‘significant statements’ that pertained directly to the stream-based activity providing an understanding of how each participant experienced the video and situated learning

phenomenon; and 3) formulating open-code meanings to cluster statements into themes (constructs) common to all participant video-interviews, referred to by Moustakas (1994) as ‘horizontalization’.

Next, an ‘axial coding’ process, described by Strauss and Corbin (1990) was used to fracture these themes, allowing the identification of categories and any theoretical dimensions unexpected. Axial coding put these open data “*back together in new ways by making connections between a category and its subcategories*” (Strauss & Corbin, 1990, p. 97). From this process, taxonomic categories emerged and were assigned labels. Criteria for status included: 1) the frequency of a theme’s occurrence in the data; 2) its inclusiveness and the ease with which it related to other unsolicited student themes; and 3) the clarity of its implication for a more general inductive theory.

A final step was selective coding, an integrative process of selecting a core category [theme], systematically relating it to other categories [constructs], validating those relationships by searching and confirming and disconfirming examples, and addressing them in any categories that needed further refinement and development (Strauss & Corbin, 1990, p. 116). In time, an emerging model developed propositions that related categories, developing a ‘story line’ that connected theme categories in a posited northern UCN student-generated model.

Ultimate model design emerged from a process of ‘memoing’, which entailed writing down ideas about what was evolving throughout the process of horizontalization and its axial and selective coding. The result was a ‘substantive-level theory’ or ‘grounded theory’ (*sensu* Strauss and Corbin) specific to a local challenge and its northern remote student population; a theory and mixed set of independent variables that

could then be explored statistically and tested to determine if it could be generalized from remote northern sample to global population.

In summary, as some *constructs* I measured were intangible (i.e., conscious subjective experiences or ‘eureka!’ moments), critical literature review and theoretical conceptualization helped me to formulate and describe a cyclical, holistic, and iterative method for examining student experiences, ‘overt’ behavior change and environmental advocacy. This pre-through-post-method process from community to student provided the necessary abstract understanding, statistical validation, perceived assumptions, and hypotheses of surfacing result subtleties for relationships existing in this situated and student-generated phenomenon.

### **PHASE 8 - Factor Analysis and Model Conceptualization**

In sum, as student respondents from seven diverse programs were recruited (Table 3.3), they first had to learn to operate the equipment, participate in didactic and situated learning, evaluate their own field-based perspectives on lesson type, and afterwards, express their experiences and insights in open-ended unsolicited theme-driven interview sessions. Since a large number of mixed statements and their associated relationships were being considered, it was decided *factor analysis* could offer a more full explanation of ‘normative’ and dependent variable themes (and ‘constructs’) than stepwise multivariate analysis while helping to reduce the highly varied responses to a smaller number of dimensions or *factors*. To this end, factor analysis was expected capable of revealing underlying patterns and detecting structures responsible for observed relational

connections between the test scores and the quantified qualitative survey of unsolicited student responses. With minimally preconceived factor-related structure on model development, I inductively selected eight independent variables from the quantitative test analysis (Chapter 4) and 19 norm-referenced and surfacing qualitative themes for each of the four different lesson type propositions posited (Table 3.3).

Table 3. 3 *Selected independent quantitative and qualitative variables for factor analysis and variable reduction.*

Quantitative Variables	Qualitative Variables
<sup>1</sup> 7 Programs (NRMT; nursing; early childhood education; law enforcement; business; dental assisting; education)	2 Situated or Didactic * (binary)
4 Lesson Types (didactic, DPV, situated; SPV)	2 Collaboration (Yes or No) * (binary)
2 Cultures (Aboriginal and Non-Aboriginal – self declaration)	3 Awareness (self, environment, exercise)
2 Genders (male and female)	2 Qualia (Yes or No) * (binary)
5 Question Types (multiple choice; sentence completion; bullet answer; long answer; calculation)	5 Knowledge acquisition (New experience & PV; knowledge sharing; educational development; social responsibility; environmental knowledge)
3 Test Evaluations (Total score; NFU; MFP)	3 Skills acquisition (skill development; personal development; improved learning strategy)
	2 Behavior (Yes or No) * (binary)
<b>Total Variables = 8</b>	<b>Total Variables = 19</b>
<b>Grand Total Variables = 27</b>	

<sup>1</sup> Shaded cell variables were not used in reduction.

Factor analysis of these 27 predictor variables was expected to be especially appealing even though the quantitative and quantified-qualitative predictors considered in this UCN student evaluation would have a high degree of measurement error, as is common with most educational evaluations (Cody & Smith, 2005). Thurstone (1931)

believed factor analysis could appropriately be used as a first stage in mapping such new and unknown domains, studying correlations among various treatments (e.g., test scores) and noting many observed correlations might be accounted for by constructing a simple model for those scores. Moreover, factor analysis would indicate whether several measures used to assess learning gains could conceptually be combined as a single kind of learning, or whether two or more distinct independent kinds of learning were taking place. As such, exploratory factor analysis was expected to provide a statistical tool especially well suited to my quest for a northern educational theory and inductive variable exploration regarding mixed student abilities, knowledge acquisition and meta-ethic behaviors related to environmental advocacy and northern freshwater awareness – each having high margins of error with respect to assessment (Ling, 1973).

In short, the benefit and purpose of using exploratory factor analysis was to find a hidden set of ‘*constructs*’ (in sync with a posited conceptualized model derived from unsolicited candidate responses **and** quantitative test score outcomes), these being fewer in number than the original group of predictor variables from analysis. Following the selection of a relevant combination of perceived quantitative and qualitatively unsolicited open-ended interview response items (n=27), all data were evaluated using factor-analysis several times before arriving at a final solution.

To fully reflect and summarize the ideas in this Methods chapter and position my particular use of factor analysis and video to assess *adult* learning (i.e., andragogy versus pedagogy), my *modified* PV technique challenges even subjective standards Widdowson and Howard (2009) were unable to forward regarding the mixing of uneven levels of complex cultures at different stages of development (i.e., Neolithic to late Capitalism).

My style of video use is intended to effectively mirror new realities of engagement ‘back towards’ participants creating global context at a personal level - a ‘recorded repository’ of *their* relationship with the environment (i.e., advocacy in the ‘personal’ sense).

In contrast to a clash of cultural ideologies, this *modified* scholastic and social video assessment of ‘learning modality’ permits the documentation and reflection of local norms and priorities, addressing barriers and instilling confidence while providing the opportunities to share personally, socially, and spiritually. Video and non-generic criteria evaluate typically-unassessed abilities while avoiding controversial assumptions about differences in northern Indigenous performance - cursorily exploring and including thoughts that facilitate transformative behaviors for those who may not have the words.

### **An Additional Source of Information for this Research**

Although key sources of information for this research were Indigenous northern community members, Elders, colleagues, and students involved in the post-secondary action research process, one additional watershed source of information, knowledge, and ‘typically-unassessed’ skills-base for this dissertation was considered. In an unusual starrng, and between the riparian walls of spruce coated with blowing snow, my Dad found little corners of his days to lobby for my doctoral plan and to put a premium on small things like an armful of wood to keep the fire warm for every shivering student I had solicited (Plate 3.4). It took 50 years, but my academic world became a dialogue in which my Dad entered regularly, permanently enriching me with his ‘grounded’ and non-conformal thoughts that flowed from inner sources beyond the reach of classroom

instruction. Thinking back, I marvel that he found time in such a busy life for my education, engaging in a ceaseless skillful attempt to teach me using the most explosive of all teaching techniques ... 'by example'.



*Plate 3.4* A situated scene for learning as students calculate stream flow.

My Dad understood that hard work gave the kind of opportunity to satisfy yourself that nothing else could. He did 'listen' to me more closely for the past quarter-century, but he also continued to believe that a lecture was a process by which a professor's notes were passed to students without passing through the brains of either. His kind steady voice is missed as it is in these 'northern' places, invariably near forested streams, where that sense of remembering is particularly strong for me. I still feel he is learning and laughing with me every single moment (Plate 3.5). I have to. I can think of

no better time or companion. I knew my Dad as a speaker of no mean ability, but with a mind to formulate things worth hearing ... if you watched closely.



*Plate 3. 5* Gordon Roy Stepaniuk – my Dad and teacher.

## Chapter 4: Embedded Learning, Participatory Video and Scholastic Achievement in Northern Environmental Education

### Abstract

Academic performance is a challenge that confronts many postsecondary students in northern Canada. As such, this study explores the role of situated (field-based) learning and video in facilitating *academic* performance as it relates to freshwater availability. First-year students ( $n=97$ ) enrolled at the University College of the North in Manitoba were randomly assigned to four adult education approaches containing identical subject matter. Student performance was assessed using outcomes of *quantitative* testing that focused either on *concepts* or *applied* skills. Empirical data were analysed using ordered multinomial logistic regression and related only cursorily to *unsolicited* qualitative statements arising from post-test interviews. Non-conventional lesson interaction significantly increased ( $p=0.003$ ) quantitative test score means by 26%, raised skill scores by a grade level (12%), and significantly improved ( $p=0.07$ ) *concept* understanding using participatory video. Importantly, there was less of a difference academically between non-Aboriginal and self-declared Aboriginal students when situated learning and video were compared to didactic classroom delivery. Despite these benefits, Indigenous students still had lower test scores (11%) than those who were non-Indigenous. By identifying non-conventional strategies for improvement in environmental education, tertiary level institutions are presented an option for increasing academic performance via alternative lesson deliveries ideally mitigating the high attrition rates that still plague postsecondary education in rural Manitoba and northern Canada.

## **Introduction**

Manitoba's vision as it relates to training and the future is that every learner will complete an education with a profound sense of accomplishment, hope, and optimism (Canadian Rural Revitalization Foundation [CRRF], 2010). The educational needs of rural, low-income, remote northern, Métis, and First Nation communities are recognized as priorities. Barriers encountered by such groups include low population densities, inadequate funding and infrastructure due to declining local enrolments, high costs incurred by staffing and in operating regional centres, the large geographical size of school divisions, and inadequate research (CRRF, 2015). Low-density populations, in turn, give rise to high commuting distances and the need for travel as well as inadequate access to pedagogical infrastructure in home communities (Nardozi, 2011).

Associated considerations confronting postsecondary institutions in the North include inadequate remedial courses and lack of support for new tertiary-level students (Sciadas, 2005), fragmented online learning and a digital divide due to the lack of technology-enabling infrastructure (Looker & Thiessen, 2003), and the lack of comprehensive credit transfer strategies (Xu & Jagers, 2010). Moreover, there is a longstanding need for, and turnover of, 'qualified' and motivated instructors (Canadian Council on Learning, 2006), quality counseling and academic tutoring (Jenkins, 2012), and a shortage of suitable family housing environments in the proximity of northern tertiary-level institutes (UCN Strategic Plan, 2015).

Importantly, northern communities are ethno-culturally diverse and consist largely of First Nation (i.e. Cree Ininev/Inniniwak), Métis residents, and more recently

arrived immigrants. These adult students in particular are confronted by many unique barriers, which are complicated, multifaceted and interconnected (Mendelson, 2006). Regional challenges related specifically to Indigenous pre-tertiary-level participation and accessibility include low secondary graduation success rates for Aboriginal students that are half of the national average (Brown, 2011; Statistics Canada, 2015). These same students are also confronted by pedagogical and andragogical approaches that are culturally inappropriate, assimilative in nature (INAC, 2010), and perceived as poorly designed (Davis, 2014; Nardozi, 2011; Precel, Eshet-Alkalai, & Alberton, 2009).

Added social and political factors also indirectly contribute to poor academic performance and retention among Aboriginal students as their families and communities still contend with a legacy of longstanding colonial and assimilative government policies as well as existing proximate challenges including high unemployment rates, poverty, food insecurity, and low levels of health and wellbeing (Davis, 2014; Nardozi, 2011).

Besides these foregoing educational and wellbeing challenges, environments across northern Canada are being altered by widespread industrial development. For instance, the indispensable value of fresh water is increasingly appreciated as northerners witness how lentic and lotic environments respond to the extreme ways in which natural watersheds are exploited. Hydro development, for example, has had extreme adverse environmental impacts across Manitoba, including changes in hydrology, flooding, erosion of shorelines, degradation of permaculture, increased concentrations of mercury throughout the food web, and declines in fish populations (Hoffman, 2004; Pip & Stepaniuk, 1988; Stepaniuk, 1990).

These environmental changes, in turn, have dramatic and adverse implications for Indigenous livelihoods and transient cultures (Waldram, 2008). River diversions and hydro development have in some cases displaced entire communities, including South Indian Lake and Lake St Martin. Associated impacts reflect a long history of neglect and oppression on the part of the provincial and federal governments (Ford, Berrang-Ford, King & Furgal, 2010; Hoffman, 2004; Thompson, 2015). Not only do many northern Manitoba communities have limited opportunities to address such disruptions, they have little support when it comes to educating, documenting, and communicating associated changes in the environment.

Consequently, northern Indigenous communities are 90X more likely to experience fresh water-related concerns than other Canadians (Boyd, 2011). Moreover, these commensurate educational and environmental narratives have not received the same degree of public or political attention as those confronting urban and rural populations in southern regions (White, Murphy, & Spence, 2012). Acquiring an education and getting a glass of water are no simple tasks in these communities and this is putting the welfare and health of resident individuals at grave risk (Kumar & Farenhorst, 2016).

In response to these environmental declines, northern fresh water management strategies have been developed by federal and provincial governments, including comprehensive reporting standards and implemented protocols utilizing multi-barrier approaches which reduce threats from natural and anthropogenic actions (INAC, 2012). Yet, these strategies have been criticized as inadequate. In part because of the lack of standards and confusion about roles and responsibilities (Office of the Auditor General of Canada [OAG], 2011); inadequate stakeholder and community consultations (Bowden,

2011); limited access to knowledge and technical skills related to monitoring (Rizvi, Adamowski, & Patrick, 2013); inadequate training and certification (Plummer, Grosbois, Armitage, & de Loe, 2013); and the exclusion of Indigenous communities and their experiences and cultural traditions in decision-making (Basdeo & Bharadwaj, 2013). In appraising these shortcomings, it has been argued that any future monitoring and decision-making must include 'alternate' forms of learning – these grounded in both cross-cultural science and traditional cultural expressions (Cameron, 2012; Rafferty, Jimmieson, & Armenakis, 2013).

Subsequently, environmental education is of great importance to northern and Indigenous communities, in part to increase awareness regarding these impacts and to better enable isolated communities to monitor and respond to such changes. Specifically, educational approaches are urgently needed to facilitate the monitoring of rivers in Manitoba, and elsewhere across northern Canada. Addressing uncertainty and associated challenges regarding change is desperate (Hipel, Fang, Taha, & Bristow, 2013). Education initiatives clearly play an important role in addressing these challenges.

Unfortunately, a vital knowledge 'gap', as well as the absence of a sound conceptual base for understanding and facilitating relevant learning in northern and remote regions exists (Medema, Adamowski, Orr, Wals, & Milot, 2015). Future education-related research must present options on sustained place-based learning frameworks (Ison & Watson, 2007) enabling transformative behavioral change that centers on shifts in underlying beliefs and affective fresh water sustaining assumptions. Moving away from a dependence upon classroom-based education approaches towards an integration of quantitative and qualitative assessment and non-traditional lesson

delivery (Ford, Knight, & Pearce, 2013), as well as a transition towards more collaborative and purposeful cross-cultural interaction between educators and students (Dyball, Brown, & Keen, 2007) will reduce the fracture between local need, the urgent requirements for gathering ‘motivational’ information that can be used for education, and technical skill sets that would be of pragmatic use for a northern adult populace. Sadly, most curricula in northern Canada are still Eurocentric in nature. Despite the existence and needs of a substantial northern student population, educational delivery remains highly ‘urbanized’ (Kitchin, 1999), representing a cultural barrier to many Indigenous students and, in part, contributing to high failure and drop-out rates (Sanderson & Kindon, 2004). Basic skills and employment training in the north are often eclipsed by unsuitable theoretical and academic approaches.

Chronotopically (i.e., of time and place), environmental education and fresh water monitoring that ‘reflects’ northern priorities typically relies on data that are designed and gathered by technologists from the south (Harden & Levalliant, 2008). Inadequate educational infrastructure, foreign metaphors, cross-cultural translation, and a general lack of understanding regarding fresh water sustainability essentially undermines science-based education regarding local fresh water-related issues in the isolated Canadian north.

Typologies reflecting heuristic curricular support for remote practice needs to go beyond the southern influx of Eurocentric conceptions as concepts are often understood very differently between individuals and across residing and transient cultures in the North (Randstrom & Deur, 1999). Conventional approaches to adult education have yet to rethink northern educational delivery to small populations as they relate to situated experiential learning and employment pathways in remote environments (Hart, 1996;

MERN, 2016). This is reflected, in part, by poor Indigenous student academic performance in many northern postsecondary institutions (Sims & Falkenberg, 2013). Indeed, attrition rates in the Natural Resources Management Technology Program at Manitoba's University College of the North, are >80% each year (UCN Faculty Handbook, 2016/2017). Subsequently, institutional resources and alternative approaches to curricular design, delivery, and evaluation are desperately needed in ways that will result in improved retention, infused affective paradigms, and scholastic performance while better preparing northern students to use 'their' knowledge in future regional management and environmental decision-making (Knight and Yorke, 2002; MERN, 2016).

### **Situated Learning in Education**

Situated learning, first described as a theoretical model of instruction by Brown, Collins, and Duguid (1989), has made a significant impact on contemporary educational theory and practice (Lave and Wenger, 1991; MERN, 2016). The theory contends that meaningful learning takes place if 'embedded' in the physical and social context in which it is used. Hansman and Wilson (2002) and Lave and Wenger (1991) argue that learning should not be viewed simply as the transmission of decontextualized knowledge from one individual to another but rather a process of social co-construction, which has particular resonance for northern adult education. Hungerford and Volk (1990) postulated this theory produces a model of instruction with real practical application, while Rule (2006) found that 'problem-based' situated learning contextualizes knowledge while promoting

the development of greater skills and confidence in ways that are self-directed and grounded in place.

Simply, situated learning theory addresses the gap between real world and in-class learning. The theory represents an apprenticeship where novices, with the support of an expert guide and model, take on progressive responsibility until they are able to function independently (Herrington & Oliver, 1995). Rather than being colonial in nature, situated learning is described as ‘enculturation’ or the adopting of skills, knowledge, values, and cultural heritage of a particular community (Vincini, 2003). Knowledge is perceived not as an individual’s cognitive structure but rather as the creation and reflection of community beliefs over time. Topics are integrated and discussed critically (not sequentially), and at its most basic level, situated learning emphasizes the idea that much of what is learned is specific to the situation in which it is learned (Kimble, Hildreth, & Bourdon, 2008; MERN, 2016). Learners use tools as practitioners, and become cognitive apprentices in that discipline’s geography and culture (Hansman & Wilson, 2002). Hence, it is important to identify critical aspects of situated learning and to translate this theory into an effective northern teaching method of place.

## **Situated Learning and Participatory Video Technology**

In transferring and advancing meaning from one context to another, Kondon (2003) and Lunch (2008) argue that ‘participatory video’ (PV) can play a central role in situated learning extension. Evolving from conventional participatory research (Lewin, 1946) and wider debates about its framework and practice, new technological components can share in such conceptual and operational knowledge building (Leyshon, 2002). Digital video introduces methodological development and *new* tools which encourage and enable temporal and spatial connections fore-fronting new methods into local conditions and local knowledge collection (Mattingly, 2001; McIntyre, 2003; Murthy, 2008). Relevant and non-hierarchical in practice, PV is also documented to engage inequalities visually (Kondon, 2003), a surety that can provide a tone and perhaps standard of reflexivity for the University College of the North - and its students.

### **Participatory Video – History, Application and a Quantitative Examination**

Although participatory ideologies and viewpoints have been recognized as innovative for decades, and PV has a history of effective use in social change, it has yet to fulfill its promise according to Goodman (2003), Society for People’s Education, Empowerment and Development Trust [SPEED] (2008), and Witteveen and Lie (2009). These researchers state that although video technology has been used since the 1960s to explore a diversity of issues through video recording, its growth rate has now waned. Arguably first developed in 1967 with the economically and politically marginalized

Fogo Island fishing community off the northeast coast of Newfoundland (Milne, Mitchell, and de Lange, 2012), film was used to assist villagers in identifying common problems and in coming to terms with *local* challenges. Through film, and radio before this, it became possible for community members to move cooperatively toward shared development goals (Schwass, 1993). Decision-makers who had never traveled to Fogo Island were able to gain insight into the islanders' situation. Outcomes, since identified as the '*Fogo Process*', have resulted in improved government policy and action for small remote communities (Lunch, 2008).

Guided collaboratively by Colin Lowe, Fred Earle, and Donald Snowden, film was used to develop a collective vision and strategy for Fogo's bleak economic renewal (Ferreira, 2006). Snowden is credited as the first person to use 16-millimeter film media in a team-based community development approach and his design has become a standard for participatory community development (Buchy, 2008). Snowden's films substantiated that rural poverty did not necessarily stem from economic deprivation. Rather, alternative indicators such as *isolation, inability to access information, lack of confidence, and lack of organization* were implicated as root causes (Crocker, 2008). Film created the requisite awareness and self-confidence for people-advocated development to occur (Snowden, 1983). The Fogo project became an internationally acclaimed prototype using a technological 'product' to promote dialogue and social change.

Inspired by the Fogo Process, the methods and techniques of PV have since been modified by a wide diversity of community-based researchers and social activists in attempts to better serve local needs and situations (Evans & Foster, 2009; Lunch, 2008). The accessibility of video and its ability to be used for awareness has resulted in PV

being used for telling many stories. Applications include: action research as a means for involving users in their own research (Lunch, 2004); program monitoring (Lunch & Lunch, 2006); institutional capacity building (Gilbert, 1992); knowledge creation regarding issues confronting Aboriginal communities (Ferreira, 2007); principles of experiential learning related to social/gender impact assessment (Riano, 1994; Rush & Allen, 1989); and program evaluation in First Nations communities (Ferreira, Ramirez, & Walmark, 2000).

By definition, PV is a process whereby a group collaboratively explores issues they face when telling *their* story through film (Lunch, 2007). It is an iterative process intended to value traditional knowledge, local cultural values, and heritage (Widdowson & Howard, 2009). It thus builds bridges between decision makers and communities, enabling individuals to gain control over decisions impacting their lives (Chowdhury et al., 2014; Murphy et al., 2007; Olmos, 2005). Although the processes and final products do not usually target large audiences, this method and methodology can be used effectively for advocacy, policy lobbying, social learning, and education among local rural development participants (Shaw, 2012).

A key aspect of PV is that local participants are considered the subject-matter experts (i.e., people who understand the complexity of their own situations) capable of defining and articulating the focus of their video stories. As argued by Lunch (2008), participatory video opens communications channels for project recipients and assists development of participant-led projects – often with sustainable and far-reaching impacts. Accordingly, the PV process has furthered research and development activity by handing over control to locals, from inception to finish. Concurrent expectations include the

promotion of dialogue, temporal documentation, and the capacity to gauge trends. Not only does PV have the capacity to document dynamic changes within a culturally and paradigmatically pluralistic participant body, it also has the ability to mobilize knowledge, chronicle the evolution of creativity, advance technical maturation, and generate confidence in ‘problem-solving’ and ‘experiential’ approaches (Chowdhury et. al., 2014; Evans & Foster, 2009).

Participatory video has thus helped incorporate and even *synthesize* Indigenous knowledge and scientific data as each relates to community-led research (Natural Resource Management in the Mountain Regions of Asia [NORMA], 2008). Although, it is acknowledged video technology offers authentic access of professionals to students in remote locales; personal observation and literature review show that PV has yet to be adequately evaluated as a ‘scholastically-driving’ learning tool. On one hand, PV provides the opportunity to learn from the training experience itself sharing insights on its usefulness (SPEED, 2008). Yet, the question remains: can PV and education work together in credible *academically* significant ways? Minardi and Ritter (1999) first addressed this question, stating video recording techniques have been advocated without any empirical evidence on scholastic efficacy. Lunch (2008), Miller and Cruce (2004), and Rosenstein (2008) continue to argue that research is showing PV technologies are useful for learning in multi-cultural and behavioral settings.

Regarding education specifically, Witteveen and Lie (2009) used video as a *qualitative* support tool for rural development. They coined the term ‘embedded video for social change’, referring to a strategy that recognized potential roles of both ‘product’ and ‘process’ in enhanced learning. In this instance, a digital video recording process

combined with action research embedded in a local product captured direct insight and social process by participants and facilitators (Witteveen & Lie, 2009). While important in its own right, this research was only ‘qualitative’ in nature. Academic relevance has yet to be demonstrated using ‘*quantitative*’ and mixed-methods assessment approaches.

### **Need for Transforming Instructional Methods at UCN**

Since 1966, University College of the North (UCN), previously Keewatin Community College (KCC), has provided adult education programming in northern Manitoba for a large number of culturally diverse communities spread across a vast and unique landscape in north-central Canada. The university’s service area is quite distinct, setting the institution apart from other colleges and universities in Manitoba, where 65% of the region’s population is of Aboriginal ancestry and scattered throughout a 325,000 km<sup>2</sup> area, stretching from Churchill to Swan River (UCN Faculty Handbook 2015/16).

University College of the North provides education and training to 2,500 enrolled students from a sparse population of 75,000 people and is the only post-secondary educational institute physically located in the region. It comprises an established network of two campuses and 12 regional centers – nine in First Nations communities and three in the larger towns of Churchill, Flin Flon, and Swan River. This region contains 27 First Nations communities, 34 Métis communities and seven ethnically diverse urban centers (i.e., Churchill, Flin Flon, Swan River, Thompson, The Pas, Wabowden, and Snow Lake). As a result, it is important to understand UCN’s northern function as distinct from

the remaining three public universities in the south (i.e. Brandon University, University of Manitoba, and University of Winnipeg).

As a northern public institution mandated to provide post-secondary education integrating college and university programming to a northern population, UCN has facilitated a breadth of post-secondary offerings since 2002, where institutional and paradigmatic shifts reshaped a vocational technical college (KCC) into a combined college-university (UCN). This change in mandate reflects a shift from assimilation to an accommodation and situated support for Aboriginal education paradigms in this region of the province. The 2016 Provincial UCN Act (C.C.S.M. c. U55) intends to ensure culturally inclusive development that embraces people and communities in the region. This 'new' UCN intent is to support a cultural responsiveness that reinforces the importance and integrity of a northern culture with its high population of Indigenous people and increasing flux of ethically diverse newcomers – and then to grow synergistically from specific contextual learning experiences that emerge.

In response to the many challenges that confront northern Indigenous students in this region, UCN has adopted the *Kenanow* learning model to ensure a new education system that builds a strong identity in students and a rooted sense of belonging that acknowledges the roles and responsibilities of family, community, the traditions of northern Indigenous community living to the larger world. In this context, the educational challenges that UCN faces as a northern institution include an ever-increasing multi-cultural divide, a retro-active influx of unemployed southern university graduates (i.e., program parasitism), and extremely high dropout rates of northern Indigenous students (UCN Strategic and Academic Plans, 2015-2020).

Population aside, the geography of UCN's service area is rich in natural resources, fresh water, and economic potential but Indigenous communities in the region have gained little or no 'educational' or economic benefit and locals are often negatively affected by large-scale resource and hydroelectric development (Thompson, 2015). At the same time, provincial land ceding has created a need for Aboriginal communities to be competent in science-based natural resource management and land use planning, thus creating a need for natural resource-accredited certification, diplomas, and degrees. An increased capacity in technical skills in the environmental sciences, especially when integrated with cultural traditions and Traditional Knowledge, no doubt will provide greater voice and better enable these communities to have an increased role in fresh water monitoring and responding to industry-associated changes within their environment.

One such component is a better understanding of water basins and stream flow to realize and manage variability. This is especially important since Manitoba's provincial economy is predicated on the wise use of fresh water. Management and hydropower-associated changes in water levels and flooding have had dramatic impacts on many Indigenous communities across northern Manitoba in particular. Unfortunately, as water flow needs to be studied and while there is an increased demand for natural resource technicians, enrollment and associated graduation from the UCN Natural Resources Management Technology program has decreased substantially over the last five years (UCN Strategic Plan, 2015). This downward trend of enrollment through graduation at UCN reflects similar declines in enrollment in natural resources programming at other colleges and universities across Canada (Sims & Falkenburg, 2013).

According to University of Manitoba economist Richard Lobdell, UCN needs to develop educational strategies that overcome educational barriers specific to its region (Martin, 2014). Likewise, the past Chancellor of UCN, Ovide Mercredi argues that northern students deserve an opportunity to succeed at university which could in part be facilitated by more appropriate instructional methods, stating “*my community is not unique in their thirst for education [but if necessary] the university can eat its standards so my people can eat*” (Mercredi, 2009, p. 9). Clearly, there is a need for more diverse teaching methods that may be more effective than current teaching methods.

This can in part be achieved by technical training that includes ‘non-traditional’ situated learning theories and technologies inclusive of participatory video. Hence, the goal of this chapter is to examine whether situated learning delivery and the mediating use of PV can improve *academic* performance by comparing the impacts of a didactic classroom lecture to three ‘non-traditional’ educational methods. The latter includes the use of PV in a didactic lecture; a situated learning field exercise; and the use of PV plus a situated field learning exercise. Ultimately, it is anticipated the use of situated learning and PV will facilitate scholastic advance and cursorily explored potential behavioral transformation towards fresh water sustainability, supporting adult learning for northern and remote students at the University College of the North, and more broadly an increased *awareness* about the critical importance of fresh water in Manitoba.

## Methods

Following an action research methodology (Denscombe, 2009), all students were instructed in the calculation of stream discharge, either in the classroom, or *in the river*. Stream discharge is technically defined as the volume of water flowing through a given cross-section of a stream over a given period of time (usually expressed in cubic meters per second), requiring several measurements of depth and velocity to yield an average discharge calculation. In the field, velocity calculations were obtained using the Price No. 622 Type AA Current Meter and metric conversion chart (equipment commonly used by federal and provincial water resources agencies) (Plate 4.1).



*Plate 4.1* Student and equipment in action demonstrating and measuring in-stream water flow.

During a one-hour period in September 2008, my research was presented to 348 newly enrolled students at UCN. These students were enrolled in Natural Resources Management Technology (NRMT) and six non-NRMT disciplines, including Nursing, Law Enforcement, Early Childhood Education, Dental Assisting, Education, and Business Administration. Of the original 348 students, 257 (74%) attended a 90-minute follow-up lecture on historical and contemporary issues related to northern provincial fresh water sustainability, development, diversion and flooding. Attending a subsequent 60-minute introduction and orientation activity to participatory video (PV), 213 (61%) of the students volunteered to learn about and use a Sony DSR-PD170 digital video camcorder (Plate 4.2). Following this workshop on participatory video, 203 (58%) students volunteered to participate in the research. They were randomly assigned to four instruction types: 1) didactic or classroom instruction without PV [n=33]; 2) didactic instruction with PV [n=56]; 3) situated instruction without PV [n=41]; and 4) situated instruction with PV [n=73] (Table 4.1).



*Plate 4. 2* Student actively integrating situated indigenous knowledge interviews with technological skills gained from participatory video workshop.

Of these 203 students, 89 didactic adult learners (with and without PV) attended a fourth session and ‘second’ 60-minute conventional classroom lecture on the calculation of stream discharge. Both ‘didactic’ and ‘didactic + PV’ groups of students were provided with notes and the opportunity to create their own notes related to stream discharge. The remaining 114 situated learners (with and without PV) received no classroom-based lecture or notes, but only a 15-minute on-site pre-exercise demonstration of the calculation of stream discharge. The two groups (situated and situated + PV) received the same note set that the didactic learners had received related specifically to the discharge calculation method – but only following completion of the on-site exercise so that all four lesson approaches would, in effect, have the same preparation materials necessary for subsequent testing. Of the original 203 candidates,

158 students from all four lesson groups partook in a subsequent five-hour field experience intending to measure in-stream flow.

Table 4. 1 *Four instruction types delivered to research participants*

	No Participatory Video	Participatory Video
Didactic	<ul style="list-style-type: none"> <li>• Classroom Lecture (90-minutes)</li> <li>• Participatory Video Workshop (60-min)</li> <li>• Stream Activity Participation</li> <li>• No Camera Use</li> </ul>	<ul style="list-style-type: none"> <li>• Classroom Lecture (90-minutes)</li> <li>• Participatory Video Workshop (60-min)</li> <li>• Stream Activity Participation</li> <li>• Video Camera Use</li> </ul>
Situated	<ul style="list-style-type: none"> <li>• In-field – (15-min) Demonstration (No Classroom Lecture)</li> <li>• Participatory Video Workshop (60-min)</li> <li>• Stream Activity Participation</li> <li>• No Camera Use</li> </ul>	<ul style="list-style-type: none"> <li>• In-field – (15-min) Demonstration (No Classroom Lecture)</li> <li>• Participatory Video Workshop (60-min)</li> <li>• Stream Activity Participation</li> <li>• Video Camera Use</li> </ul>

Both didactic and situated learners were then expected to complete the stream-based exercise in small groups (of three to five students) resulting in one stream flow calculation per group. Students using PV were instructed to record challenges in applying the didactic lessons (or the situated learning lessons) to measure stream flow while using video giving them a unique opportunity to increase their voice in the learning exercise and to share any difficulties they experienced related to stream monitoring (Plate 4.3). All participants had the opportunity to watch the video after the field activity.



*Plate 4. 3* Participatory video field opportunities to voice experiential concepts.

### **Data Analyses**

A mixed strategy for data collection and analysis was used, which focused mainly on quantitative test score findings but incorporated ‘*cursor*y’ qualitative data as well (Creswell, 2007). First, upon completion of the field activity, quantitative scholastic learning outcomes were assessed for 97 (61%) of the 158 field candidates using a test that evaluated written knowledge and skills acquisition. The test contained 22 questions: six multiple choice; 10 sentence completion; four short answer; one essay answer; and one multi-segmented mathematical calculation question. Questions were categorized into two groups: those that were ‘*Necessary for Understanding*’ (NFU) – (12 questions/23 marks), and those ‘*Mandatory for Procedure*’ (MFP) – (10 questions/ 34 marks). The NFU

questions generally referred to underlying theory and concepts whereas MFP questions generally referred to applied techniques and skills.

To expand upon definition and implication of ‘metric’ evolution and improve comprehension of my results, this chapter’s instructional intent is to narrow the knowledge (NFU) and skills (MFP) gap by enabling learning to help remote-based students accomplish training outcomes. The idea was to focus on students who typically score well on field-based levels of technical training, while failing more theoretical portions of an examination only to place themselves at greater risk of attrition.

Subsequently, I make the case for separating essential technical training (or ‘mandatory for procedure’ metrics) *from* theoretical foundations (or ‘necessary for understanding’ metrics). From this perspective, the ‘mandatory for procedure’ (MFP) designation delineates specific field-level and equipment-use skills needed for future employment to be independent in the field, and to manipulate tools in often complex ways. This MFP separation illustrates ‘competency of task’ that learners at this level can do completely; learning specific to the demands of technical aptitude, mathematical technique, and an ability to check for accuracy.

The ‘necessary for understanding’ (NFU) designation is intended to identify ‘conceptual’ gaps providing new strategies for developing and integrating theoretical ideas with MFP skills, providing the ‘foundation’ for learning new skills and adapting to change. Without a strong ‘theoretical or NFU’ foundation, technicians will have difficulty with what technical training is intended to cover. It is necessary to separate learning into these two components, as UCN tends to stumble here, particularly with regards to successful remote Indigenous student completion of technical training. It is my

hope this metric separation will focus success in evaluation of technical training, thereby increasing student ability to perform successfully.

Conversely, ‘integrating’ these two evaluative metrics into my study design is perceived effective in helping adult learners improve their understanding of relationships between theory (NFU) and technical skill (MFP) while choosing appropriate field-level strategies and aiding instructors who want to develop effective and ‘fair’ evaluative training plans.

Test questions were initially developed with input from pre-research focus group discussions with surrounding communities, instructors, and the UCN Elders Council (see Chapter 3). No student group had access to test materials prior to examination. It took students 45-90 minutes to complete the quantitative test, which occurred approximately two to three weeks following the didactic lectures and situated in-stream exercise.

Total test scores as well as MFP and NFU scores were examined empirically. In addition to analysing absolute test scores, these data were also ordered into three relative score categories and re-analysed: 1) low score (0 -33%); 2) medium score (34-66%); and 3) high score (67-100%). Finally, test scores were also categorized as pass (>60%) or fail (<60%) and analysed, this according to UCN criteria for pass-fail grading.

All test scores were evaluated for subsample normality using Kolmogorov-Smirnov and Shapiro-Wilks tests, and equal variance was evaluated using Levene’s tests (Levene, 1960; SPSS, 2014). As response variables were categorical, ordered logistic regression was used to explore, detect, describe, and test the predictive power of a naturally occurring set of independent variables, to assess the relative contribution of each, and to provide an indication of the adequacy of my chosen model (i.e., set of

predictor variables) by assessing ‘goodness of fit’ (Stastica, 2013). Variables included PV and lesson context (situated vs. didactic) as well as gender, ethnicity, program (NRMT vs. other), theoretical skills, and practical skills (Table 4.2).

Second, to supplement the knowledge and skill acquisition test, I also conducted ‘unstructured’ open-ended interviews using only ‘*unsolicited*’ candidate responses during interviews with each of the 97 student participants. Most interviews focused on what students had learned, what had facilitated learning, and what had hindered learning. Interviews were video-recorded and edited using Final Cut Pro (V6). Interviews each lasted 20-30 minutes, generally proceeding until no new insights emerged.

Categorized for what participants had in common as they experienced standing in the stream, unsolicited and emerging themes were labeled, coded, superficially examined for relationship with quantitative findings, and archived in Final Cut Pro for repeated review and re-examination via future statistical analysis (see Chapter 5). Examination was inductive, forming broad theme categories and reconfiguring them into new, narrow and revised constructs (Cortazzi, 1993). Inspection consisted of: 1) viewing the footage several times to obtain an overall understanding; 2) identifying significant statements pertaining directly to the experience of how each participant experienced the situated phenomenon; and 3) formulating open theme meanings and clustering them into axial constructs common to all participants (Moustakas, 1994; Strauss & Corbin, 1990). Criteria for status included: 1) the frequency of a theme’s occurrence; 2) its inclusiveness and the ease with which it related to other theme categories; and 3) the clarity of its implication as a construct in an emerging hierarchical model developing propositions that could be related with the outcomes of the quantitative analysis.

## Results

### Quantitative Test Findings

Test questions (n=22 @ 57 marks) were separated into two categories: i) those *practical* or *applied* in nature and 'mandatory for procedure' (MFP) and ii) those *theoretical* or *conceptual* in nature and 'necessary for understanding' (NFU). Although there was a great deal of variation in test scores, student performance scholastically overall was low. Indeed, mean test scores for Total, MFP and NFU were 51.8%, 48.8%, and 56.1%, respectively (Table 4.2). Notably, preliminary descriptive examination, indicated 'business management' and 'law enforcement' program-level test score 'means' did not meet University College of the North's (UCN) minimum (60%) academic grade requirement.

The impact of a number of independent variables on test scores was explored next. Of these, *culture* or learning modality presented a strong role in academic performance. Total and MFP test scores for non-Aboriginal participants were significantly ( $p < 0.005$ ) higher than self-declared Aboriginal participants (Tables 4.3 and 4.4), although they were not significantly ( $p < 0.05$ ) different for NFU scores (Table 4.5). Scores on the former group were higher on average by 40.59% (12 marks), 45.91% (8 marks), and 33.81% (4 marks) for Total, MFP, and NFU scores, respectively (Table 4.6).

Table 4. 2 *Definition of and descriptive statistics for the explanatory variables used in the ordered logit analysis of total test score achievement.*

Label	Description	Categorical Variables		Continuous Variables	
		Mean	S.E.	Mean	S.E.
<b>Total Score</b> (Dependent)	1=Low (0 to 33%), 2=Medium (34 to 66%), 3=High (66%>)			<b>29.52</b>	1.39
<b>MFP</b> <sup>1</sup> (Dependent)	1=Low (0 to 33%), 2=Medium (34 to 66%), 3=High (66%>)			<b>16.60</b>	0.91
<b>NFU</b> <sup>2</sup> (Dependent)	1=Low (0 to 33%), 2=Medium (34 to 66%), 3=High (66%>)			<b>12.92</b>	0.58
Aboriginal	1 if respondent is an aboriginal; 0 otherwise	0.45	0.05		
Gender	1 if respondent is a male; 0 otherwise	0.25	0.04		
NRMT <sup>3</sup>	1 if respondent is a student of Natural Resource Management Technology; 0 otherwise	0.15	0.04		
PV <sup>4</sup>	1 if respondent is under participatory video (SPV <sup>11</sup> and DPV <sup>12</sup> ) program; 0 otherwise	0.52	0.05		
Aboriginal-PV	1 if respondent is an aboriginal and under participatory video (SPV and DPV) program; 0 otherwise	0.23	0.04		
Non-Conventional	1 if respondent is under non-conventional (Situating, SPV and DPV) program; 0 otherwise	0.77	0.04		
Practical (ILS <sup>5</sup> , PD <sup>6</sup> , SD <sup>7</sup> )	1 if respondent is has practical skill development; 0 otherwise	0.59	0.05		
Theoretical (NE <sup>8</sup> , KS <sup>9</sup> , ED <sup>10</sup> )	1 if respondent is has improvement learning system; 0 otherwise	0.48	0.04		
Gender-Aboriginal	1 if respondent is an aboriginal Male; 0 otherwise	0.09	0.03		
Gender-Situating	1 if respondent is a male and under Situating program; 0 otherwise	0.09	0.03		

<sup>1</sup> MFP - Mandatory for Procedure; <sup>2</sup> NFU - Necessary for Understanding; <sup>3</sup> NRMT - Natural Resources Management Technology program; <sup>4</sup> PV - Participatory Video; <sup>5</sup> ILS - Improved Learning Strategy; <sup>6</sup> PD - Personal Development; <sup>7</sup> SD - Skills Development (environmental); <sup>8</sup> NE - New Experience; <sup>9</sup> KS - Knowledge Sharing; <sup>10</sup> ED - Educational Development; <sup>11</sup> SPV – Situating Lesson plus PV; <sup>12</sup> DPV – Didactic Lesson plus PV.

Table 4. 3 *Ordered Logit Analysis (Dependent variable **Total Score**) of total test score achievement.*

Variable	Coefficient		Marginal Effects		P-Value
	( $\beta$ )	Std. Err.	dy/dx	Std. Err	
<b>Aboriginal</b>	<b>-2.02</b>	0.71	0.316	0.11	<b>0.005</b>
<b>Gender</b>	<b>-2.64</b>	1.00	0.511	0.19	<b>0.009</b>
<b>Aboriginal-Gender</b>	<b>1.97</b>	1.11	-0.17	0.06	<b>0.077</b>
<b>NRMT<sup>1</sup></b>	<b>3.90</b>	0.99	-0.27	0.05	<b>0.000</b>
Non-Conventional	-0.78	0.68	0.10	0.07	0.253
<b>Gender - Situated</b>	<b>1.83</b>	1.10	-0.17	0.06	<b>0.095</b>
PV <sup>2</sup>	0.60	0.67	-0.09	0.10	0.374
Aboriginal - PV	0.27	0.90	-0.04	0.12	0.765
Practical Skill	-0.36	0.31	0.05	0.04	0.250
<b>Theoretical Skill</b>	<b>-0.62</b>	0.32	0.09	0.04	<b>0.048</b>
Thresholds					
$\mu_1$	-0.391	0.926			
$\mu_2$	2.068	0.949			
Model Statistics					
$\chi^2$ H <sub>0</sub> : all $\beta=0$ , (df=10) 43.02 (p<0.0001)					
Log Likelihood Value (Full Model) = -83.516 (p<0.0001)					
Log Likelihood Value (Intercept) = -105.028					
McFadden's Adj R <sup>2</sup> = 0.091					

<sup>1</sup> Natural Resources Management Technology program; <sup>2</sup> Participatory Video.

Table 4. 4 *Ordered Logit Analysis (Dependent variable **MFP**) of total test score achievement.*

Variable	Coefficient		Marginal Effects		P-Value
	( $\beta$ )	Std. Err.	dy/dx	Std. Err	
<b>Aboriginal</b>	<b>-1.92</b>	0.69	0.38	0.13	<b>0.005</b>
<b>Gender</b>	<b>-2.02</b>	0.92	0.45	0.19	<b>0.028</b>
<b>Aboriginal - Gender</b>	<b>1.78</b>	1.02	-0.23	0.08	<b>0.082</b>
<b>NRMT<sup>1</sup></b>	<b>2.91</b>	0.85	-0.34	0.06	<b>0.001</b>
Non-Conventional	-0.02	0.67	0.01	0.13	0.976
Gender - Situated	1.27	0.100	-0.19	0.11	0.203
PV <sup>2</sup>	-0.03	0.63	0.01	0.13	0.961
Aboriginal - PV	0.40	0.88	-0.74	0.15	0.650
Practical Skill	-0.22	0.31	0.04	0.06	0.483
Theoretical Skill	-0.38	0.30	0.07	0.06	0.204
Thresholds					
$\mu_1$	0.049	0.862			
$\mu_2$	1.844	0.883			
Model Statistics					
$\chi^2$ H <sub>0</sub> : all $\beta=0$ , (df=10) 33.19 (p<0.0001)					
Log Likelihood Value (Full Model) = -89.958 (p<0.0001)					
Log Likelihood Value (Intercept) = -106.555					
McFadden's Adj R <sup>2</sup> = 0.043					

<sup>1</sup> Natural Resources Management Technology program; <sup>2</sup> Participatory Video.

Table 4. 5 *Ordered Logit Analysis (Dependent variable NFU) of total test score achievement.*

Variable	Coefficient		Marginal Effects		P-Value
	( $\beta$ )	Std. Err.	dy/dx	Std. Err	
Aboriginal	-1.03	0.69	0.21	0.14	0.138
<b>Gender</b>	<b>-2.72</b>	0.98	0.58	0.17	<b>0.005</b>
Aboriginal - Gender	1.19	1.12	-0.18	0.13	0.288
<b>NRMT<sup>1</sup></b>	<b>3.04</b>	0.87	-0.35	0.06	<b>0.000</b>
<b>Non-Conventional</b>	<b>-1.65</b>	0.70	0.26	0.09	<b>0.018</b>
Gender - Situated	1.50	1.05	-0.22	0.10	0.158
<b>PV<sup>2</sup></b>	<b>1.16</b>	0.65	-0.23	0.12	<b>0.073</b>
Aboriginal - PV	-0.71	0.92	0.15	0.21	0.435
Practical Skill	-0.05	0.30	0.01	0.06	0.965
<b>Theoretical Skill</b>	<b>-0.74</b>	0.32	0.15	0.06	<b>0.021</b>
Thresholds					
$\mu_1$	-0.001	0.881			
$\mu_2$	1.805	0.905			
Model Statistics					
$\chi^2$ H <sub>0</sub> : all $\beta=0$ , (df=10) 37.00 (p<0.0001)					
Log Likelihood Value (Full Model) = -87.995 (p<0.0001)					
Log Likelihood Value (Intercept) = -106.495					
McFadden's Adj R <sup>2</sup> = 0.061					

<sup>1</sup> Natural Resources Management Technology program; <sup>2</sup> Participatory Video.

Table 4. 6 Total, MFP and NFU test scores with respect to self-declared culture.

Self-declared culture		Total	MFP	NFU
Non-Aboriginal	Mean	<b>34.85</b>	<b>19.98</b>	14.87
	N	53	53	53
	Standard Deviation	12.367	8.233	4.840
	Std. Error of Mean	1.699	1.131	.665
Aboriginal	Mean	<b>23.09</b>	<b>12.52</b>	10.57
	N	44	44	44
	Standard Deviation	12.400	8.188	5.768
	Std. Error of Mean	1.869	1.234	.870
Total	Mean	29.52	16.60	12.92
	N	97	97	97
	Standard Deviation	13.650	8.982	5.676
	Std. Error of Mean	1.386	.912	.576

When culture and the type of question were examined in detail, it seemed both Aboriginal and non-Aboriginal students did best in *sentence completion (SC)* and *bullet answer (BA)* whereas the latter group did better in *long answer (LA)* and *calculation (CA)* questions (Figure 4.1).

*Gender* also played an important role in determining academic performance. Total, MFP, and NFU mean test sub-scores indicated males (n=24) tended to score higher than females (n=73); particularly for Total and MFP test scores in this northern student sample (Table 4.7). Outcomes of the ordered logistical regression indicated that females did significantly poorer than males with respect to Total ( $p < 0.009$ ), MFP ( $p < 0.028$ ), and NFU ( $p < 0.005$ ) test scores (Tables 4.3, 4.4 and 4.5). In this case, mean test score values for male students were 8.39 % higher than for female students with respect to Total score and 14.34 % higher for MFP scores (Table 4.7).

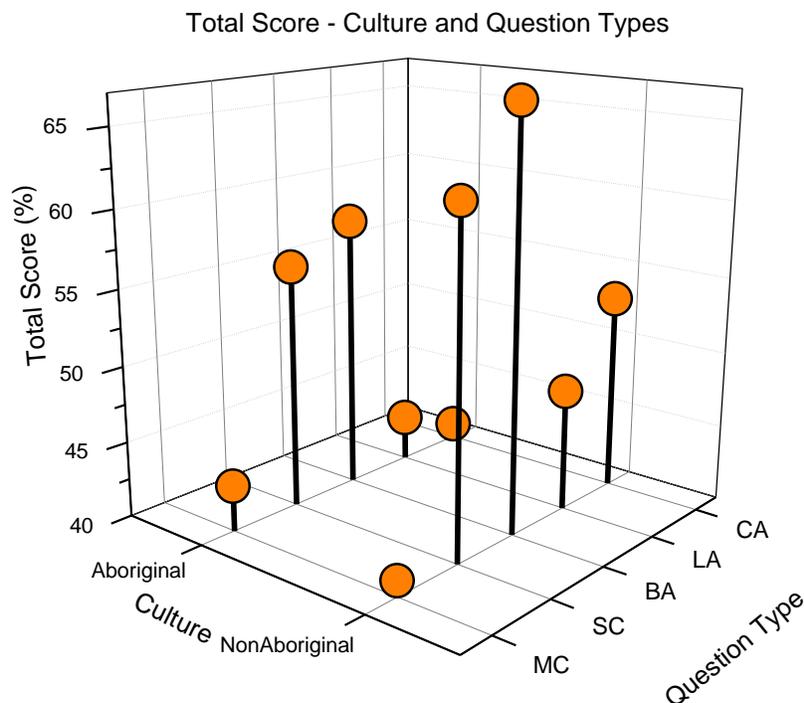
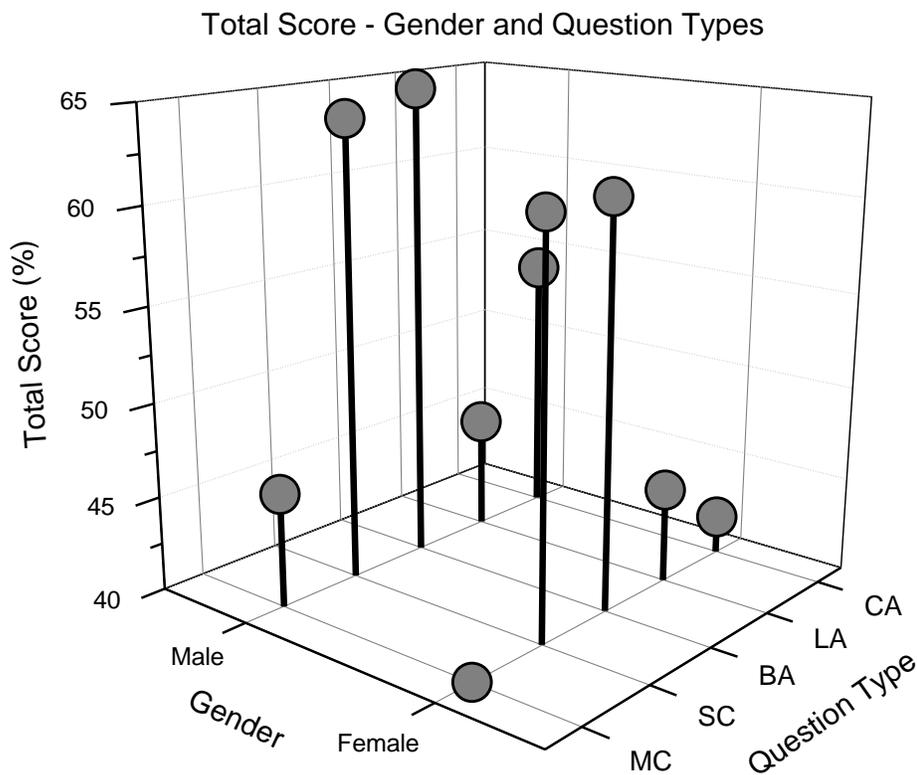


Figure 4. 1 Total test score percent as related to culture and question type. MC-Multiple Choice; SC-Sentence Completion; BA-Bullet Answer; LA-Long Answer; and CA-Calculation.

Table 4. 7 Total, MFP and NFU test scores with respect to student gender.

Gender		Total	MFP	NFU
Female	Mean	<b>28.89</b>	<b>15.99</b>	12.90
	N	73	73	73
	Standard Deviation	13.630	9.110	5.610
	Std. Error of Mean	1.595	1.066	.657
Male	Mean	<b>31.42</b>	<b>18.46</b>	12.96
	N	24	24	24
	Standard Deviation	13.828	8.495	5.996
	Std. Error of Mean	2.823	1.734	1.224
Total	Mean	29.52	16.60	12.92
	N	97	97	97
	Standard Deviation	13.650	8.982	5.676
	Std. Error of Mean	1.386	.912	.576

The influence of *gender* on academic performance was also evaluated for different *types of questions*. Of the five different question types used to evaluate knowledge and skills acquisition, it seemed that males did substantially better in *calculation* (CA) type questions (Figure 4.2).



*Figure 4. 2* Total test score percent as related to gender and question type. MC-Multiple Choice; SC-Sentence Completion; BA-Bullet Answer; LA-Long Answer; and CA-Calculation.

Academic performance also showed a significant *interaction* between culture and gender for Total ( $p < 0.077$ ) and MFP ( $p < 0.082$ ) test scores (Tables 4.3 and 4.4) although not for NFU test scores (Table 4.5). Indeed, mean Total and mean MFP scores showed

that there was much less difference in academic performance between Aboriginal men and women (i.e. 4.28% and 12.16% for Total and MFP scores) than for non-Aboriginal men and women (i.e. 4.29% and 8.84% for Total and MFP scores) (Table 4.8).

Table 4. 8 *Total, MFP and NFU test scores with respect to student culture and gender.*

<b>Total test score</b>				
	Aboriginal	Standard Error	Non-Aboriginal	Standard Error
Male	23.89	3.49	35.93	3.59
Female	22.89	2.19	34.42	1.92
<b>MFP</b>				
	Aboriginal	Standard Error	Non-Aboriginal	Standard Error
Male	13.78	1.98	21.27	2.24
Female	12.2	1.47	19.47	1.32
<b>NFU</b>				
	Aboriginal	Standard Error	Non-Aboriginal	Standard Error
Male	10.11	1.75	14.67	1.53
Female	10.69	1.01	14.95	0.72

Student ability to score higher also varied according to *program* types. Some programs were combined to increase sample size, and thus comparisons were made between Natural Resources Management Technology (NRMT) and ‘other’ (non-NRMT) programs. Generally speaking, students in NRMT had substantially higher academic performance than those in the other programs with respect to Total score ( $p < 0.000$ ), MFP ( $p < 0.001$ ) and NFU ( $p < 0.000$ ) (Tables 4.3, 4.4 and 4.5). Mean Total, MFP, and NFU test scores were 49.06%, 58.99%, and 35.05% greater for students in the NRMT program (Table 4.9).

Table 4. 9 Total, MFP and NFU test scores with respect to program choice

Program Type		Total	MFP	NFU
Non - NRMT	Mean	<b>26.82</b>	<b>14.70</b>	<b>12.12</b>
	N	82	82	82
	Standard Deviation	12.826	8.234	5.716
	Std. Error of Mean	1.416	.909	.631
NRMT	Mean	<b>44.27</b>	<b>27.00</b>	<b>17.27</b>
	N	15	15	15
	Standard Deviation	7.086	4.884	2.815
	Std. Error of Mean	1.830	1.261	.727
Total	Mean	29.52	16.60	12.92
	N	97	97	97
	Standard Deviation	13.650	8.982	5.676
	Std. Error of Mean	1.386	.912	.576

The impact of *situated non-conventional learning* on academic performance was also evaluated. Generally this impact and that of PV on test scores was less important than gender, culture and program type as indicated by the ordered regression. Somewhat expectedly, test scores for NFU were significantly higher ( $p=0.018$ ) for students in didactic classes than those in non-conventional classes (i.e. situated, situated + PV, and didactic + PV) (Table 4.5). Examined in detail, students had 21.36% higher grades, perhaps showing conceptual or theoretical focus emphasized in the NFU questions were better suited to classroom-based learning (Table 4.10). Alternatively, mean MFP test scores tended to be higher for non-conventional classes (16.63 vs. 16.50 or 0.78%, Table 4.10) and even more so with Aboriginal students (12.85 vs 11.40 or 11.96%, Table 4.11).

Table 4. 10 *Total, MFP and NFU test scores with respect to Lesson type.*

		Total Score	MFP	NFU
Didactic	Mean	31.68	16.50	15.18
	N	22	22	22
	Standard Deviation	9.877	7.183	3.936
	Standard Error of Mean	2.106	1.531	.839
Non- Conventional	Mean	28.88	16.63	12.25
	N	75	75	75
	Standard Deviation	14.569	9.488	5.953
	Standard Error of Mean	1.682	1.096	.687
Total	Mean	29.52	16.60	12.92
	N	97	97	97
	Standard Deviation	13.650	8.982	5.676
	Standard Error of Mean	1.386	.912	.576

Table 4. 11 *Total, MFP and NFU test scores with respect to Lesson type as affected by culture.***Total Score**

	Non-conventional	Standard Error	Didactic	Standard Error
Aboriginal	22.38	2.33	25.50	2.17
Non-Aboriginal	34.27	2.06	36.83	2.65

**MFP**

	Non-conventional	Standard Error	Didactic	Standard Error
Aboriginal	12.85	1.51	11.40	1.62
Non-Aboriginal	19.76	1.38	20.75	1.67

**NFU**

	Non-conventional	Standard Error	Didactic	Standard Error
Aboriginal	9.53	1.01	14.10	1.18
Non-Aboriginal	14.51	0.79	16.08	1.15

Mean Total, MFP and NFU test score comparisons indicate that males do much better (24.36%, 30.18% and 15.42% respectively) than females when exposed to non-conventional lesson delivery (Table 4.12). Moreover, both genders seemed to do poorly

when learning was theoretically-based and not applied in nature. There also was a significant ( $p=0.095$ ) interaction between gender and lesson delivery with respect to Total test score such that males seemed to respond better to situated learning than females (Table 4.12).

Table 4. 12 *Mean test score interaction between gender and lesson delivery.*

### **Total Score**

	Situated	Standard error	Didactic	Standard error
Male	<b>33.57</b>	5.59	30.53	3.34
Female	<b>26.28</b>	3.87	29.75	1.70

### **MFP**

	Situated	Standard error	Didactic	Standard error
Male	<b>20.86</b>	3.33	17.47	2.04
Female	<b>15.39</b>	2.44	16.18	1.18

### **NFU**

	Situated	Standard error	Didactic	Standard error
Male	12.71	2.45	13.06	1.45
Female	10.89	1.52	13.56	0.70

The influence of teaching delivery was also compared among lesson types and question types. Students in didactic classes seemed to have higher Total test scores for *sentence completion* (SC), *bullet answer* (BA) and perhaps *multiple choice* (MC) question types, where as those in situated and situated-PV classes generated higher *long answer* (LA) and *calculation* (CA) question scores (Figure 4.3).

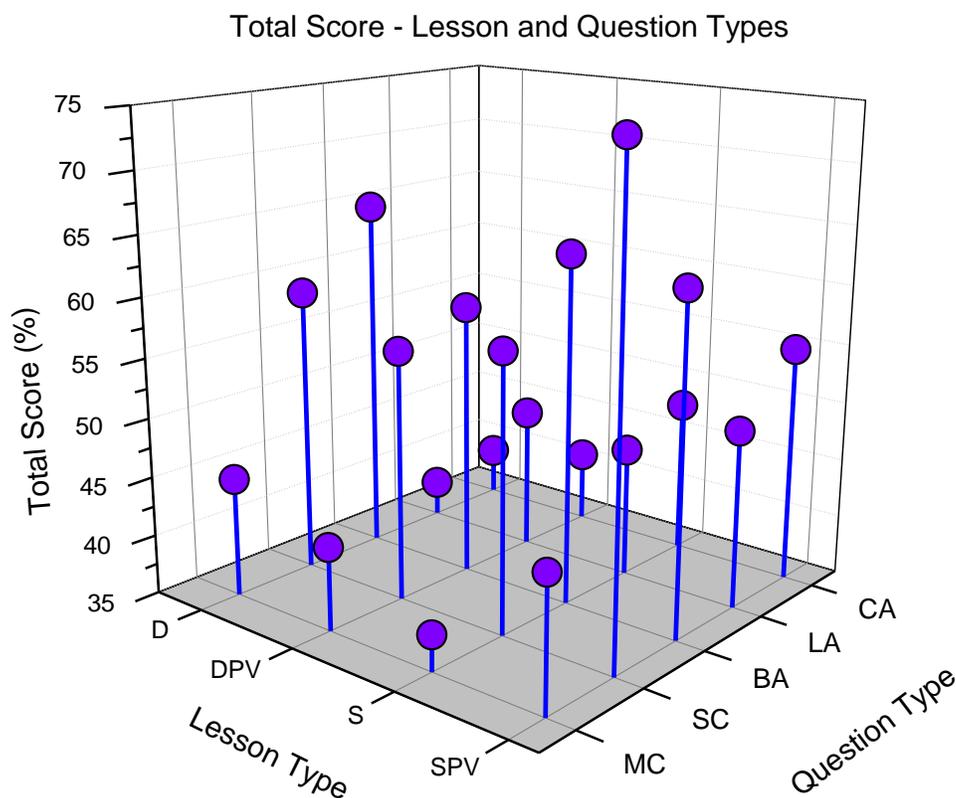


Figure 4.3 Total test score percent related to lesson type and question type. D-didactic; DPV-didactic + PV; S-situated; SPV-situated + PV; MC-Multiple Choice; SC-Sentence Completion; BA-Bullet Answer; LA-Long Answer; and CA-Calculation.

The influence of *participatory video* (PV) usage was generally of less significance, at least as revealed by ordered logistic regression analysis for scholastically-based Total test scores (Table 4.3) and MFP test scores with this small sample (Table 4.4). Yet PV had a significant positive ( $p=0.073$ ) effect on NFU test scores (Table 4.5).

Culture also seemed to play a role with respect to PV. Non-Aboriginal students in PV classes had lower Total, MFP and NFU scores than those in non-PV (i.e. situated, didactic) classes whereas Aboriginal students exhibited higher Total and MFP scores

(Table 4.13). Although not statistically significant, there was less of a difference between Aboriginal and non-Aboriginal mean Total and MFP test scores when PV was used (26.43% for Total score and 42% for MFP score), in part perhaps because Aboriginal students were doing better with the use of participatory video (Table 4.13).

Table 4. 13 *Mean test score as an interaction between culture and participatory video.*

**Total Score**

	PV	Standard error	Non-PV	Standard error
Aboriginal	<b>24.73</b>	2.46	<b>21.45</b>	2.83
Non-Aboriginal	32.64	2.81	37.32	1.69

**MFP**

	PV	Standard error	Non-PV	Standard error
Aboriginal	<b>14.18</b>	1.73	<b>10.86</b>	1.72
Non-Aboriginal	18.29	1.86	21.88	1.10

**NFU**

	PV	Standard error	Non-PV	Standard error
Aboriginal	10.55	1.10	10.59	1.37
Non-Aboriginal	14.36	1.07	15.44	0.74

Interestingly, female students using participatory video tended to score higher than their male counterparts with respect to Total (3.99%), MFP (2.75%) and NFU (5.54%) mean test scores (Table 4.14), which is important since females typically performed less well than males.

Table 4. 14 *Mean test score interaction between gender and participatory video.*

<b>Total Score</b>				
	PV	Standard error	Non-PV	Standard error
Male	28.22	5.79	33.33	2.95
Female	<b>29.37</b>	2.08	<b>28.28</b>	2.51

<b>MFP</b>				
	PV	Standard error	Non-PV	Standard error
Male	16.11	3.61	19.87	1.75
Female	<b>16.56</b>	1.41	<b>15.25</b>	1.64

<b>NFU</b>				
	PV	Standard error	Non-PV	Standard error
Male	12.11	2.44	13.47	1.36
Female	<b>12.80</b>	0.80	<b>13.03</b>	1.04

A profile plot for the interaction between program and participatory video (PV) indicates using PV resulted in higher Total test scores (19.43%) for NRMT students but was not so beneficial (0.95%) for non-NRMT program students (Figure 4.4). The difference between NRMT + PV and non-NRMT + PV students was 41.36% suggesting NRMT students utilized PV more effectively with respect to Total score.

The difference between the Total score of students who used video and didn't use video in the '*situated*' class also showed an important difference (Figure 4.5). The estimated increase in test score between students who used video and those who did not was 16.69%. There was also a 7% increase in total test scores in didactic delivery.

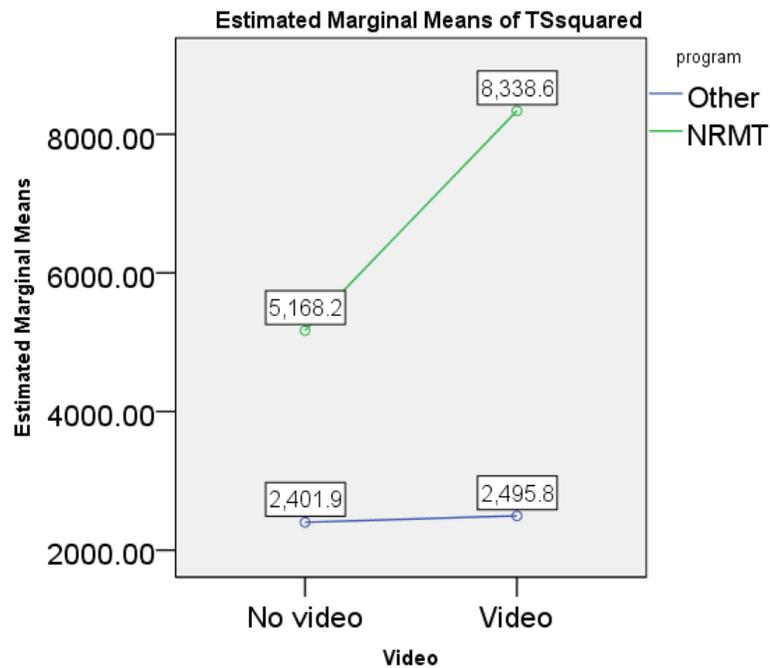


Figure 4. 4 Profile interaction between participatory video and program. To convert TS-squared to percent, take the square-root.

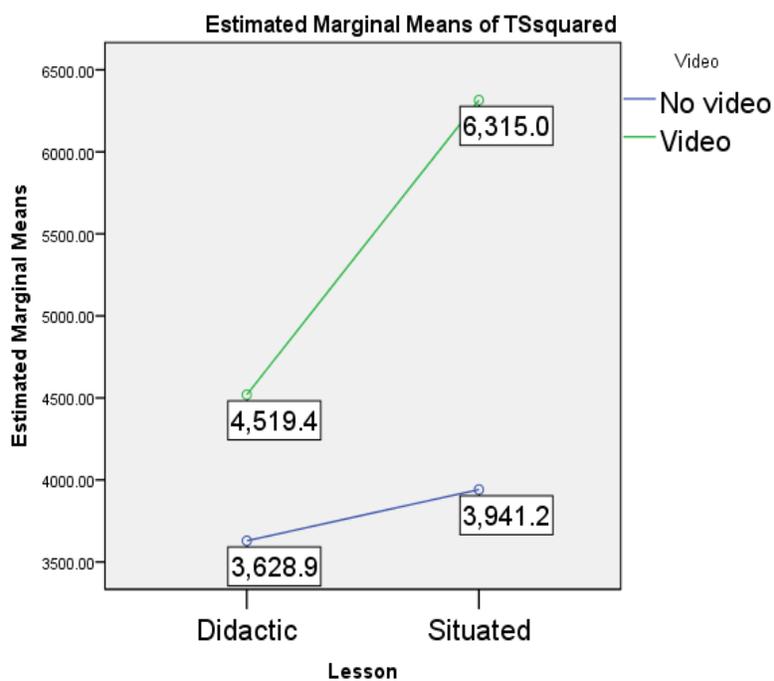


Figure 4. 5 Profile interaction between participatory video and lesson type.

From the profile plot below, it is also apparent there is an important difference in the NFU results in the situated class between those who used participatory video and those who did not. Students in the situated exercises benefited from the use of video and got higher NFU scores (Figure 4.6). Alternatively, students in the didactic lectures who used video generated lower NFU scores. This interaction implies the effects of participatory video usage vary depending on the lesson type. Students in the situated class who used video performed significantly better than those who did not ( $p$ -value = 0.003) and obtained scores higher by approximately 26.32 points on the NFU part of the examination. In contrast, students in the didactic class who used video performed less well (-9.77 points) than those who did not.

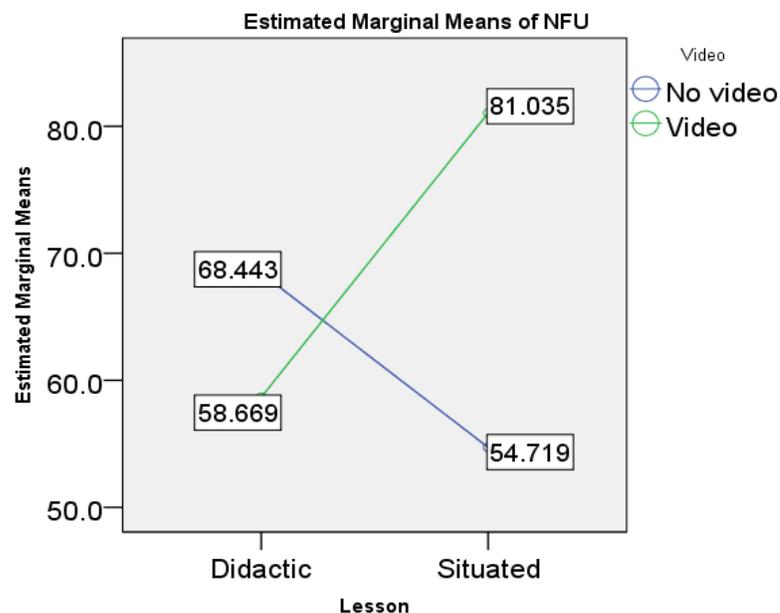


Figure 4.6 Profile plot for the interaction between lesson and video.

### **Cursory Qualitative Findings Surficially Related to Test Scores**

While not readily apparent in quantitative test score evaluation, when students were interviewed about their experiences, they often indicated they had found the ‘non-conventional’ approaches to delivery to be of great value. From unsolicited student response, different themes were cursorily identified that spoke to the *nature* of these scholastic benefits providing direction for *integrated* study design phases to be examined further (Chapter 5). These *themes* included being situated, working collaboratively, becoming aware, developing skills, acquiring knowledge, and even experiencing overt behavioral change.

Contextually, but only cursorily, students found it was difficult to pay attention and to apply the details of the stream water monitoring technique in the ‘didactic’ sessions but not while ‘on-the-land’. In the voice of one nursing student, *“I realized a strategy that is from situation to lecture setting rather than the reverse, so I will now try to do more in clinical settings as this was an easier way to learn”* (Student 72). Students in non-conventional learning environments indicated *“there was an increased attention – both voluntary and demanded by being there”*; and *“being in the cold and snow was peaceful – it was a less strict environment”* (Student 21).

The stream discharge calculation exercise also incorporated an element of ‘**collaboration**’, defined here as working together to achieve success by sharing knowledge and building consensus within the student working groups (Plate 4.4). Student cohort-generated statements included *“groups provided a reinforcement of concepts”*

(Student 91); and *“as a group there was completion [of the exercise] – most likely not possible by myself”* (Student 73).



*Plate 4. 4* Students working together positively and achieving success by sharing knowledge and building consensus within the working groups.

Participation in situated learning also increased **‘awareness’** among many of the students. By definition, ‘awareness’ is the ability to perceive, or be conscious of events, objects or patterns culminating in ‘mindfulness’. Unsolicited statements ranged from being cognizant of fresh water to new understandings of self and group dynamics. One student thus mentioned *“I am examining the concept of a watershed differently – the exercise has opened my eyes to humanity’s cost and use of nature”* (Student 9). Other students indicated *“it was difficult to step back – I am more accepting of others perspectives”* (Student 10) and *“I believe I am a better person with an improved and more focused understanding”* (Student 56).

Occasionally, awareness seemed focused on an internal state (a visceral feeling) whereby participating in the streamside event an awareness enabled students to develop a ‘Eureka!’ moment, or **transformative conscious subjective ideas** (CSE) about ‘their’ experiences. For example, some expressed feeling *"less hope, and less in-control knowing this information"* (Student 18). Others indicated *"a cultural and community holistic connectivity"* (Student 6) even though they had lived in northern Manitoba all their lives without having ever crossed a flowing stream, stating they were *"terrified and in awe at the same time – I won't forget it"* (Student 11).

Other unsolicited responses indicated non-conventional delivery methods may also play a strong role in enhancing student knowledge and skill development. Students indicated *"these skills will certainly improve my chances for career development"* (Student 85); *"I realized my leadership capability of taking charge of a group of people"* (Student 23); and *"I've realized a confidence in communication, a decreased anxiety and a reduced stereotype casting"* (Student 3). These latter statements essentially reflect the UCN mission.

Some students further explained how learning in groups helped them refine such skills. One participant stated *"I realized my leadership capability of taking charge of a group of people"* (Student 23) while another mentioned *"others made me realize I need to ask more questions and a greater variety of questions while participating in class"* (Student 30). In sum, ‘non-conventional’ delivery was shown to be an important medium creating *meaningful* opportunities for improved learning in the field.

Most students in the video groups mentioned educational and environmental advance, knowledge sharing, social responsibilities, and new experiences; *"using the*

camera helped me to realize” (Student 77). This is indicative that all lesson types are (or can be) equally effective for knowledge acquisition, but that PV played a particularly important role in creating engaged learning in these classes. Video encouraged students to discuss and share their understanding with their peers (Plate 4.5). Some participants stated they *“developed an improved ability to network with like-minded people”* (Student 75) and *“others were really excited when I told them what I was doing”* (Student 86).



Plate 4. 5 Student participant documenting the stream experience.

Video also encouraged students to reflect and associate their in-class **knowledge** with their responsibility in the community. Some students indicated: *“I am going to voice my perspective with Chief and Council regarding the environment”* (Student 51); *“I have been thinking about the world more, not simply myself and this town – we must smarten up as I sadly found garbage and keys in this beautiful stream segment we researched - in*

*the middle of nowhere!*” (Student 3). Essentially, these unsolicited (and ‘non-Likert’ generated) responses indicated that working with a video camera and recording learning experience contributed to link these experiences and to engage with the wider world.

Administratively, and from a compilation of student video archive clips of their learning experiences, Program Directors at UCN similarly realized the benefit of ‘non-traditional’ lessons, and the need to change the traditional ‘didactic’ style of instruction that is still so prevalent. There was keen interest on the part of the Vice President of Academics and Research to have non-traditional lesson types and PV explored with a commitment to bring innovation in existing instructional methods at UCN:

*“I think that the way you are constructing curriculum will provide students with that opportunity to go beyond the scientific, go beyond the cultural, go beyond the social, to think about things from an integrated, interrelated, interdependent perspective because that is the ‘real’ learning”*

Kathryn McNaughton – Vice President Academic and Research UCN

The President of UCN further added that PV and situated learning could be used to complement existing lecture-based learning, in part because a variety of approaches are essential, while arguing at the same time that these changes were overdue and would need to incorporate – and validate – student experiences in order to be successful.

*“... there is a change afoot and they’re trying to hold back the dam, and the dam has to break, because the dam excludes many, and if we are not teaching and making education accessible for everyone, then we are not educators. Sadly, I think we are victims of ‘progress’ for progress’s sake – so our design must help to cultivate the spirit of asking students to examine their living and living experiences - how they are going to move forward in the future - how they are going to contribute – to understand the very place that they live –.”*

Denise Henning – President UCN

## Discussion

As reported by Brookfield (1983), and Henning (1998), it is naïve to assume significant learning is restricted to the classroom. Contextually, Klerkx (2008) argues the still-widespread dependence on conventional didactic approaches and scholastic efficacy to learning are criticized in rural regions, while Pant and Hambly-Odame (2010) find didactic approaches and rote assessment in underdeveloped, low-income areas results in poor educational outcomes. According to Lunce (2006) this contextual dichotomy between classroom and situated experience negatively affects knowledge acquisition, frequently resulting in physical and mental absenteeism on the part of participants. Duffy and Cunningham (1996) cited students feel disconnected from real-world and local environments in traditional settings as didactic approaches fail to reflect a natural reality including ‘opportunities’ for non-academic and experience-based insights, especially for mature adult learners relating their life experiences (Ellsworth, 2005).

My research findings agree; didactic lessons and rote empirical assessment have limitations and present as disconnected from local contexts when participatory and embedded techniques are ignored altogether. University College of the North (UCN) student test score results show that northern ‘at-risk’ learners do not perform well empirically and in many cases fail abjectly when confined to conventional didactic learning and rote assessment. This was especially true for students who were Aboriginal, female, and in programs other than University College of the North’s Natural Resources Management Technology (NRMT).

Even though overall UCN student test performance was quite low, didactic delivery and empirical assessment selected only for higher Necessary for Understanding (NFU) scores reflecting conceptual knowledge acquisition reproduced as rote memorization generated through multiple choice, sentence completion and bullet answer question types. Conventional lesson approaches did not develop new insights or the ability to perceive what is not immediately obvious while handling complex in-stream challenges. Such critical learning is multi-dimensional and does not occur in such straightforward ways (Parkes & Zimmaro, 2016). Regrettably, an over-reliance on rote empirical test scores generated via traditional didactic delivery seems to perpetuate the ongoing education crisis in Manitoba's north.

According to Wright (2002), this decontextualized transmission of knowledge is *fuzzy* as there are differences in sensory registration that vary from student to student; compounded by many embedded criteria (e.g., worry, fear, group dynamics, excitement, and home life). Ultimately, each student perceives things differently because their learning, and indeed life histories, do not match. But, all students are expected to perform as if their incoming 'enrolment-level' knowledge and skill learning frameworks are identical on which the instructors add 'their' own lesson plans. Consequently, as students in didactic settings may develop some level of understanding for disseminated conceptual (NFU) topics and techniques in class, their ability to translate these ideas into *applicable* practice and Mandatory for Procedure (MFP) skills is not being addressed. Clearly, as current UCN teaching typologies and evaluation remain highly Eurocentric in nature, there is a need for more diverse learner-centered deliveries and assessments that are more effective in bridging links between western education and Indigenous

disseminations and values, and more generally student life experiences at this remote institution, in this northern region.

As I grounded my research in a northern and remote reality, and because I considered northern adult students' needs to participate and to think about the nature of society in which they live, my non-conventional approaches (delivery and assessment) emphasized ideas of praxis, affirming education must take the learner to where they are and build on existing interests. As Buckland (2010) confirms, the financial literacy of low-income participants in Winnipeg improved when their fiscal budgets were 'situated' within personal constraint. My research extends Buckland's assertion using non-conventional delivery strategies that not only encourage similar 'qualitative' insights, but the improvement of 'quantitative' test scores academically.

Besides showing embedded learning aids academic performance by reflecting and affirming northern student experiences, both didactic and non-conventional lessons were integrated with Participatory Video (PV). The 'process' of digitally recording participant interaction while in the stream was the main focus of this part of the assessed activity. In essence, the use of PV in this manner helped facilitate training and learning. Its use provided a positively mediating mechanism for engaging marginalized UCN students in small groups to focus and articulate their individual and collective learning scholastically.

In accordance with Lurch (2008, p. 6) whose expectations are that video will "*help other methods go even further*", PV was used (in this study) to encourage 'scholastic' learning by offering 'direct' experience embedded in traditional and situated learning styles. Video proved not only an effective means of creating spaces for cross-modality learning, it helped to acquire knowledge frames in a 'real-life' context for those who

participated in the video exercise. In sum, the use of non-conventional lesson delivery using PV in this education process was a success. My video-mediated learning demonstrated untapped potential for northern academic and social change. Preliminary qualitative results showed that PV in both didactic and situated lessons was effective in raising awareness, drawing attention to key student needs, and involving participants directly in decision-making processes while exploring immediate solutions. In this sense, PV facilitated and affirmed student experiences and insights. Yet, 'quantitative' outcomes made it clear PV-related changes in improved academic performance were related to student gender, self-declared culture (or northern learning modality) and program type.

Findings also indicated PV facilitated the creation of student-centered exercises that enhanced learning about fresh water sustainability. Qualitatively, and quantitatively, cursorily explored interview results indicated that PV increased student engagement with classmates and the subject matter helping them reflect and use problem-solving practices to gain relevant skills and knowledge. It was also observed that student recordings of field trainings and their learning 'stories' played a key role in this 'on-the-land' knowledge and skill acquisition conceptualization of fresh water conservation.

Just as the work of Donald Snowden influenced subsequent generations of PV related to community development and social justice across Canada (Quarry, 1994), the findings of my northern Manitoba study reflect the outcomes of somewhat similar recent experiences in rural education that facilitated capacity development (Chowdhury et al., 2011; Mann, 2006; Van Mele, Wanvoeke, & Zossou, 2010). Similarly, Hedrick-Wong, Karmsjo, and Sabri's (1997) video account of forest destruction for road-widening successfully used PV to gain just compensation from the local government for lost trees

in Bangladesh. And, Chowdhury et al. (2014) and Kindon's (2003, p.142) affirmations that PV, if used within carefully negotiated relationships, has the potential to create space for transformation and learning.

My use of 'quantitative' data analysis complements and extends such qualitative documentation of PV as an effective learning tool. My results indicate the use of PV *empirically* increased total test score 'means' by 5-20% per lesson type, increasing successively from didactic (D) through didactic plus PV (DPV), situated (S), and situated plus PV (SPV) lesson deliveries. Moreover, analysis of variance suggested PV and 'program' interacted significantly ( $p=0.002$ ) to increase total test scores (by 19.4%) for NRMT students, while also increasing Total, MFP, and NFU test score totals empirically between 5-10% for students in each of the six remaining program types.

Participatory video also interacted with 'lesson' type for situated PV learning and resulted in significantly greater academic scores with respect to *long answer* and *calculation* 'question types' when both a situated environment and a camera were used. Most significantly ( $p=0.01$ ), participatory video and lesson type combined to increase total test scores (17%) and NFU test scores (26%) for students engaged in situated (S) and situated plus participatory video (SPV) learning.

By and large, the results of this study lead to a number of key insights into situated learning and PV for adult learners at UCN. Generally, UCN students who experienced situated and/or PV lesson types were more likely to acquire knowledge and technical skills compared to students who experienced didactic lessons only. Even didactic lessons used in conjunction with PV scholastically-increased total test scores by 17%, yet these students performed less well in conceptual (NFU) test scores than those in

didactic lectures alone, perhaps indicating an overload of facts while attempting to cope with the deluge of new information or a mismatch between testing and learning experiences. While participatory video is clearly no panacea, my findings beg for increased 'quantitative' empirical evidence regarding educational and participatory video evaluation collected over an extended time frame regarding the sustainability of educational designs themselves (Grudens-Schuck, 2001).

Student 'program' type clearly played a strong role in influencing academic performance. Perhaps predictably, students enrolled in the Natural Resources Management Technology (NRMT) program outperformed students in other programs. However, their total test scores also improved more substantially (by 41%) in using non-conventional lesson types (DPV, S, SPV), compared to non-NRMT students in these same lesson types. Students in NRMT were likely already more interested in local environments and in technical environmental management requirements (i.e. calculating stream discharge) than other students, and perhaps less intimidated by the technical intricacies of this delivery method or even of the 'stream' learning environment itself.

Gender also played a strong role in scholastic student outcomes. In general, male students outperformed female students when it came to total, NFU and MFP scores. That said, female students responded most positively to non-conventional lesson types, as evidenced by increases in total (24%), MFP (30%), and NFU (15%) test scores. Females also took advantage of the PV technology slightly more so than male counterparts, displaying average score increases of 5% across test sub-scores. These scholastic increases also interacted with question type, in that the performance of situated plus PV female students showed a notable (20%) improvement in successful *long answer* and

*calculation* questions. Lunce (2006) similarly showed abstract mathematical competency is increased when taught in a real-world context relative to a formal classroom context. And, Scouller (1998) suggests these kinds of questions facilitated performance in a wide range of jobs dependent on a wide diversity of competencies including high levels of persistence, attention to detail, and a willingness to check accuracy before moving on.

A most interesting finding was that non-conventional lessons seemed to enhance Aboriginal scholastic performance. Aboriginal MFP quantitative test scores increased a full grade level (12%) in non-conventional lesson delivery environments. Specifically, PV increased Aboriginal total, MFP and NFU test scores although no such improvement was exhibited by non-Aboriginal students. Thus, the difference between non-Aboriginal and Aboriginal academic performance was reduced by PV.

Finally, differences in test scores were greater (8%) between Aboriginal males and females than non-Aboriginal males and females, indicating that Aboriginal males responded particularly strongly to PV. In sum, PV in both conventional and non-conventional lesson delivery was found to be effective in enabling the academic performance of Aboriginal students, and is thus worthy of further exploration in addressing the widespread barriers that Aboriginal students face at UCN and other post-secondary institutions in the remote north.

Generally, these findings support a shift for UCN and other secondary and post-secondary institutes from didactic teaching styles towards ones that are mixed with those 'non-conventional' in approach. In the low-income regions of northern Manitoba, there is a particular need for effective alternatives to didactic teaching strategies, which have been widely criticized as being ineffective (Lobdell in Martin, 2014; Mercredi, 2009). In

this study, situated learning methods and the strategic use of participatory video technology helped improve learning process and outcome, whether this related to knowledge acquisition, awareness, technical skills, or the cursory examination of overt behavior change (see Chapter 5).

In extension, these approaches might help mitigate high ‘failure’ and dropout rates in the north, and contribute to positive learning experiences in and outside the classroom. Simply, non-conventional approaches captured experiential learning in a ‘process’, helping students reflect on issues that exist at the nexus between environments, their cultural modalities, and application of a technical and scientific undertaking - in this case - the exploration of water monitoring and sustainability. Experiential situated learning and participatory video processes thus provided students with the ability to develop learning skills, collect data, analyze, communicate their observations, and to think critically about, and organize around, community-based issues related to the availability of fresh water in the north.

Although scholastic advance and academic relevance has yet to be verified in my *modified* PV recycling as a ‘process’ versus a ‘product’, the alteration in approach and significance of ‘V’ in ‘PV’ revealed an untapped potential for remote academic and empirical improvement in facilitation and social change. Engaging marginalized participants in this northern region *visually* encouraged those with ‘inequalities’ and little formal knowledge to become effective free-talk providers through chronicled and affirming story-telling opportunities to share and discuss *their* understanding of how to engage with the wider-world. Conducive to developing criteria for repeated viewing, the

‘V’ in ‘PV’ acted as a digital repository and positively mediating mechanism for building model clarity.

Interestingly, the use of ‘V’ in ‘PV’ proved effective in both the didactic and situated environments raising self, exercise, and environmental mindfulness. Camera use concentrated participant focus inwards towards task completion. Extending Buckland’s (2010) assertions that participatory video improves insight ‘qualitatively’, analysis of variance of this UCN sample suggests my *modified* video technique interacted quantitatively with program type, question type, gender, and northern student learning modalities to increase total scholastic test scores between 5 and 20%. These findings beg for increased research and empirical evidence exploring non-conventional lesson deliveries that incorporate video (the ‘V’ in ‘PV’). In essence, video provided a medium capable of capturing unforeseen student gestures leading to unanticipated results which reflected improved assessment of participant priorities and norms concerning transformative behaviors. Donald Snowden would be proud.

### **Implications**

Although aspects of this study echo the insights of other widely recognized studies (e.g. Chowdhury et al., 2014; Miller & Cruce, 2004; Witteveen, Put, & Leeuwis, 2010), my study evaluates the ‘scholastic’ role of PV and situated learning for adult learners in remote settings and the idea of northern learning modalities in contrast to ‘culture’. My findings are of great educational and social importance as they indicate: that unconventional learning can facilitate academic performance; that these approaches

can address barriers to learning as influenced by gender and northern learning modalities; and that these approaches can incorporate and reflect local norms and priorities - and for that matter incorporate appropriate axiological approaches to evaluation.

Although this study and chapter focus on changes in quantitative and conventional test scores, it is obviously important to situate such research in the context of broader approaches to evaluating academic performance related to provincial fresh water sustainability. Arguably this dependence on quantitative empirical test scores is too simplistic in nature. The complexities of northern adult education require that instructors working in these remote communities better develop local and meaningful course content, and just as important, generate more meaningful forms of adult or mature student evaluation.

The *first* thing to note is that controversial assumptions regarding differences in academic performance between self-declared Aboriginal and non-Aboriginal students become less important once one steps away from conventional forms of teaching. In so doing, a detailed dialogue that explores alternative and more diverse approaches to student assessment is vital.

*Second*, the ability to critically analyze and to apply concepts in the real world is not the same as the ability to absorb rote information in a postsecondary environment. To 'analyze' is the ability to investigate potential relationships and incorporate new critical insights. It does not mean that students have the words or experiences to make these insights relevant in their personal or professional lives. The practical implications of these findings are serious for newly enrolling northern 'adult' learners, especially as less emphasis is placed on factual accuracy and more emphasis is placed on chronotopic

traditions and values. Not only is being ‘embedded’ and working collaboratively required to advance holistic understanding, but the use of generic (and often urban-centered) criteria in evaluating northern adult academic performance (solely) are arguably less likely to be successful in remote locations. More diverse approaches to remote assessment are desperately required in order to reveal typically unrecognized types of knowledge acquisition. Such approaches would affirm student experiences and learning priorities, and ideally anticipate and mitigate against un-assessed abilities and potential student paradigms of failure (see Chapter 5).

A *third* implication which needs to be drawn from my study is that some procedure for discovering what students *care* about is necessary before teaching commences. A mixed and integrated model that links values, awareness, motivational dispositions, cross-cultural realities, and competencies to ‘mature’ learning regarding the environment and associated ‘resources’ is essential. This quest has serious implications for adult learners situated in northern and remote settings, helping to facilitate local student recruitment, retention and employment.

*Four*, feedback provided by Elders, other educators, and University College of the North administrators signal that student video archives could be used for convincing various audiences that changes in instructional method, and more generally ‘on-the-land’ andragogy of place, are important as they relate to environmental education for northern settings. Through these same discussions, many others indirectly involved in this research proposed interesting and potential solutions (see Chapter 5). Moreover, video archives could also be used outside the context of UCN, to enable advanced learning and

assessment by rural development professionals, educational psychologists, Elders working for livelihood improvement, and to better justify appropriate educational reform.

*Finally*, these results and those reflected elsewhere in my thesis, make it apparent that when Participatory Video (PV) is accompanied by principles of effective facilitation and assessment (e.g. experiential learning, student collaboration, traditional cultural expressions, and team work) PV used as a process can instill a spirit of critical inquiry on the part of participating students, providing them with an opportunity to share their personal, social, and spiritual beliefs while also helping them to excel academically. My findings not only corroborate, but extend, the findings of studies by Chowdhury et al. (2014); Ferreira, Ramí rez, and Lauzon (2009); Miller and Cruce (2004); and Witteveen, Put, and Leeuwis (2010); all of whom, as advocates of educational technology, state a situated participatory promise (and the use of video) potentially provides students with the means to know what to look for in the parts, to incorporate traditional cultural expressions, and to act critically in the cultural fabric of Canadian environmental education. My contribution is an empirically-associated research addendum regarding improved remote student scholastic achievement.

Emphatically, my research findings indicate that non-conventional situated and PV-based lesson approaches show students how to think empirically through and reflect on technical, local cultural, and fresh water conservation issues while cursorily exploring potential thoughts that facilitate transformative behavior desperately needed in the North, and the world over. Student academic performance as well as recruitment and retention will no doubt continue to increase to the corresponding degree that educators in northern

settings will be more willing to incorporate these (PV and situated learning theories) and related evaluative techniques in their teaching approaches.

## Chapter 5: Greater Success in Nurturing Environmental Transformation in Northern Postsecondary Programming

### Abstract

Effective ‘non-traditional’ approaches to environmental learning and evaluation in northern Manitoba remain ephemeral as indicated by negative local attitudes towards education. As increased attrition and abysmal failure rates have not changed in decades, there is relevance in exploring experiential context and the implications of a northern student-centered conceptual model that will improve awareness and academic performance. To help prevent perpetuating a dis-order in which *traditional Indigenous cultural expressions* are neither developed nor recognized, learning experiences of 97 University College of the North (UCN) students regarding fresh water availability and the calculation of stream flow in traditional classroom and ‘natural’ settings were documented. Mixed quantitative test scores and quantified-qualitative (affective) student statements were related using Participatory Video as a ‘mediating’ technology. Using exploratory factor analysis, three axes explained 50% of the variance from an original set of 27 integrated variables. Axes of variation, declining in order of importance, were *Environmental Engagement, Academic Test Scoring, and Non-Conventional Lesson Delivery*. Sixty-five of 97 *unsolicited* student responses suggest that unique meta-ethical ‘eureka!’ or ‘aha’ learning moments were undeniably important. Findings advocate UCN must now ask which aspects of curriculum delivery and enrollee assessment might result in greater academic success when nurturing transformational learning, especially in the context of ongoing threats to both fresh water and preservation of traditional cultures in northern Manitoba.

## **Introduction**

Fundamentally, challenges related to fresh water resources for remote segments of Manitoba center on place-based awareness and technical aptitudes. The key to addressing these gaps is to understand how characteristics of northern learners relate to the skills and abilities required to succeed in environmental training delivery. In effect, this means overcoming similar obstacles of geographic distance that Donald Snowden (1983) implicated when working in the Fogo Islands, including isolation, inability to access information, lack of confidence, and lack of organization.

The interconnection among environment, education, and employment echoed in Snowden's work has largely been ignored in Manitoba's north: for instance, the promise of an educational approach that welcomes purposeful learning, recognizes and addresses biological and cultural diversity, and fosters the emergence of new non-conventional educational models of delivery (Azurmendi, 2008). These challenges have yet to be recognized much less addressed in this region where adult learners often struggle due to gaps in underlying skills required to process content, rather than the actual content itself (Adult Learning, Literacy and Essential Skills Program [ALLESP], 2016).

As with all instructional methodologies, western 'traditional' methods of didactic instruction have certain strengths. These include building basic foundational skills in reading, writing, document use, and numeracy required for learning and developing new strengths (Boudard & Jones, 2003; Sanchez & Wiley, 2009). Of concern, however, are the limitations and disconnect from 'real' northern context when non-conventional and

participatory techniques are generally ignored (Duffy & Cunningham, 1996). According to Siewert (1998), didactic lectures and rote evaluation fail to capture representational portions of a northern heuristic experience, thus keeping classroom learners from reinterpreting anything according to their own embedded and lived values. From Henning (1998) to Lim and Chai (2008), educational researchers have speculated this didactically-conveyed knowledge is restricted to the context of the class and not where knowledge is created - nor used.

Large-class didactic lectures to remote northern audiences that make no link between learner experience and topics of discussion essentially represent poor practice. Emerging literature and discourse indicate that such approaches are of little use to educators if seeking to promote critical thinking or to encourage growth in maturity of student attitude and behavior (Mertens, 2014; Schwandt, 2007). Subsequently, an increasing number of educators believe it vital to focus on non-conventional teachings because it is at least partially through these deliveries and spaces 'outside' of educational institutions that self-identities are shaped (Sandlin, Wright, & Clark, 2011).

Questioningly, and for all intents and purposes, the field of adult education has seemingly long-relied on theories of development grounded in concepts of social and behavioral progress (Schwandt, 2007). Unfortunately, the literature still remains underdeveloped regarding the integration and assessment of local values and world views in northern remote Indigenous programming. The theoretical genesis for this idea is that knowledge assessment is explicit. Unfortunately, other than Bloom (Anderson, Krathwohl, & Bloom, 2001) and Vygotsky (1962), little exists in the way of mixed-metrics for evaluating learning. Missing from northern education-related discourse and

critical understanding of student learning modalities is a contemporary focus on assessing mixed quantitative test scores and qualitative ‘constructs’ (i.e., beliefs, feelings, values, cross-cultural sharing, and emotions as meaning systems) including overt transformative behavior and critiques of extraordinary or extra-rational events signifying constructs of ‘aha!’ moments (Dirkx, 2006; Mezirow, 2000).

According to Grudens-Schuck (2001), mixed-methods exploratory research is absolutely necessary to affirm and underscore the surprising degree to which adults bring different meaning to the ordinary dimensions of contemporary educational practice. Merriam (2004) suggests such research should target student constructions of experience (i.e., being situated, working collaboratively, generating awareness, and observing behavior). Unfortunately, countless models neglect evaluating ‘affective’ development using mixed methods recipes (Johnson, Onwuegbuzie, & Turner, 2007; Kline, 1998; Mertens, 2014) and as a result, such techniques (and students) are typically side-stepped in northern Indigenous curricular design. As Nunnally (1978) suggests, many research results are vitiated by inadequate mixed-methods explanation specific to timely offerings.

Alternatively, and as advocated for adult extension, student-first perspectives can bridge these Western and traditional Indigenous knowledge systems to engage in emergent and iterative lesson design (Howley, 2005). Participatory perspectives plan, elicit, and value ‘authentic’ local input (Ferreira, 2006; Lunch, 2008; Roling & Wagemakers, 1998). However, remote northern facilitators are challenged by variation in learning contexts, cultural dialectics, time-table constrictions, and curriculum innovation (Blackmore, 2007). Moreover, there are specific and additional barriers that confront natural ‘resource’ disciplines across North America.

For instance, despite an increased recognition of the importance for fresh water conservation and environmental sustainability across Canada (Kallis et al., 2006), only a small proportion (1.5%) of Manitoba's population is actually studying resource-related topics (Manitoba Bureau of Statistics, 2011). Indeed, Pryor et al. (2012) recently revealed that a mere 0.5 % of incoming North American undergraduates indicated the natural resources as their academic major. Sharik and Frisk (2008) similarly state that enrollment within postsecondary natural resources programs has on average been decreasing 4% per year for the past 20 years. According to Sharik (2009, p. 26), "*the health of ecosystems is likely to erode and, in turn, the health and wellbeing of humans*".

Culturally framed, Indigenous students generally continue to perform poorly in formal Euro-Canadian classroom settings (Atleo, 2001). Regrettably, effective cross-cultural approaches to learning, evaluation, and technical skills-training, remains ephemeral in Manitoba's, and for that matter Canada's, North. Current teaching approaches are often irrelevant to the northern adult learner, as indicated by high dropout rates, negative attitudes towards education, and re-enrollment sponsorships in multiple programs. Moreover, this notion of *'failure'* further enables an already problematic exodus from close-knit remote communities (Martin, 2014). Hence, the importance of cognitive style, emic curriculum development (Malley, Smith, & Watts, 1992), and experiential context must be realized if these challenges are to be effectively addressed (Manitoba Education Research Network [MERN], 2014).

To complicate these dynamics further, Indigenous students (and scholars) indicate there are few opportunities for inclusion and input in these changes (Mercredi, 2010; Wilson, 2008). Instead of shunting northern Indigenous students into disjointed

academic silos, the University College of the North (UCN) needs to arrive at a situation where its students (at every stage of their development – from design, through instruction, to evaluation), can play a strong role in remote educational programming.

### **Participatory and Collaborative Approaches to Cross-cultural Learning**

Much work has focused on collaborative and participatory methodologies in teaching over the last 80 years (since Dewey, 1938), yet methods remain controversial and erratic in approach. For instance, Jennings (2000, p. 4) cites that participatory philosophies are often seen as inappropriate and expensive where rapid change is viewed as important, effectively shelving such processes to “*where the cod liver oil sits*” and where they “*may work, but even a small dose tastes bad*”. Murphy et al. (2007) advise that countless studies ‘ride the fence’ between methods making for an ‘underworld’ of misfit research; and Howley (2005) argues that follow-through, continuous collaboration, and consistent delivery with a coherent exit strategy is often non-existent or at least inconsistent in approach within postsecondary institutions. To exemplify this, UCN has simultaneously offered ‘parallel’ *Aboriginal* NRMT programming alongside a ‘non-Aboriginal NRMT’ program based on current political climates.

Likewise, an ongoing local debate at UCN is how to gain ‘real’ knowledge from an Indigenous Elders’ Council and to incorporate it in a respectful manner that is understandable to respective staff (and students) at the same time that an Aboriginal President is forcibly escorted from the property. Aboriginal academics with PhDs, decades of experience, and the qualities needed in a contemporary post-secondary

president are still in short supply. Dr. Denise Henning fit all those criteria, and yet was ousted, in large part for opposing a mandatory Indigenous awareness program that promoted a delivery and participation that she perceived as “*white guilt*” (Martin, 2014).

Concerning ‘*participation*’, definition is generally an interpretation of the group defining it, but one-ness with an area can be understood as an “*organizing philosophy comprised of the history of a People that have lived in a particular territory*” (Atleo, 2001, p. 24). As such, ‘pedagogy of place’ speaks to how chronotopic (i.e., of time and place) context is central to understanding. Subsequently, successful knowledge generation is assumed to be social in nature while assuming that participants experience the world differently and that knowledge changes over time (Kallis et al., 2006). The result, according to Jennings (2000), is “*an extraordinary mélange of context-specific, formal methodologies, matrices, pedagogies and ad hoc approaches to enhance participation*” (p. 3). As such, remote institutional participatory capacity must build and transform existing ideologies into training and skill development designed to improve present conditions (Shipley, 2002); but it must also be founded on a belief that participants can be trusted to shape their own future (Howley, 2005).

### **The Opportunity to Define a Northern Student Learning Model**

Adequate participation in decision-making in remote and northern Manitoba communities has been, and continues to be, difficult. Twenty-years ago, Indian and Northern Affairs Canada (INAC, 1997) identified a number of factors undermining community ‘well-being’ that still persist today. These include poverty, inadequacy of

infrastructure, and local environmental destruction. In similarly isolated regions, Gelinas (2005) cites insufficient-technological proficiencies, unforgiving terrain, cultural stigmatism, non-existent recovery costs due to poor economic conditions, lack of qualified personnel, and inadequate and unclear educational guidance - all as factors that perpetuate the gulf that undermines participation in these regions. Further, the rate and pace of environmental change in the North is rapid and formal knowledge production is increasingly perceived as lagging in utility.

Unfortunately, theories in education that attempt to meaningfully 'integrate' both traditional cultures and scientific knowledge remain peripheral since the end products have little perceived utility in either dominant society or within the Indigenous communities themselves (Mazzocchi, 2006; Mercredi & Turpel, 1993). Justifiably, there is dire need for an approach to northern adult education that promotes a diversity of past and present cultural epistemologies while supporting student *opportunities* to learn. Consequently, there is much relevance in exploring the implications of an existing northern and provincial Indigenous student-centered model.

The UCN, for example, presently seeks to recover bi-cultural and environmental traditions borrowed from surrounding Indigenous communities in ways that are student centered and culturally appropriate (UCN Academic Plan, 2015). University College of the North's *Kenanow* Model is about bridging the traverse between western education and Indigenous perspectives in the transmission and responsibilities of knowledge dissemination. Drawn from Cree language, *Kenanow* reads as '*all of us, all of us who are here*'. For the Ininiwak, this education system has been transmitted through families and communities for multiple generations and is now institutionally represented in the UCN

*Kenanow* Learning Model. The model itself is based on a kinship system where all things, functioning together, help to ensure education is naturally and harmoniously integrated and transmitted. Chosen by the UCN Council of Elders, this decision was made based on the understanding of a responsibility to extend traditional knowledge to future generations in the form of Indigenous educational research, curriculum design, cross-cultural learning frameworks, program delivery, and institutional implementation.

Yet the continued absence of diversity in lesson design, delivery, and ‘entry-level’ assessments of mature student performance at UCN inadvertently enforces a uni-dimensional and euro-dominant model of education onto local northern Indigenous ‘abilities’ and thus perpetuates dis-order in which *traditional cultural expressions (TCE)* and local skills are neither developed nor incorporated in academia (Sutherland & Henning, 2009). Present evaluation of student performance at UCN contributes to the illegitimization of Indigenous northern students and their learning modalities. Anderson, Reder, and Simon (1996) summarize this concern stating: “*What is needed to improve learning and teaching is to continue to deepen our research into circumstances that determine when narrower or broader contexts are required and when attention to narrower or broader skills are optimal for effective and efficient learning*” (p. 10).

### **Northern Bi-cultural Dialectics and the influence of TEK**

Once dependent on Indigenous mindfulness regarding food preparation, travel routes, fishing and survival skills, Cree ‘mindfulness’ or ‘traditional ecological knowledge’ (TEK) has been increasingly integrated into new euro-Canadian ways of life

and this northern Manitoba region. When perceived as ‘useful’, traditional cultural expression is ‘welcomed’ and incorporated. Traced anthropologically (Stevenson, 2004), the TEK phenomenon is again of keen interest. Current awareness coincides with environmental consciousness (McKenzie, 2002), activism for Indigenous and human rights (Phare, 2009), educational preservation (Atleo, 2001), educational design (i.e., *Kenanow*), and research growth due to “*the presence of a dedicated group of scholars producing not only academic material but feeding information into international policy [Berkes, 1999] legitimizing knowledge research in Canada*” (Oakes et al., 2000, p. 12).

Yet, there is also suspicion of TEK’s ‘scientific’ merit as a condition to pursue research (Brook and McLachlan 2008; Sutherland & Henning, 2009). As Bocking (2005) submits, TEK results in millions of dollars spent on ignored studies contributing little to no understanding of northern ecology. Widdowson and Howard (2009) propose the tendency of social scientists “*wanting to believe TK has value*” - similarly misappropriates funds towards resource-focused institutions such as the Natural Resources Institute (NRI) at the University of Manitoba as ‘traditional ways’ are still likely to be incompatible with the requirements of contemporary scholarship. At the same time, however, remote community survival is dependent upon continued adaptation, which is sometimes viewed as ‘non-traditional’ (Sutherland & Henning, 2009). Unfortunately, the increasing complexity of problems confronting northern communities requires an ever-greater amount of technical knowledge and skills.

Although there continues to be a great deal of thought regarding the appropriateness of lesson types and theoretical models grounded in paradigms of participatory collaboration (Brown, 2004; Zandvliet & Sammel, 2002), these cross-

cultural educational models remain controversial and thus perpetuate the dichotomies between western philosophies and heuristic learning. Many Indigenous scholars believe ‘their’ ideas thus lose the ability to remain relevant. For instance, the notion that storytelling and circular dialogues are disorganized and that empirical quantitative evidence is hierarchically more important than extra-rational knowledge sometimes spreads through western-based lesson delivery and methods in remote areas (Atleo, 2008; Davidson-Hunt & Berkes, 2003; Oakes et al., 1998; Phillips & Burbules, 2000). As didactically fixed lectures, ‘removed’ ideas lose the ability to grow and change – they lose a relational accountability (Wilson, 2008, p. 123). Tafoya (1995) explains that the western paradigm disconnects this complexity and relationships on knowledge which prevent isolated and ‘at-risk’ students (and visiting researchers) to function optimally. Facilitators who emphasize social construction of knowledge affirm these views. Bandura (1977) and Vygotsky (1978) argue that learning is inherently social and embedded in a *particular* cultural setting (Cobb & Bowers, 1999), and that what is true in one time and place may become false in another time and place (Woolfolk, 2005). Thus, particular ideas may be useful within a specific ‘community of practice’ and what counts as new knowledge is determined in part by how well a new idea fits with *current* accepted practice and context (Lave & Wenger, 1991).

Admissibly, all conceptualized *models* and *theories* are true if they make sense to those being considered and if they allow others to enter into the reality of those already involved. Hence, a theory is presumed as accurate and meaningful if the educator or researcher uses the correct tools, deliveries, and technologies to convey a deep understanding of the way others reason. Smart (1976, p. 100) labeled this iterative

process the '*postulate of adequacy*' asserting that if a scientific account of human action were presented to an individual as curriculum, it must be understandable, translatable into action, and comprehensible in terms of a common sense collaborative interpretation of everyday life via a repetitive process with an aim of approaching a targeted result.

### **A Rationale for using technology - Participatory Video**

An initial interest in Participatory Video (PV) methods was reinforced through my involvement in a June 2008 video training program at Oxford, England. Enrolment was restricted and focused on practitioners interested in new approaches to strengthening participant voice. According to Chris Lunch (2008, personal communication), "*videos containing the views, evaluations and descriptions of projects by the participants themselves are always the best and most transparent way of communicating*".

Regarding UCN Elder concerns for community benefits and the integration of the *Kenanow* Model, PV was seen as particularly relevant to highly customized services for small numbers of beneficiaries, and most applicable to program contexts in which conventional delivery and evaluative techniques provide insufficient or ill-perceived feedback (Lunch, 2008). Importantly, PV provided a forum for examination and monitoring, filling an analytical 'qualitative' gap encompassing factors of Indigenous story-telling, unexpected results, and the unintended consequences of 'excluding' research. The 'thick' description generated through this approach was expected to provide students of various cultures with the opportunity to incorporate 'their' subjective and affective insights.

As a technology, PV is one such iterative process and tool intended to value local cultural expression and traditional knowledge, to build connections between communities and decision-makers, to enable individuals to gain control over decisions impacting their lives locally, and to bridge the Traditional-local and the Western-academic (Chowdhury et al., 2014; Murphy et al., 2007; Olmos, 2005). In some situations, the education and learning derived through PV actually raises awareness of local problems and any explored themes. Such *awareness* enables a larger number of participants to become directly involved in decision-making processes, foster appropriate solutions, enhance documentation, and perhaps provide an opportunity to archive participant views (Ferreira et al., 2009; Mann, 2006). One objective lies in asking individuals to think through and reflect on their *own* concerns while exploring potential solutions.

A key aspect of PV is the focus on local participants as subject-matter experts (i.e., students who understand situations from a vernacular perspective) rather than the focus of the research. As stated by Lunch (2008, p. 8), “*participatory video opens communications channels for project recipients and assists development of participant led projects – often with sustainable and far-reaching impact*”. According to Lunch, the process furthers research development by handing over control of the target activities from inception, to germane evaluation. Outcomes include the promotion of an engaged dialog, temporal documentation, and the capacity to gauge trends. Not only does video have the capacity to document dynamic changes within individuals and groups, it chronicles the evolution of creativity, technical maturation, and confidence in PV itself as a focused problem-based-solving technique.

However, as posed by Lunch (2008), and subsequent to his initial experiences with PV, how can researchers formalize its obvious potential as a monitoring and evaluation tool and develop a more systematic approach; and how can PV add a quantifiable element in an otherwise highly qualitative material that is being generated? These elements are the ‘mixed-methods research gap’ explored in this chapter.

Lunch (2008) has pointed to the fact that potential amalgamation of other methods and PV holds potential as a monitoring and evaluation methodology. He explains “*we can see how participatory video, with its ability to convey a rich picture, could help other methods go even further and make the video more accessible to all kinds of audiences, and to all parts of the communities themselves, including children, the elderly, and the illiterate*” (Lunch, 2008, p. 30). Based on a similar intention, and in contrast to community immersion advocated by most participatory researchers, my PhD advisory committee believed this style of mass and individual exploration of local ‘ceremonies’ would generate valid heuristic ideas without imposing a pre-structured research design (Coady, 1939, pp. 30-32; S. McLachlan, personal communication, 2008).

The main question addressed in this chapter is what general ‘mixed’ themes can be found that enable effective student assessment and performance determination in a remote cross-cultural context? Indeed, mixed empirical (test scores) and affective qualitative determinants may enable me to better identify the barriers that confront Indigenous and other northern students in their learning and how they respond to fresh water sustainability issues locally. Specifically: 1) does lesson type and evaluative measure have anything to do with student academic performance and/or behavioral change; and 2) are differences in student *academic* performance the result of ‘lesson

type' rather than conventionally-defined geographic and 'culturally perceived disadvantages'? Accordingly, which combination of techniques and methods will best facilitate and assess environmental science knowledge and skills acquisition to both Indigenous and non-Indigenous adult learners in remote regions of Manitoba?

Fundamentally, my overall *goal* is to describe, better understand and enhance postsecondary education by providing learning strategies and improved student understanding in ways that can be used in remote postsecondary institutions in northern Manitoba - and more generally across northern Canada. My specific *objectives* are to: 1) characterize student learning experiences regarding natural resources monitoring, in this case an exercise related to fresh water stream discharge calculation and situated practice that connects theory to applied learning; 2) assess how these student experiences affect scholastic knowledge and skills acquisition; 3) determine to what degree these experiences result in changes in awareness, behavior, and a sense of personal advocacy regarding the environment in relation to academic performance; and 4) to assess how this knowledge acquisition and opportunity for generated affective behavior differ according to lesson type, thus providing insight into the demands of technological ecological training of adult learners in the North.

## **Methods**

### **Protocol Submission and Qualitative Data Collection**

Although University of Manitoba's Policy 1406 on *The Ethics of Research Involving Human Subjects*, and the University College of the North's *Ethical Conduct of*

*Research Involving Humans* exposed unique bi-cultural challenges regarding protocol submission and review in this northern Manitoba region, ‘mixed data’ collection and integrated analysis offered exciting dimensions to further assess my research design. Quantitative test scores evaluating student experience had already been shown to ‘academically’ improve using alternative approaches to learning (Chapter 4); however, ‘qualitative’ inquiry and integration of *affective* dimensions as informed by ‘*unsolicited*’ responses to these learning experiences and lesson deliveries would provide student participants with additional and considerable control over the interview and broader research process (Corbin & Morse, 2003).

Although Glesne and Peshkin (1992) suggest research that examines ‘*your own backyard*’ is politically risky, Creswell (2007) posits that when it is important to study one’s own organization, multiple strategies of data collection and validation help ensure the account is insightful and accurate. Subsequent concerns and considerations regarding my ‘non-leading’ and integrated method as sensitizing the University College of the North (UCN) to vital challenges in video-interviewing were clarified according to UCN’s Governing, Learning, and Elders Council directives, and this mixed methods research protocol was ultimately approved by the University of Manitoba Joint Faculty Research Ethics Board (Protocol #J2008:110).

### **Study Design**

This next section is a study design *postscript* to a sustained level of ‘analysis’ that goes beyond data collection and the empirical analysis of UCN student test scores

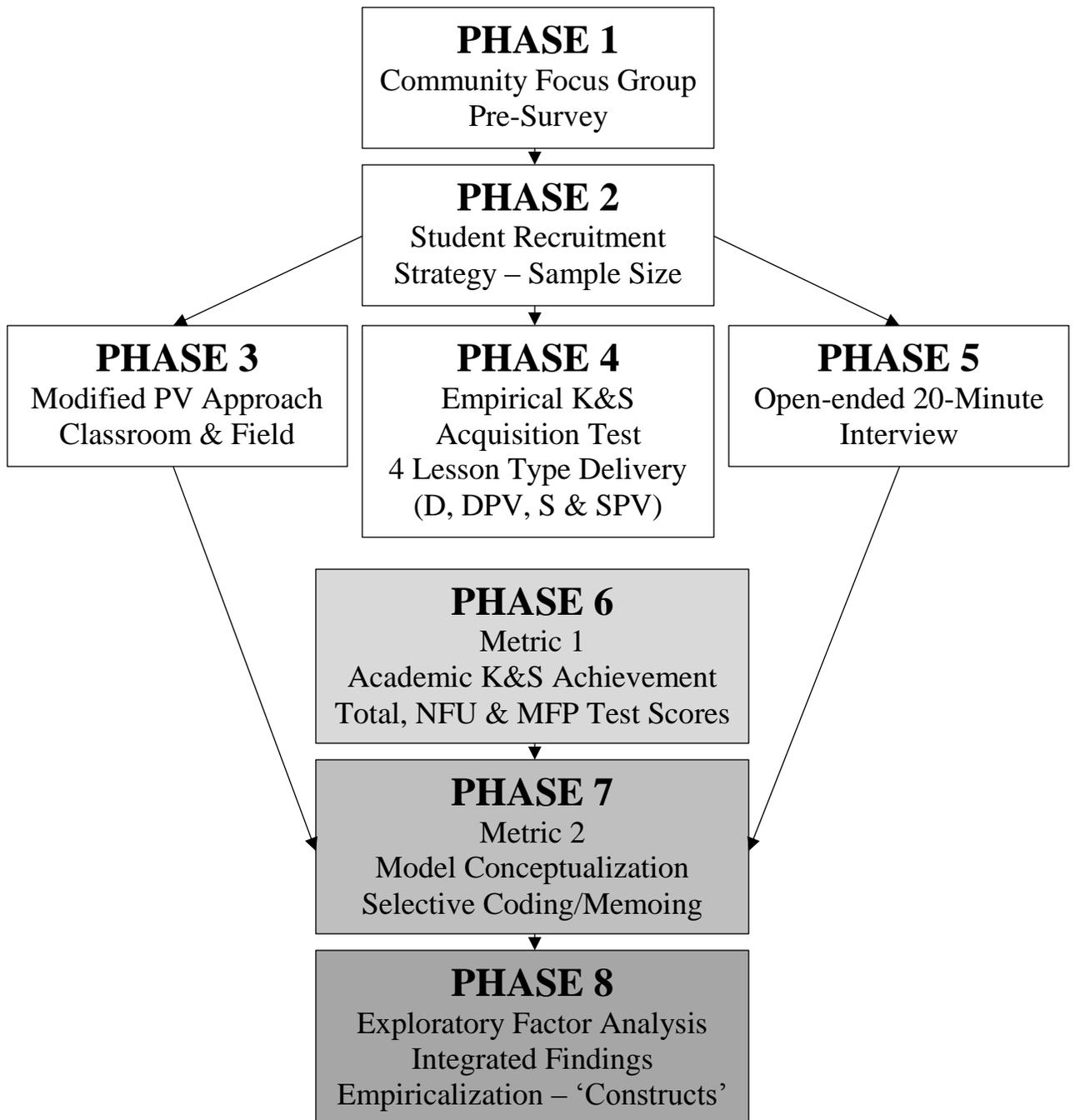
(see Chapter 4). Three additional methods ‘*phases*’ of analysis (in this chapter) now integrate and develop previous test score results (Chapter 4) with qualitative variables. These additional three ‘*phases*’ supplement previous data collection and empirical test assessment which consisted of PHASES 1-5 of this study design (Figure 5.1).

Part 2 (this Chapter) describes specific but segregated conditions for integrated ‘*data analysis*’ consisting of an additional three (study design) phases including: 1) PHASE 6 – the open coding and quantification of participatory video insight, empirical knowledge and skill acquisition test score totals; 2) PHASE 7 –conceptualized axial and selective coding of unsolicited student participant interview responses; and 3) PHASE 8 – exploratory factor analysis of integrated quantitative (i.e., scholastic test score totals examined in Chapter 4) and quantified unsolicited student interview response culminating in a four-level ‘*model*’ conceptualization and structure.

The results are conceptualized from the *integrated* analyses of the mixed student data gathered. Calculations are now specific to exploratory factor analysis of amalgamated test score findings (Chapter 4) ‘and’ the newly integrated quantified-qualitative video-documented interview response categories.

As with Chapter 4, my query for Chapter 5 and its three supplemented study design ‘*phases*’ was whether University College of the North (UCN) students would perform the same as a result of different instructional types (i.e., didactic lecture versus situated or experiential delivery). The fundamental question now was: which methods would best describe empirical test score ‘*sets*’ of numbers (Chapter 4) AND integrated qualitatively gathered ‘*thick*’ findings, underlying structure, and constructs via exploratory factor analysis so as to make accurate *inferences* about different lesson types, operant

behavior, and affective advocacy in a personal sense? As before, four effective lesson deliveries were represented: 1) didactic lectures; 2) didactic lectures plus PV; 3) situated experience; and 4) situated experience plus PV.



*Figure 5.1* Segmentation of the research design sequence outlining relationships between eight component phases and this Chapter's integrated analysis. PHASES 6-8 are highlighted as they form the empirical basis of this chapter

## **PHASE 1 - Focus Group Survey – Searching Motives for Methodological Practice**

As with quantitative test data analysis (Chapter 4), pre-study regional *community* focus group sampling was designed around Husserl's (2012) concept of 'bracketing' social assumptions, and a Colaizzi (1978) and Moustakas (1994) phenomenological approach in which I set aside my beliefs to welcome new perspectives when exploring this remote provincial phenomenon. My pre-study community focus-group approach provided a way to identify concerns, local stressors, and research direction (Banyard & Graham-Bermann, 1993). I used a *maximum variation* sampling philosophy that consisted of determining criteria that would differentiate the groups (Creswell, 2007, p. 75; Miles & Huberman, 1994). Following Fetterman (1998) and Polkinghorne (1989), I included outlying individuals via a '*big net approach*' identifying these community participants within a larger continuum of possible responses, and which I would ultimately use to ground my forth-coming mixed-data *student*-focused research at UCN.

Community participatory focus group data consisted of 20 hours of video that documented the outcomes of eight community groupings (i.e., *Sapataweyak*, The Pas-*Opaskwayak*, Thompson, Norway House-*Kinosawi Sipi*, Grand Rapids-*Misipawistik*, Easterville-*Chemawawin*, Snow Lake and Gillam-*Makaso Sakikan*). Open-ended questions in these focus group settings probed participant priorities, significant local challenges, fondest memories, regional frustrations, northern examples, personal experiences, and contributions to personal outlooks (Greenbaum, 1998).

Data collection rested on non-ordered, group recommendations derived from the ideas of Lovett (1983) who declared “*people need to think about the nature of society in which they live*” (p. 5). Based on this intention, these eight gatherings produced heuristic themes around watershed awareness, technical inability, community displacement, flooding, river diversion, hydroelectric power, high voltage direct hydro current right-of-ways, education, culture, and the northern availability of fresh water. Additionally, *unstructured* one-to-one follow-up interviews with 12 former focus-group participants were video-documented so that these participants could better share what was important to them free from within-group disturbance.

Questions in these interviews focused on a sequence, asking whether anything had been missed. This audio-visual information was viewed several times to obtain insights into local concerns, which would then provide a context for subsequent student-focused research. Decisions regarding core lesson type and assessment arose from these community focus group and individual findings and UCN Elder suggestions which provided local traditional cultural expression, examples informing decisions regarding what students and who should be sampled, and how research should progress with prospective UCN student participants.

## **PHASE 2 - Recruitment Strategy and Stream Activity**

In order to develop theory and a prospective model originating from focus group and core community concern, a heterogeneous sample of UCN student participants was recruited next to contribute place-based criteria for studying instructional outcomes.

Rationale for acquiring a *heterogeneous* student sample necessitated conditions under which a lesson delivery model would be valid (Charmaz, 2006). Student sampling strategy benefited from conceptualizations by Marshall and Rossman (2014) who suggest sampling aspects of: the **event**; the **setting**; and the **participants**. According to Creswell (2007), “*in a good plan for study, one or more of these levels need to be identified*” (p. 127). Subsequently, I collected data in terms of ‘levels of sampling’: 1) at the stream site level – *evaluation of scholastic knowledge and skill*; 2) at the event or process level - *observation and participatory video*; and 3) at the participant level – *qualitatively coded unsolicited open-ended student interview responses*.

Newly enrolling UCN student cohorts were greeted in September 2008. A 60-minute period during this first week of regular classes was used to disseminate introductory information about the research to 348 entry-level students. From this phase, participants were recruited through opportunistic sampling from seven disciplines (i.e., Nursing, Dental Assisting, Early Childhood Education, Law Enforcement, Business, *Kenanow* Education, and Natural Resources Management Technology or NRMT). Final lesson-type sample size breakdowns were: didactic (n=22); didactic plus participatory video (n=30); situated (n=24); and, situated plus participatory video (n=21).

In accordance with UCN Elders and regional community focus-group outcomes, students ‘outside’ NRMT were included in order to represent diverse perspectives. Most important, UCN students would be individual adults who all experienced the learning phenomenon and who would all ideally articulate their lived experiences through participatory video and post-interview (Miles & Huberman, 1994). Creswell (2007) and

Gergen (1994) advocate that the focus must be on emergent stories, recognizing all candidates (related and otherwise) have stories to tell.

Field-level data collection and situated participation sessions in a wadeable (and safe) stream were launched some time following where all participants assembled into groups of three to five, each accessing the modified participatory video technique. All student groups were exposed to situated calculations of stream flow.

Stream flow or 'discharge' is defined as the volume of water flowing through a given cross-section of a stream channel during a given period of time (expressed in cubic meters per second), requiring several measurements of depth and velocity to yield an average calculation. Velocity calculations were obtained using the Price No. 622 Type AA Current Meter and each participant used a Sony Digital Camcorder (DSR-PD170) to video-document 'their' experience. Upon completion, each student was asked to address an on-site questionnaire capturing 3-5 immediate impressions of their experience, which encouraged feedback, retention for post-activity interviews, and which reduced bias that would otherwise favor participants with greater writing facility (Plate 5.1).



*Plate 5.1* Participating student addressing on-site questionnaire regarding the capturing of three to five immediate impressions of their situated stream learning experience.

### **PHASE 3 - Modified Participatory Video Approach**

Field research involved an interpretive and naturalistic approach meant to observe student participant action in a natural setting where candidates would experience the stream discharge calculations, and attempt to make sense of and interpret the in-stream phenomenon as related to *their* experiences regarding a didactic or situated lesson delivery (Chapter 4) using a ‘modified’ and supplemental participatory video activity (Denzin & Lincoln, 2005; Stringer, 2008).

Students were informed that *participatory video* values local knowledge and builds a learning community enabling participants to gain greater control over their own academic development. Participatory video was thus meant to provide students with an

opportunity to reflect on *their* training experience (on and off site) and to share *their* insights regarding the learning ‘in-the-classroom’ and ‘in-the-river’. Chase (as cited in Denzin & Lincoln, 2005) suggests such access to methodological performance situates individual stories within each respondent’s personal experiences.

A ‘modified’ single-frequency participatory video reporting procedure was chosen and used in my work. In contrast, Johnston (2002) reported participant discomfort in multiple-evaluation group feedback situations. In his experience, some participants were compelled to ‘lobby’ on behalf of their own observations, be too ‘generous’ to colleagues, and experience tacit pressure to support the comments of others participants (i.e., the researcher, or dominant personalities) based on real (or perceived) status.

This ‘modified’ procedure allowed 97 students to comment on their individual and collective perspectives, using their own words to explicate classroom and in-field exercise-related questions, confusions, and awareness of lesson types on video. Specifically, this modified participatory video technique was used in-situ, to generate meaningful ‘field’ evaluative criteria that were then coded and analysed.

#### **PHASE 4 - Knowledge and Skills Acquisition Test**

Upon completion of the stream activity, a 22-question ‘knowledge and skills acquisition test’ was administered to each participant (see Chapter 4 for scholastic results). For purposes of research integrity, specific test questions were not provided prior to assessment. Only pre-prototype questions considered for skill acquisition were verbalized when participants were first recruited. The time needed to complete the test

was 1-2 hours. Test questions were separated into those: 1) necessary for understanding – NFU - {12 questions/23 marks}, and 2) mandatory for procedure – MFP - {10 questions/ 34 marks}. These outcomes are detailed in Chapter 4.

### **PHASE 5 - Open-Ended Interviews and Unsolicited Response**

A general guideline in qualitative research is to study as many individuals as possible, and to collect extensive detail about each as the intent is not to generalize information, but to extract the specifics (Pinnegar & Daynes, 2006). Consequently, it was important to elicit the specific meaning of the in-stream phenomenon from all UCN students who would experience it (Miles & Huberman, 1994).

To acquire this meaning, and supplement in-stream participatory video and the ‘knowledge and skill’ testing, I conducted ‘*unstructured*’ follow-up interviews with these 97 students. To learn from these remaining participants from different programs having different levels of involvement in the ‘natural’ environment (including individuals with whom the environmental movement was peripheral to their lives), interview procedures were open-ended in nature. They consisted of video-documenting an interview with each student, gathering ‘thick’ data through the collection of answers and stories, reporting individual experience, and ordering the meaning of these experiences. I used a pre-designed questioning format and Final Cut Pro (Version 6) to record all interview responses. To better obtain a wide diversity of experiences and thoughts, each student was asked to use their field-acquired and bulleted notes (if desired) and to respond to the following two open-ended questions:

- 1) How did participating in this exercise affect you - can you provide an example using some aspect of how the process (or exercise) unfolded?

and

- 2) Were you aware of any consequences (i.e., benefits or dis-benefits) of your participation – what was central to the exercise or process for you and why?

Greater depth and diversity in questioning was achieved by asking two additional open-ended questions on the ‘back end’ of the interview, thereby inviting interviewees to focus their attention on generating unsolicited input that would lead to greater textural description of the experience and ultimately providing an understanding of their experiences during the in-situ stream-side calculation activity:

- 1) Is there anything else that you can tell me to help ‘me’ understand ‘your’ experience?

and

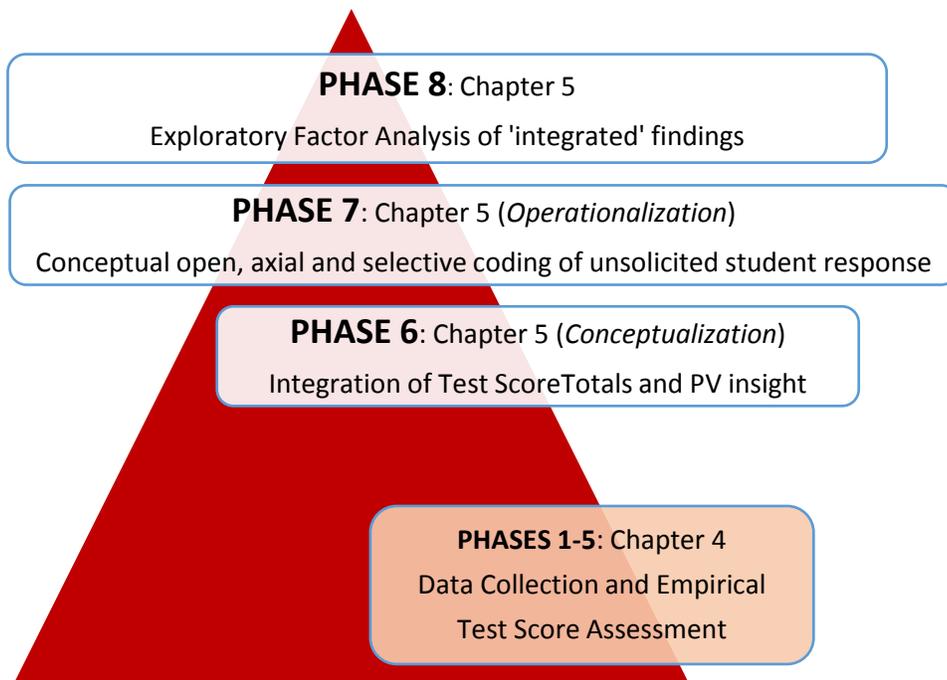
- 2) Is there anything you would like to ask (or add) regarding the project and your participation in this experience?

To further reduce potential bias, my interview approach included intermittent summary paraphrasing to re-focus and/or re-align any ‘wandering’ student responses; asking the same question at different times during the interview and in different ways; and providing an unrelated example (i.e. work-related scenario) to encourage response. Student interviews each lasted 20-30 minutes and generally proceeded until no new

themes emerged. In total, involvement in this project required that each student commit to many hours of learning: 12 hours for didactic-lecture participants and 11 hours for situated exercise participants.

### **PHASE 6 – Data Integration, Open-coding, Mixing PV and Knowledge Acquisition**

The amalgamation of quantitative test score findings (Chapter 4) and unsolicited interview themes (Chapter 5) was hypothesized to provide a unique measure of verification and assessment to the situated participatory video method and follow-up open-ended interviews rather than drawing solely from academic test scores or subjective video-recorded perceptions alone (Figure 5.2). Accepting this study design and procedural outlook, non-conventional lesson delivery and assessment was expected to promote reflection as an aspect of abstraction formation, even though the activity would not necessarily bring about future personal action, nor necessarily involve social change (Collins et al., 1989; Resnick, 1987).



*Figure 5. 2* Integration of qualitative findings (Phases 6, 7, and 8) following data collection and empirical test score assessments.

In order to solve the stream discharge calculation challenge and complete the research task, each UCN student learner was required to reflect upon the resource-based exercise and its lesson delivery in its entirety - predicting, hypothesizing, and experimenting in order to provide site, area, velocity, and volume calculated solutions while in the classroom or in the field (Folke, Colding, & Berkes, 2003). The ‘situated’ participatory video method would, posited in this aspect, speak to all mixed program students using a common idiom (i.e., culturally and perhaps using no language whatsoever) when dealing with challenges of direct relevance to northern Manitoba at a tertiary-level educational institution.

At this *pre-conceptualization* stage, I first posited potential themes and a conceptual model that incorporated mixed data. It was this mental processing of thoughts and ideas that enabled me to identify antecedent instruments, measurement, empirical, and theoretical connections in the hope to better understand and assess student learning and behavior. This phase was therefore used to construct a methods strategy to amalgamate quantitative data (Chapter 4) and the qualitative data presented here (Chapter 5). An ‘open coding’ process, described by Strauss and Corbin (1990) was used to fracture unsolicited student generated themes, allowing the identification of categories and any theoretical dimensions. The objective was to determine attributes and response-clusters from unsolicited student statements while considering indicators that would signify surfacing codes, related themes, and emerging constructs using exploratory factor analysis.

### **PHASE 7 - Operationalization - Axial and Selective Coding**

To *operationalize* this conceptual pre-model creation strategy, I targeted emerging themes and constructs in such a way that each could be identified, measured, and intuitively related (Figure 5.3). Observable *empirical indicators* were the end-product of this process, becoming items that permitted declarative statements about emerging theme-clusters that in turn reflected an evolving ‘model’ framework. Coding focus subsequently described what participants had in common as they calculated river discharge while standing in the stream. The focus was on ‘participant meaning’. Phase 7 model design was an *inductive* process, working through multiple levels of abstraction,

forming categories but then reconfiguring statements into new and revised code forms, and inter-related themes that ranged from the narrow to the broad. Cortazzi (1993) suggests that such a ‘restorying’ process links ideas to a chronology of participant experience.

As with quantitative data collection (Chapter 4), analysis of student video interviews consisted of: 1) viewing the footage several times to obtain an overall understanding; 2) identifying ‘significant statements’ that pertained directly to the experience and that provided an understanding of how each participant experienced the video and situated learning phenomenon; and 3) formulating meanings to cluster statements into themes (constructs) common to all participating student video-interviews, referred to by Moustakas (1994) as ‘horizontalization’.

Axial coding put these data “*back together in new ways by making connections between a category and its subcategories*” (Strauss & Corbin, 1990, p. 97). From this process, categories emerged and were assigned labels. Criteria for status included: 1) the frequency of a themes’ occurrence in the data; 2) its inclusiveness and the ease with which it related to other themes; and 3) the clarity of its implication for a more general inductive theory.

A final step was selective coding, an integrative process of selecting the core category [theme], systematically relating it to other categories, validating those relationships by searching, confirming, and disconfirming examples, and addressing in any categories that needed further refinement and development (Strauss & Corbin, 1990, p. 116). An emerging model in turn developed propositions that related categories,

developing a 'story line' structural narrative that connected participant theme categories in a hierarchically-posed northern UCN student realm.

Ultimate model design emerged from the process of 'memoing', which entailed writing down ideas about what was evolving throughout the process of horizontalization and its open, axial, and selective coding processes. The result was a 'substantive-level theory' or "grounded theory" (*sensu* Strauss and Corbin) specific to a local problem and its northern remote student population; a theory that could be tested for its empirical verification to determine if it could be generalized from northern sample to global population.

In operational summary, as some constructs I measured were intangible (i.e., conscious subjective experiences or 'Eureka!' moments), conceptualization helped to formulate and describe a cyclical and iterative method for examining arising overt student behavior and any scholastic hint at environmental advocacy. This pre-through-post-method process provided the necessary abstract understandings, statistical validations, and hypotheses of surfacing result subtleties for relationships existing in this UCN student phenomenon.

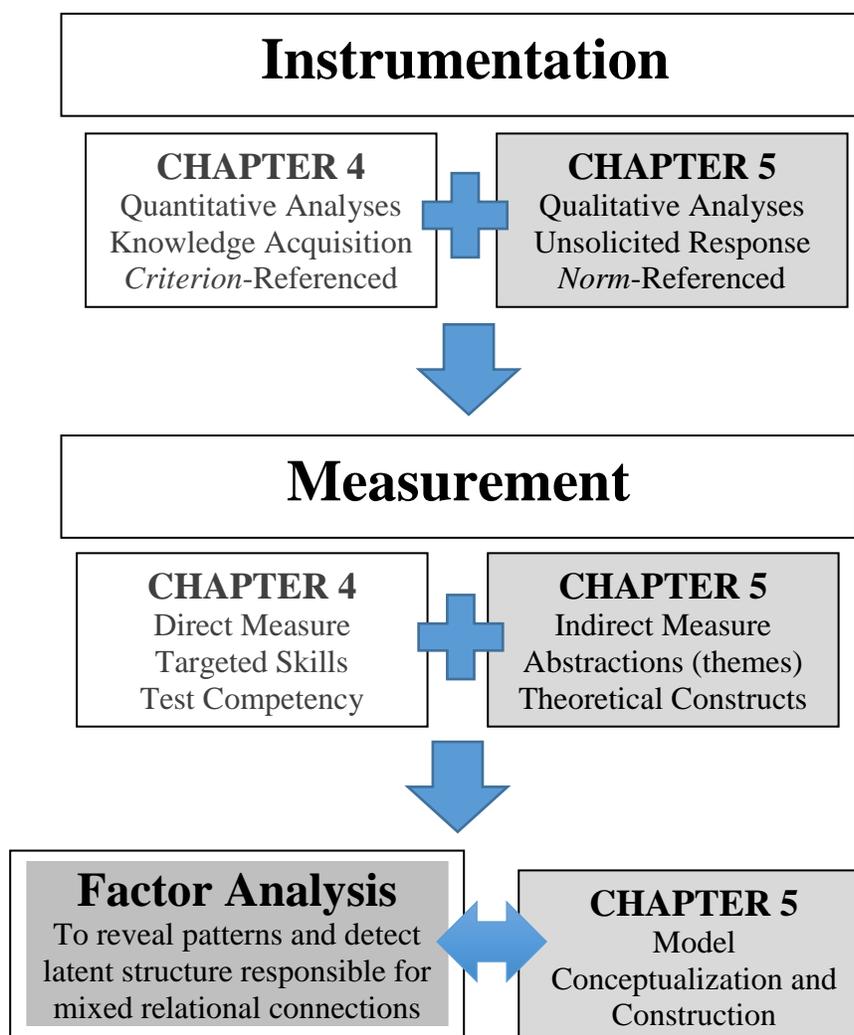


Figure 5. 3 Mixed data conceptualization and construction of an emergent conceptual model.

### PHASE 8 - Factor Analysis and Model Conceptualization

Methodologically, student respondents had first been recruited, learned to operate the equipment, participated in didactic and situated lessons, evaluated their own field-based perspectives on lesson type, and afterwards, expressed unsolicited learning experiences in non-Likert designed and open-ended interview sessions (Phases 1-5).

Since a large number of mixed statements and their associated relationships were also being considered, it was decided that exploratory *factor analysis* could offer a fuller explanation of dependent variable themes and ‘constructs’ than multivariate regression analysis while helping to reduce the highly varied responses to a smaller number of factors. To this end, factor analysis is also capable of revealing underlying patterns and detecting structures responsible for observed relational connections. In sum and with a minimally preconceived structure on model development, I eventually selected eight independent variables from the quantitative analysis (Chapter 4) and 19 surfacing qualitative themes to be used for each of the four different lesson types (Table 5.1).

Table 5. 1 *Selected independent quantitative and qualitative variables for factor analysis and variable condensation.*

Quantitative Variables	Qualitative Variables
<b>Programs</b> (7: NRMT; nursing; early childhood education; law enforcement; business; dental assisting; education)	Learning (2: Situated or Didactic)
<b>Lesson Types</b> (4; didactic; DPV; situated; SPV)	Collaboration (2: Yes; No)
<b>Culture</b> (2: Aboriginal; Non-Aboriginal – self declaration)	Awareness (3: self; environment; exercise)
<b>Gender</b> (2: male; female) <sup>1</sup>	Eureka! moment (2: Yes; No)
<b>Question Type</b> (5: multiple choice; sentence completion; bullet answer; long answer; calculation)	Knowledge acquisition (5: New experience and PV; knowledge sharing; educational development; social responsibility; environmental knowledge)
<b>Test Evaluation</b> (3: Total score; NFU; MFP)	Skills acquisition (3: skill development; personal development; improved learning strategy)
	Changed Behavior (2: Yes; No)
<b>Total Variables = 8</b>	<b>Total Variables = 19</b>
<b>Grand Total Variables = 27</b>	

<sup>1</sup>Shaded cells indicate variables not incorporated into exploratory factor analysis as they were seen as independent or explanatory variables.

Factor analysis of random predictor variables was seen as especially appealing because the (quantitative and quantified-qualitative) predictors considered in this UCN student evaluation would normally have a high degree of measurement error, as is common in most educational evaluation (Cody & Smith, 2005). Thurstone (1931) believed factor analysis was appropriately used as a first stage in mapping new and unknown domains, studying correlations among various treatments (e.g., test scores) and noting many observed correlations might be accounted for by constructing a simple model for those scores. Moreover, factor analysis would indicate whether several measures used to assess learning gains could conceptually be thrown together as a single kind of learning, or whether two or more distinct independent kinds of learning were taking place. Centrally, exploratory factor analysis provided a statistical tool that was especially well suited to my quest of a northern educational theory regarding mixed student abilities, knowledges and behaviors – each with high margins of error with respect to assessment (Ling, 1973).

In my remote UCN study, for example, it would be unrealistic to believe test scores would be influenced solely by northern living culture. In short, the benefit and purpose of using exploratory factor analysis was to find a hidden set of ‘constructs’ (in sync with a posited conceptualized mixed methods model derived from unsolicited qualitative candidate responses and quantitative test outcomes), these fewer in number than the original group of predictor variables. Using exploratory factor analysis in this manner would allow for a certain degree of flexibility and a multiplicity of views of the same data set in order to aid interpretation of my overarching research questions related to the students of the University College of the North.

Following the selection of a relevant combination of perceived quantitative test and qualitatively unsolicited open-ended interview response items, mixed data were evaluated using factor-analysis several times before arriving at a final solution. The decision to stop extracting factors depended on how much ‘random’ variability remained. Nunnally and Bernstein (1994) refer to this as ‘variance condensation’, by which a common variance is shared among a set of factor items. In this case, SPSS was directed to suppress items that had loadings less than 0.3 or 9% (Comrey & Lee, 1992).

## **Results**

### **Exploratory Factor Analysis**

Outcomes of the 27 variable factor-analysis showed that just a few factors explained a large portion of the total variability in this mixed data inquiry. Analysis revealed learning patterns based on quantitative test scores and qualitative measurements progressing from open-ended unsolicited student response to yield a three-factor foci, which explained 50% of the variance from an original set of 27 variables (Plate 5.2; Table 5.2). These three dominant axes of variation were identified in declining order of importance as: 1) *Environmental Engagement*; 2) *Academic Test Scoring*; and 3) *Non-Conventional Lesson Delivery*.



*Plate 5.2* Student group preparing for stream velocity and discharge measurements and calculations.

Table 5. 2 *Three dominant factors underlying variability on mixed data.*

Factor Number and Latent Inductive 'Construct' Label	Variable Type	Variance	Factor Loadings (%)	Mean Scores (SE)
<b>1 – Environmental Engagement</b>		<b>25%</b>		
Awareness of Environment (Aw) <sup>1</sup>	Categorical		0.86 <sup>9</sup> (74) <sup>10</sup>	0.42 (0.05)
Social Responsibility (KA) <sup>2</sup>	Categorical		0.69 (48)	0.24 (0.04)
Environmental Knowledge (KA) <sup>2</sup>	Categorical		0.67 (45)	0.34 (0.05)
Awareness of Self (quale) (Aw) <sup>1</sup>	Categorical		0.63 (40)	0.61 (0.05)
Personal Development (SA) <sup>3</sup>	Categorical		0.57 (35)	0.27 (0.04)
Knowledge Sharing (KA) <sup>2</sup>	Categorical		0.48 (23)	0.14 (0.04)

<b>2 – Academic Test Scoring</b>		<b>17%</b>		
Calculation Question (CA) <sup>4</sup>	Continuous		0.83 (69)	3.40 (0.32)
Sentence Completion (SC) <sup>5</sup>	Continuous		0.83 (69)	7.41 (0.34)
Long Answer Reply (LA) <sup>6</sup>	Continuous		0.73 (53)	4.56 (0.30)
Total Test Score (TS) <sup>7</sup>	Continuous		0.65 (42)	29.5 (1.39)
Multiple Choice Reply (MC) <sup>8</sup>	Continuous		0.58 (34)	4.13 (0.18)

<b>3 – Non-Conventional Lesson Delivery</b>		<b>9%</b>		
New Experience and PV <sup>11</sup> (KA) <sup>2</sup>	Categorical		0.68 (47)	0.27 (0.04)
Educational Development (KA) <sup>2</sup>	Categorical		0.62 (40)	0.18 (0.04)
Awareness of Exercise (Aw) <sup>1</sup>	Categorical		0.49 (24)	0.32 (0.05)

<sup>1</sup>Aw = situated awareness codes (n=3); <sup>2</sup>KA = knowledge acquisition codes (n=5); <sup>3</sup>SA = skill acquisition codes (n=3); <sup>4</sup>CA = calculation question abbreviation – Chapter 4; <sup>5</sup>SC = sentence completion abbreviation – Chapter 4; <sup>6</sup>LA = long answer abbreviation – Chapter 4; <sup>7</sup>TS = total score abbreviation – Chapter 4; <sup>8</sup>MC = multiple choice abbreviation – Chapter 4; <sup>9</sup>Eigenvalue calculation was achieved by directing SPSS to suppress items loading less than 0.3 (or 9%) following Comrey and Lee (1992); <sup>10</sup>Squared loadings in brackets show eigenvalue correlation strengths in percent; <sup>11</sup>PV = Participatory Video.

### Three Factor Condensation

To evaluate factor loading results, presentation was simplified so patterns of item-to-factor correlations were distinct (Table 5.2). Items that loaded strongest on a given factor were ‘*most like*’ the construct the factor represented, and those items that had weak loadings were ‘*least like*’ the construct. Factor loadings were considered ‘high’ if they were greater than 0.6 and moderate if they were above 0.4: lesser loadings (0.3) were ignored (Cody & Smith, 2005). Squared loadings<sup>9</sup> indicate how much of the variance of each variable is explained by the latent factor.

Explaining 25% of the total sample variance, the first factor, as described by six large positive loadings, accounted for far more variance than the two subsequent component factors. I referred to this factor as “*Environmental Engagement*” due to high loadings by the following and ‘similarly-theme-coded’ variables: 1) awareness of environment {0.86}; 2) social responsibility {0.69}; 3) environmental knowledge {0.67}; 4) awareness of self {0.63}; 5) personal development {0.57}; and 6) knowledge sharing {0.48} (Table 5.2).

The first thing to note is that ‘academic test scoring ability’ factor loadings were smaller and that empirical test scores did not present as Factor 1. **Factor 1** rather, presented as ‘*Environmental Engagement*’ or learning in ways that were meaningful within a student’s cultural life-world. Although ‘*Academic Scoring*’ (Factor 2, see below) was indeed a useful scholastically-related construct, it accounted for a less important and limited domain of northern (isolated) student ability: an ability operationally defined by a quantitative test score which assessed recall of only rote

information rather than a willingness to process situated experience and to value new meta-ethical insight.

The importance of lesson delivery reflected in **Factor 1** is highlighted by unsolicited and coded qualitative responses of students using PV in-the-steam and in open interviews. These students proclaimed: *“I now have a realization that resources are abused and it is frightening to me”* (Student 35); and *“I have an awakening regarding my attention, caring and concern for the environment”* (Student 62). This level of *Advocacy* in a personal sense and perspective (typically unassessed in traditional academic methodologies) has direct implications for longstanding learning, which will be discussed below.

The second factor derived was labeled as *‘Academic Test Scoring’*. This factor ‘was’ expected and was interpreted as a dimension that indicated student academic performance according to quantitative test scores (see Chapter 4). Five attributes were reflected in the 57-question test: 1) calculation questions {0.83}; 2) sentence completion questions {0.83}; 3) long answers {0.73}; 4) multiple choice questions {0.65}; and 5) Total Test Score {0.58}. The variance explained by this second factor accounted for 17% of the detected latent attachment.

**Factor 2** involved a familiarity with the store-and-recall dimension of learning. Unsolicited student statements that highlighted the importance of this factor included: *“I learned new knowledge related to my employment focus”* (Student 16), and *“the exercise validated to me that mathematics was difficult”* (Student 27). This traditional didactic model of test application and student validation was limited to passing a given exam. It fails to reflect the kinds of rich learning that were occurring in the situated and PV

contexts, which would have certainly been better addressed by non-conventional evaluation methodologies and the gathering of wider information on the meaning-making abilities of these northern students being assessed. Although important, this kind of rote testing also fails to reflect the richness of gathered Elders, the Kenanow model paradigms of learning desired by UCN governing bodies, and expectations suggested by the region's community focus group pre-student survey.

Finally, exploratory factor analysis yielded an important third factor concerning '*Non-Conventional Lesson Delivery*'. This factor presented high to moderate loadings for sub-variable themes including: 1) *new experience and PV* {0.68}; 2) *educational development* {0.62}; and 3) *awareness of exercise* {0.49}. This accounting for a less substantial but still meaningful 10% of the total variability provided a 'base level' platform from which my eight-phase conceptualization, 4-Level Model, and operational framework would be developed and verified (Figure 5.1).

Student responses that reflected the importance of Non-Conventional Lesson Delivery were: "*it was a complete learning awareness*" (Student 44), and "*there was an increased attention - both voluntary and demanded by being there*" (Student 21). Being situated and engaged in collaborative knowledge construction appeared to enhance participant understanding, as documented by a mediated and modified participatory video technique and students who further affirmed "*I am examining the concept of a watershed differently - the exercise has opened my eyes to humanity's cost and use of nature*" (Student 9) and "*I've lived in northern Manitoba all my life but have never crossed a flowing stream - I was terrified and in awe at the same time - I won't forget it*" (Student 11).

### Coding Development, Construct Definition and Model Conceptualization

Considering the stream discharge activity a participatory ‘process’ (i.e., reflecting a means and not an end) originating from traditional and non-conventional lesson delivery, results indicated that experiential awareness allowed students to film and to speak for themselves, to form collaborative multi-way communicative relationships with one another, to have opportunities for autonomy and cooperation, and to strengthen their technical comprehension. For instance, an *unsolicited* response supporting these reflections was the following statement: *“I could be a little more honest with myself about how I really do feel and say it is ok not to be easy going and to maybe embrace the assertive side of myself - maybe it is a mask that I am wearing that I need to get rid of”* (Student 44). Student interaction also played an important role in encouraging behavior that was healthy for personal well-being as well as ecological sustainability:

*“It taught me a lot about teamwork - I am usually a do-your-own-thing-kind-of-guy - I like doing things by myself - I don’t really like depending on people for help - or for other things because I get disappointed in them - but this brought my law enforcement class together - it taught us to get to know each other a little bit better because we only had been in school for the past four weeks - and after this thing we kinda bonded - which was a good thing for my class and myself - I actually had fun doing something with people who I didn’t even know - it’s a really bonding experience - and I really felt that - when we did it”* (Student 37 – Plate 5.3)



*Plate 5. 3* Student interaction encouraging behavior that is healthy for individuals as well as ecological sustainability.

From awareness to behavior, documented employability skills were expected to include communication, teamwork, analyzing and problem solving, initiative, self-awareness, flexibility, numerical interpretation, decision making and creativity (Hind & Moss, 2011; Lew & Hardt, 2011). These same abilities were described by UCN students during their interview statements including: *“these skills will certainly improve my chances for career development”*; *“I learned a new skill related to my employment focus”* (Student 85); and *“I realized a strategy, that is from situation to lecture setting rather than the reverse, so I will now try to do more in clinical setting as this was an easier way to learn”* (Student 72).

Essentially, each student ‘perceived’ things differently because their learning and life histories varied so substantially, especially since most of these incoming students had been raised in isolated remote communities scattered across the north (and UCN’s service area) and thus arguably shared few common experiences. But, each was expected (assumed) to ‘behave’ as if their senses and perceptions had commonalities.

Fascinatingly, the group experiences enabled each student to communicate these differences to find commonalities and provide a base for coding development, construct definition, and my model’s conceptualization. For instance, one student stated: *“I’ve never experienced anything like this before”*; *“I’ve developed an improved ability to network with like-minded people”*; *“others were really excited when I told them what I was doing”* (Student 6); and *“I will make provisional increases in opportunity for environmental curriculum when I am a teacher”* (Student 13). Unfortunately, and according to Wright (2008), the idea of ‘knowledge’ is ‘fuzzy’ and there are differences in sensory registration from person to person compiled with criteria for what each has learned for distinguishing what each calls the ‘same’ thing.

In sum, local assessment through student efforts, abilities, and responses seemed a characteristic of the groups and activity-generated culture, essentially helping me to translate northern adult student literacy theory into effective practice while qualitative evaluative aspects provided forethought on lesson delivery outcomes applicable to model conceptualization and formation.

The surveying of video interview clips of hundreds of student responses and the inspection of emerging themes, clusters, and factor ‘constructs’, resulted in a four-level conceptual and hierarchical framework for a northern ‘from-the-stream’ model of

learning (Table 5.3, Figure 5.4). By definition, a *construct* represented an abstract function where theory was transformed into a measurable practice (Lew & Hardt, 2011). Hence, *constructs* in my study refer to each item on the test and the intent of each question used during the interviews – both integrated during the analysis.

Supported by the ‘situated’ activity and ‘foundation’ for stream discharge calculation, the ‘opportunity’ for embedded interaction using a mediating technology such as PV (Model Level 1) in turn catapulted student participants towards an ‘*awareness*’ and the potential for an elevated level of consciousness (Model Level 2) - which in turn would permit an ‘inward’ (i.e., personal) self-examination typically ignored in conventional curriculum design and evaluative assessment..

From this second model level, it was then posited that (in some instances) the student participant would be elevated from this potential situated consciousness and introspection to a new level of short-term and ‘repeatable’, but rote (i.e., academic and scholastic) knowledge and/or technical skill acquisition (Model Level 3). These three perceived and pre-requisite model levels were then assumed to provide a subsequent opportunity for each student to contemplate a ‘longer-term’ outward and lasting expression or ‘self-sustaining’ intention that would ultimately kindle an overt transformative learning – and insight into new behavior (Model Level 4).

Each of these four Model Levels is described fully below in an attempt to formalize the different kinds of learning that students encountered during this research. Each of the levels was distinct (i.e. student awareness, elevated consciousness, academic knowledge, and transformative behavior) but also provided an opportunity to transform participants and link to a larger successive platform of student learning. As presented,

the learning was clearly richer and potentially more powerful than that normally measured, described, and assessed by academic test scores. Ideally this four-level model will be of use for shaping other kinds of natural resources and environmental education and for learning across the Canadian north.

### **Model Level 1 - A Naturalistic Base**

Regarding context, field video, and interview results, the discharge calculation exercise was initially ‘*situated*’ and ‘*collaborative*’ in nature (Model Level 1) providing a base level foundation for elevated platforms in my proposed conceptual framework (Table 5.3). Unsolicited video interview results indicated that 79 and 42 of the 97 participants mentioned some aspect of the in-stream discharge calculation activity as being situated and/or collaborative, respectively.

Unsolicited mentions that were coded as ‘**situated**’ included: 1) a place-based ‘learning’ experience {n=59}; 2) a positive environmental ‘experience’ – with ‘no’ mention of ‘learning’ {n=52}; 3) both a situated learning and positive environmental experience {n=32}; 4) a negative outdoor experience {n=2}; and 5) no mention during the interview {n=18} (Table 5.3). Students were most likely to refer to the positive nature of these situated and non-conventional activities via the following statements: “*participating was a complete learning awareness*” (Student 2); and “*being in the cold and snow was peaceful – it was a less strict environment*” (Student 48).

In cognitive science, the term ‘**situated**’ refers to an agent (e.g., student) who is embedded in an environment. The initiating and ‘situated’ perspective was hypothesized to emphasize informed overt behavior (i.e., a personal sense of environmental advocacy)

that was derived from lesson delivery, the environment, and a student agent's focused interactions with each; essentially, the nature of these interactions being defined by the participant's situated experience. Recall my theoretical methods proposition was that a match in knowledge and skill is refined and focused via 'situated facilitation'.

Table 5. 3 *Hierarchically structured interview codes and attribute clusters listing associated total number of the 97 participants that responded to each.*

Model Level	1 Experiential Model base (Outward)		2 Long-term Takeaway (Inward)		3 New Knowledge Learning and Skill Acquisition (Short term)				4 Prolonged Life long (Long term)
	Situated Experience	Collaboration	Awareness	Eureka	Knowledge Acquisition <sup>1</sup>	Skills Acquisition <sup>2</sup>	Knowledge and Skills Acquisition	Unsolicited PV mention (pos.)	Overt Behavior Change (environmental advocacy act – use less water)
<b>Platform Theme Combination</b>									
<i>Number of mentions during Interview (n)</i>	<b>79</b>	<b>42</b>	<b>90</b>	<b>65</b>	<b>66</b>	<b>58</b>	<b>91</b>	<b>8</b>	<b>25</b>
<b>Learning Experience</b>	59							8	
<b>Positive Experience</b>	52	38							
<b>Positive Learning and Experience</b>	32								
<b>Negative Experience</b>	2	4							
<b>Exercise Awareness</b>			33						
<b>Environment Awareness</b>			43						
<b>One's self Awareness</b>			62						
<b>Mentioned (once)</b>					26	43			
<b>Mentioned (twice)</b>					25	14			
<b>Mentioned (three times)</b>					14	1			
<b>Mentioned (four times)</b>					1				
<b>'an actual stated' (no change)</b>									18
<b>No Mention (during interview)</b>	<b>18</b>	<b>55</b>	<b>7</b>	<b>32</b>	<b>31</b>	<b>39</b>	<b>6</b>	<b>89</b>	<b>54</b>

<sup>1</sup> = NFU – necessary for understanding; <sup>2</sup> = MFP – mandatory for procedure skills.

Aside from knowledge and skill acquisition, overt behavior change was posited to advance synergistically, as was the development of the learner. The theoretical underpinning of these ideas are supported by Lave and Wenger (1991), and Wilson (2008).

The stream calculation exercise also simultaneously incorporated an aspect of ‘**collaboration**’ in Model Level 1, here defined as working together to achieve success by sharing knowledge and building consensus within groups. Unsolicited mentions coded as ‘collaborative’ included: 1) a positive collaborative interaction {n=38}; 2) a negative collaborative interaction {n=4}; and 3) no mention of collaborative interaction during the interview {n=55} (Table 5.3). Most references to collaboration were positive in nature and included: *“as a group there was completion most likely not possible by myself”* (Student 73) and *“I’ll be more confident doing jobs and like school assignments when we are in groups and working together and stuff - I know now that I am better working with people”* (Student 40). In contrast, negative references included: *“I felt I was not part of the group”* and *“there was a struggle for leadership”* (Student 65).

Although most collaboration requires leadership, its form was assumed to be social within these decentralized and relatively egalitarian ‘short-term’ student groups. Hence, collaboration was perceived to be a recursive process where three or more candidates worked towards a common goal. In this situated stream activity, working together was posited simply as a collective determination to reach a shared objective within a rather brief period of time. But in some instances, participants acquired much more: *“I certainly will take risks - I’ve always been a team player but I certainly think that - I usually pick my team - if we’re in a big group or something like that, there are*

*certain people that gravitate towards me or that I gravitate towards - now I think that I just might be more inclined to try somebody different for a change - I think it is learning experience” (Student 90).*

Teams that worked co-operatively should hypothetically have obtained higher test scores: a method *specifically* aimed to increase academic success as they engaged in collaborative problem solving. Additionally, these opportunities for collaboration were also assumed to encourage introspection, communication, and action of thought (Plate 5.4).



*Plate 5.4* Students from the Business Administration program engaged in didactic learning.

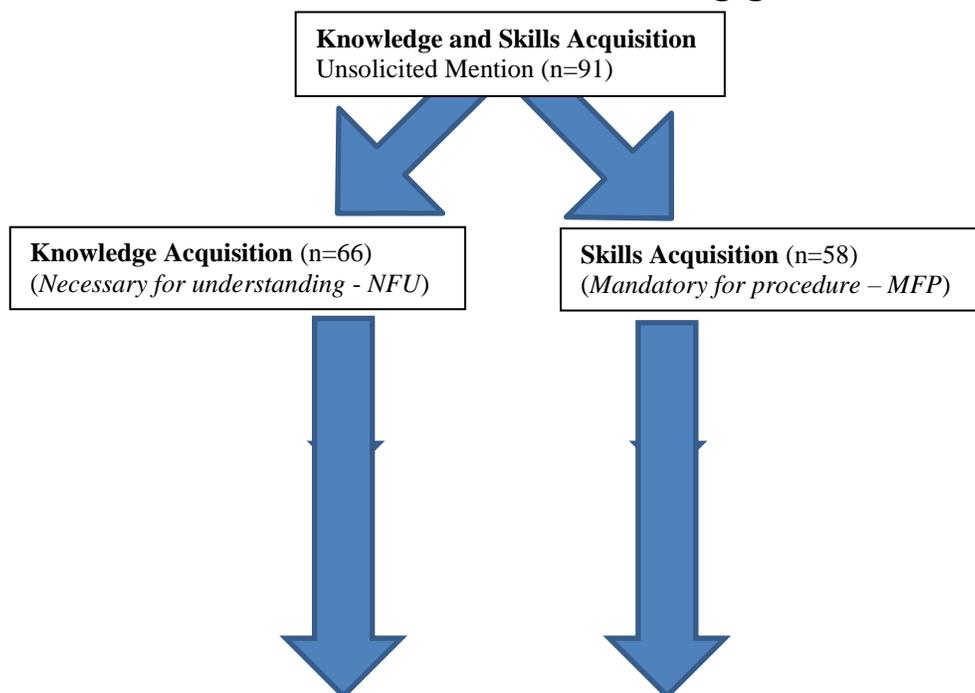
### Model Level 1 – Naturalistic ‘base’ platform – Environmental Engagement



### Model Level 2 – Catapult & take away – Internal Engagement



### Model Level 3 – Short-term rote Engagement



### Model Level 4 – Long-term Take Away

Personal Environmental Advocacy – leading to intentions  
The phenomenon of interest – environmental advocacy as a ‘sustaining’  
latent variable – life long and a prolonged take away

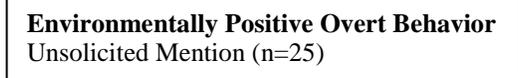


Figure 5. 4 Posited model of code interrelationships, hierarchical attribute evolution, and associated total participant interview response numbers listings (n=97).

## Model Level 2 – Eureka! (Inward) and Awareness

Following the in-stream discharge calculation opportunity being ‘situated’ and ‘collaborative’ (Model Level 1), participation provided not only increased ‘*awareness*’ but potential for an elevated level of consciousness. This subjective ‘*aha*’ experience, a transformative ‘Mezirow-like’ learning or ‘*eureka!*’ moment, represents the next level in my hierarchical and conceptual framework (Table 5.3; Figure 5.4).

Unsolicited mentions that emerged from the interviews and that were coded under the elevated theme of ‘**awareness**’ included: 1) awareness of exercise {n=33}; 2) awareness of environment {n=43}; 3) awareness of one’s self {n=62}; and 4) no mention of being aware {n=7} during the interview (Table 5.3). In total, 90 of 97 candidates made reference to some type of increased awareness; 41 mentioning more than one aspect of awareness. These reflected new understandings of the importance of freshwater: “*shock in government non-regulation and the lack of education in high-schools*” (Student 17); and students referring to the exercise’s added dimensions of flexibility and tolerance: “*it was difficult to step back - I am more accepting of others’ perspectives now*” (Student 10). It is unlikely that students would be prepared to engage in these demanding activities and self-awareness, still less practice and develop them, unless appropriate *opportunities* for such experiential learning were provided (Plate 5.5).



*Plate 5. 5* Monitoring providing increased awareness and potential for elevated level of consciousness.

By definition, ‘**awareness**’ was considered the ability to perceive or be conscious of events or patterns culminating in established ‘mindfulness’. Broadly, it is the state of being cognizant of something (Wyart & Tallon-Baudry, 2009). In biological psychology, awareness forms the basic concept of the theory and practice of Gestalt therapy; but in general, ‘awareness’ refers to public, common knowledge, or lay understanding of a specific social, environmental, or scientific issue (Brownell, 2010). Many academic disciplines try to foster ‘awareness’ of a given subject (e.g., multi-cultural awareness). Theoretically, ‘awareness’ in this study was considered a relative concept; essentially, a participant may be subconsciously aware or acutely aware of an event.

Awareness may also be focused on an internal state (a visceral feeling) from participating in an external event. Awareness therefore, can provide the raw material from which participants may develop a ‘eureka!’ moment or transformative ideas about ‘their’ experience (Model Level 2). Essentially, within each participant there was an elevated possibility for “*certain features of the bodily sensations especially, but also of certain perceptual experiences, which no amount of purely physical information includes*” (Jackson, 1982, p. 127).

Unsolicited references to ‘eureka!’ moments during the interview responses included either: 1) a conscious and transformative experience {n=65} or 2) no mention of such an experience {n=32} (Table 5.3). Student participants were often greatly concerned about the state of their wellbeing and/or the environment: “*I felt less hope, and less in control knowing this information*” (Student 18). In other cases, participants spoke about their positive insights: “*I have an awakening regarding my attention, caring, and concern for the environment. I have been thinking about the world more, not simply myself and this town – we must smarten up as I sadly found garbage and keys in this beautiful stream segment we researched – in the middle of nowhere!*” (Student 3).

The term ‘eureka!’ refers to a transformative experience or a ‘raw feeling’. Examples are the pain of a headache, the taste of my dad’s November deer stew, and perhaps even the experience of participating in the calculation of river discharge. In this model’s structure, it was assumed these ‘eureka!’ moments were dependent upon and perhaps directly related to lesson-type delivery, collaborative interactions, awareness, and the place-based ‘situated’ activity during participation in the stream discharge exercise.

In this ‘in-the-field’ and situated afternoon in the stream, each participant had the opportunity to experience subjective ‘eureka!’ expressions from participating in the collaborative stream discharge calculation activity, all while being exposed to principles associated with the acquisition of technical skill and environmental knowledge. Subsequently, with video camera in-hand, it was posited that in some instances, the student participant was elevated in a desire to continue from situated-driven consciousness to a new level of expected short-term knowledge and/or skills interest and acquisition (Figure 5.4).

### **Model Level 3 – Split Route – Knowledge Acquisition**

Ninety-one of 97 student participants referred to some new aspect of either knowledge and/or skills acquisition (Table 5.3). References to ‘**knowledge acquisition**’ as one route for student development were coded as: 1) mentioning it either once or multiple times – where responses were ordered {n=66}; or 2) making no mention of knowledge acquisition at all {n=31} (Table 5.3). Many students indicated knowledge acquisition that related directly to the non-conventional lesson delivery, for instance, *“I’ve never experienced anything like this - others were really excited when I told them what I was doing”* (Student 86), and in some cases directly to the use of participatory video: *“using the camera helped me to realize it more”* (Student 77).

Unrefined knowledge acquisition sub-codes included: 1) *new experience and participatory video*; 2) *knowledge sharing*; 3) *educational development*; 4) *social responsibility*; and 5) *environmental knowledge*. Regarding educational development and

social responsibility, participants revealed “*others made me realize I need to ask more questions and a greater variety of questions while participating in class*” (Student 30) and “*I will make provisional increases in opportunity for environmental curriculum when I am a teacher*” (Student 7). As a result, awareness and/or ‘eureka!’ moments (Model Level 2) were presumed to be ‘pre-requisite’ to *true* knowledge and skill acquisition and desire, as an evaluative academic incentive was guaranteed simply for participating and responsibly completing all research activities. It was also realized some students may memorize what was needed simply to pass the exercise and their course.

Unsolicited references to ‘**skills acquisition**’ as the alternate route for Level 3 development were coded as either: 1) student skill acquisition {n=58}; or 2) students making no mention of skill acquisition {n=39} (Table 5.3). Unrefined subcodes related to skill acquisition included: 1) *skill development*; 2) *personal development*; and 3) *improved learning strategy*. Participants recognized such skills were inextricably linked to future opportunity commenting that “*these skills will certainly improve my chances for career development*” (Student 5) and “*I realized my leadership capability of taking charge of a group of people*” (Student 23). Improved learning strategies were also frequently mentioned: “*I realized a strategy - that is from situation to lecture setting rather than the reverse, so I will now try to do more in clinical setting as this was an easier way to learn*” (Student 37) and “*I thought of myself as an indoor learner but outside was fun*” (Student 42).

Regarding definition, **employability skills** are defined here as transferable skills needed in the job market, along with some technical understanding and subject knowledge. Essentially, a group of abilities that involve the development of a knowledge

base, technical expertise, and mindset that is increasingly necessary in the modern workspace. Employability skills are considered essential qualifications for many positions in northern Manitoba and hence have become necessary for regional employment success (Hind & Moss, 2011).

With respect to hierarchical model positioning, it was assumed that intrinsically developed awareness and ‘eureka!’ moments (Model Level 2) were not only ‘pre-requisite’ for Model Level 3 knowledge and skills acquisition but also behavioral transformation (Model Level 4), particularly through experiential non-traditional learning opportunities that generally did not reflect most conventional post-secondary learning and assessment experiences (Figure 5.4).

#### **Model Level 4 – Overt Behavior Change**

Following the stream discharge activity being *situated* and *collaborative* (Model Level 1), the idea that participation provided an elevated level of *awareness* and possibly a ‘eureka!’ moment (Model Level 2), and the potential generation of ‘short-term’ situated *knowledge* and/or *skill* acquisition (Model Level 3), there was a subsequent opportunity for each participant to generate and then contemplate a longer-lasting ‘intention’ that ignited an ‘overt’ and ‘self-sustaining’ transformative learning experience in the expressing some personal sense of environmental advocacy (Mezirow, 2000).

Analytically, the latter would have to be recognized as some measurable overt act and personal sense of environmental advocacy (Model Level 4); an insight that students could ‘take with them’ that was related to something ‘beyond’ either scholastic skill or

knowledge. This overt and transformative behavior was the ultimate outcome of the three previous and underlying Levels in my conceptual model (Figure 5.4). For instance, one student referred to such insights that arose regarding previous interactions with another student specifically stating: *“the activity made me realize my perceptions about those two people prior to the exercise were biased - were not accurate - that their behavior during the exercise challenged the perceptions I had and I found that affirming for them as group members but also reminding me that I shouldn’t assume my perceptions are fully accurate. I’ve actually went to one of the two group members and I thanked them for taking that active role and that I appreciated that it was helpful for me and I think that it will make me more open to doing similar things in the future”* (Student 4).

Unsolicited references to transformative **‘behavior change’** that arose during the interviews were coded as: 1) an overt positive act {n=25}; 2) a stated ‘no change’ {n=18}; and 3) students making no mention {n=54} (Table 5.3). Related to these UCN student experiences and response, this same sense of control over the production of behavioral intentions was reflected in video statements as: *“the way I’ve viewed water as a resource - just from a general person’s perspective - I’ve lived in plenty of beautiful places where - you know - perfect little pristine streams like that flow just about everywhere - however, standing in there and actually metering the river itself and figuring out the discharge of the river - kind of makes it touch home a little bit more than just kind of watching - and it just makes me think you know we’ve really got to try to save these precious resources”* (Student 10 – Plate 5.6).



*Plate 5. 6* Students incorporating experiential and traditional knowledges.

Operationally, and by definition, an ‘overt behavior’ change (Model Level 4) or environmentally-positive act (i.e., advocacy) refers only to manifest actions of the student participants in relation to their stream-side experience, the surrounding environment, the possibility of an intrinsically associated awareness and/or ‘eureka!’ moment (which may include other participants as well as the physical environment), associated knowledge, and/or skill acquisition. These variables all culminated as a positive behavioral development action in the form of an overt transformative ‘personal’ act of advocacy regarding the environment and fresh water sustainability.

It is important to note that student observations imply that knowledge and skill acquisition is not simply cognitive but that it also has associated affective components.

These findings indicate a gap when it comes to evaluating northern UCN adult student performance as each participants' behavior is inextricably linked to pre-tertiary experiences, personal and community meta-ethical values, lesson deliveries, and regional learning paradigms that are normally overlooked.

Identifying these non-conventional types of learning activities that students care about and then assessing their cognitive behaviors (i.e., constructs) while processing a challenge provides a much richer opportunity for learning and its affirmation. It is apparent from this categorization of these *unsolicited* thoughts and insights that students from the poorest and most remote northern communities have an ample store of experience, display variation in learning modality, and are willing to present cultural insights that may ideally be valued academically - and that have the power to transform education if evaluated holistically and in appropriate and affirming ways (Plates 5.7 and 5.8).



*Plate 5. 7* Kenanow Education program student cohort following stream calculation.



*Plate 5. 8* Law Enforcement program student cohort following video review process.

## Discussion

### Situated Learning and Non-Conventional Contexts

Missing from the previous chapter's discourse and approach (Chapter 4) was any meaningful (qualitative or affective) student insight into the communal stream-side exercise where University College of the North students interacted cooperatively to develop knowledge, skills, and perhaps the opportunity to experience something '*more*'. This omission is important as it has generally been realized for more than a half a century, that experiential settings are essential regarding learning (Dewey, 1938), and that adult learners bring at least two decades of previous knowledge to the classroom offering established philosophies, guiding values, and beliefs governing their performance. Grounded in Williams' (1967) notion that all culture is educative, and Jarvis's (1992) idea that it is naïve to assume significant transactional learning is restricted to the classroom, Moore (1998) submitted situated learning is integral to perspective development and paradigm dissension. Recognizing the utility of these notions, Hung and Chen (2001) speculated that students interpret, analyze, and solve real-world challenges in these environments. As a result, learners engaging in demand-driven activities often exhibit emergent meta-cognitive *behaviors* (Land & Hannafin, 2000). In turn, Wright and Sandlin (2009) recommend educational researchers of adults study the realms of non-traditional learning as it is in these informal and legitimate spaces that dominant forms of erudition may be shaped. This chapter and its focus on stream-side learning and *mixed* assessment represents just this approach.

Insights from this study represent a comparison between situated and didactic lesson deliveries experienced by students in northern Manitoba. And, since the generation of experiential knowledge is presumed to be contextualized by action (Barab & Roth, 2006) and the sharing of information (Gee, 2010), my mixed data collection specifically reveals learning patterns and trends based on exploratory factor analysis of empirical test scores *and* quantified-qualitative insights arising from *unsolicited* student interview responses. Overall, the experiences of these 97 UCN students provides an exciting opportunity to examine ‘their’ ideas concerning lesson delivery, participatory video (PV) as a supplementary communicative technology, the acquisition of skill competencies, the development of environmental advocacy in a personal sense, and the benefits of an integrated evaluative assessment. Knowles, Holton, and Swanson (2005) advocate such holistic approaches to evaluation whereby perceptions of respondents concerning *their* participation, and the system within which *they* act, must be an educational focus as these evaluative modes are the ‘*undergirding*’ of sincere assessment.

### **Factor Ordering of Condensed Student Variables**

The three dominant axes of variation as identified by exploratory factor analysis were, in declining order of importance: 1) *Environmental Engagement*; 2) *Academic Test Scoring*; and 3) *Non-Conventional Lesson Delivery*. The first thing to note is that academic ability factor-loadings presented as less important than an affectively evaluated personal sense of ‘*advocacy*’ via engagement or learning in ways that were meaningful within a student’s cultural life-world. This **Factor 1** finding regarding ‘order’ is

particularly interesting. As a major objective of postsecondary learning, academic performance (i.e., test ability, grade point average) was expected to be most important, as it was (and is) the dominant intent of postsecondary education, and traditionally, a UCN educational priority. Yet, this latent personal sense of advocacy via streamside *engagement* as a factor and its variable conglomeration rated higher in importance than ‘*Academic Scoring*’ (Factor 2); this in contrast to existing UCN assessment strategies.

UCN student success and achievement were dominated not by a specific quantitative empirical attribute or test score, but rather by some ‘normative’ student *construct* that reflected of non-conventional lesson delivery and place-based ‘ecological insight’ while working collaboratively standing in a boreal stream wearing a pair of chest waders. Kemp and Parrish (2010, p. 55) note how rote empirical assessment is somewhat privileged in academia, a situation that normally downplays the evaluative dimensions witnessed in this UCN student sample. In contrast to conventional approaches to learning, their work also promotes the cultivation of multiple ways of knowing. Similarly, for Ellsworth (2005), learners are multidimensional, and critical learning does not occur in straightforward ways. She contends, as supported by the outcomes of my study, that postsecondary assessment must embrace different elements of practical and emancipatory knowledge (Habermas, 1972), allowing opportunities for student experiences, views and questioning to be expressed and accounted for.

**Factor 2** or ‘reproductive’ ability, simply reflected a familiarity with the store and recall of rote categorical information. This traditional and didactic model of test application and student evaluation is normally limited to ‘passing the exam’ and was *less* important compared to the *engagement* factor 1. Clearly this factor-order may cast doubt

on many assumptions regarding education in the North and shift inquiry towards non-conventional lesson delivery, holistic evaluation methodologies, and the gathering of wider information on the meaning-making abilities of (incoming) northern adult students through engagement.

Finally, exploratory factor analysis yielded an important ‘third’ factor. **Factor 3** or ‘*non-conventional lesson delivery*’, and its four sub-codes: educational development, awareness to the exercise, participating in a new experience, and participatory video - still accounted for a significant amount (10%) of the total variability. It was this factor that ultimately gave rise to a ‘base level’ with which to develop a conceptual and hierarchical four-level learning model. With similar insight into self-directed learning, and also from an institutional perspective, Nieto (2003) reflected on the needs for schools to provide an equitable and high quality education for students that includes active participation in situated activities preparing them for roles as democratic and analytical citizens in the future. According to Richardson (1994, p. 521), until students experience the concept of ‘verisimilitude’ or ‘being there’, there simply can be no agreed upon knowledge structure.

Although Andrich and Styles (1994) suggest that didactic delivery and mental development is analogous to ‘salmon leaps’, they found no sign of any such cognitive ‘leaping’ or test score advance when didactic methods were used. Rather than enabling students to ‘leap’ to more difficult challenges, lecture-based delivery and any associated assessment simply reduced re-test errors making real student progress that much more difficult. Bligh (1972) similarly noted that predetermined multiple choice and short answer questioning *does not* allow for unanticipated learning. Presenting information in

one-hour, time-tabled blocks using chunk and recall-type tests ultimately leads assessors to view all learning in terms of only one (i.e., their own) demonstrable behavior (Apps, 1979, p. 117).

A critical aspect of my in-stream learning activity and situated theory research is the notion that these student ‘apprentices’ represent a ‘community of practice’. Lave and Wenger (1991) proposed such entry-level participation in a culture of practice that entails observation from a boundary position (i.e., legitimate peripheral participation). As learning and cultural involvement increase, participants move from the role of observer to fully functioning agent. Legitimate peripheral participation enables learners to progressively piece together group culture and to determine what is required of membership. The authors concluded that “*to be able to participate in a legitimately peripheral way entails newcomers have broad access to arenas of mature practice*” (p. 110). As detailed in my study and its comparison of the two lesson types and streamside observations, UCN students resolved knowledge and skill acquisition differently. Hence, it is posited the dynamics of situated delivery be conceived in terms of a mental reference to three-dimensional navigation on the real stream-side ‘galaxy’ rather than a straight-line didactic delivery radiating from facilitator and whiteboard to student as a passive recipient of information.

What I suggest is in some way similar to Gibson’s (1966) concept of ‘affordance’ or what we choose to present to incoming students. If, for example, the metaphorical Necker cube (or lesson type) were oriented so the ‘edges’ coincide, the configuration (and lecture) would be perceived as didactically (cognitively) flat. Alternatively, as the cube (lesson) vertices move from one to another in situated experience, the configuration

of knowledge and skill acquisition may reduce barriers and be perceived multi-dimensionally through '*relational learning – and other*' (i.e., postulate of adequacy) lenses (Ellsworth, 2005, p. 2). Such activities 'invite' collaborative inspection, mental grasping, cognitive dissonance, and perceptual rivalry - these all necessary for learning, knowledge acquisition, and '*Mezirow-like*' transformative insights and sharing of thought (Fraser, 2015).

The latter is posited to occur more readily if the student moves about in a natural and situated learning environment (Gibson, 1966). Countless incompatible actions may be set in motion by engaged in-stream experiences and perspectives. Nothing in the didactic system can supply such bewilderment or wonder. A didactic approach would inevitably exclude some percentage of these 'in-stream' learners: giving little if any say to participants and representing barriers to any student self-expression. And, since it is difficult to generate alternative ways of thinking (and behaving) from didactic delivery, an important task of remote-based facilitation is to use 'what is available' and to present at least a mix of regionally-based non-conventional lesson delivery styles in order to facilitate cooperative praxis and student interaction in these remote communities and settings.

This reasoning suggests that tasks of uni-dimensional delivery, such as those traditionally employed in didactic presentation and 'canned' power point lectures, should be supplemented by local tasks and examined by collaborative multi-cultural participation if the intent is to gain deeper insight into holistic student learning in remote environs. Garland (1992) provided similar theoretical insight concerning barriers to students withdrawing and persisting in tertiary-level environmental sciences that

resembled my own findings. For instance, these results reveal incongruences between: 1) cognitive (i.e., *acquisition through experience and thought*) and affective (i.e., *attitude, awareness, quale*) perceptions; and 2) the nature to problematize (i.e., *viewpoints demanding high levels of integration and inference*) from skills, awareness, ability, and acquaintances presented. Indeed, only half (55%) of the UCN students were able to make the transition from empirical course content to personal and participatory abstraction, perhaps indicating that situated experience and an associated paradigmatic shift was required.

### **Participatory Video used as a ‘Process’ – not a Product**

As advances in affordable technology have recently enhanced interaction with ‘user-friendly equipment’ and digital video (Lunch, 2008), educators have begun to experiment with video as a tool for documenting and facilitating classroom learning (Howley, 2005; Rooney, 2007). Bascomb (2006) and Cottrell (2010) examine such projects based on theoretical frameworks grounded in multicultural education relating specifically to technology-assisted learning. Their findings indicate that technology and participatory video projects tap into various aspects of facilitation, increasing cultural awareness and enriching life-long perspectives that provide for transformational learning.

Rosenstein (2008) also discusses how participatory video assists in pushing for change by incorporating externally-generated ideas for research. An exceptional use of ‘*participatory video training, education, and action*’ is Proshika’s documentation of forest destruction in Bangladesh. The experience convinced grassroots affiliates they had

the power to solve local challenges. Participants reported video as invaluable because it makes people aware and conscious of the issues, and when participants can visualize, they are perceived to understand (Xu et al., 2009). In similar fashion, Stewart et al. (2008) cites that a participatory video clip created *in less than three hours* was effectively used as an advocacy tool for women's rights. In essence, this technology and its new portability brings access to 'atypical' users. For instance, the average student can take a smart phone almost anywhere. Hence, by inviting UCN students to question northern lesson delivery, and by recognizing this technology is a legitimate educational tool for more than just passively viewing in-class videos, I used digital video as a 'method process' to enrich learning in a northern stream environment.

Aside from the fact that participatory methods are documented to increase 'awareness of context' and to improve participant status, putting video technology into the hands of 'students' is a relatively recent development (Kallis et al., 2006). Subsequently, study design challenges that arose in my work focused in part on how to collect, make sense of, and store unsolicited student dialogue. Although some UCN students found it difficult to exhibit self-direction as *key* stakeholders in their learning, they showed that video facilitates active engagement. Although there were a diversity of experiences with video, most good and some not so good, these were reconcilable.

Moreover, although Kvale (2006) and Roulston and Lewis (2003) caution against interviews being 'ruled' by interviewers, Creswell (2007) suggests that a matrix of information sources (i.e., observations, documents, and interviews) best conveys research depth and complexity. My use of a mixed-methods and integrated variable approach to this study was to gather enough information to fully develop and saturate a northern

learning model; yet, these multiple sources of data played only a secondary role to the ‘free-talk’ interviewing that centered on video. It was for this reason that post-field open questioning was phenomenologically appropriate without being leading. Unlike narrative inquiry, this phenomenology bracketed participant meaning for several participants and their ‘lived experiences’ thereby reducing individual experiences to a description of universal northern stream essence: a composite description so I could “*grasp the very nature of the thing*” (Van Manen, 1990, p. 177).

Yin (2003) argues this design process is the logical sequence that connects empirical data to a study’s initial questions, and ultimately to its conclusions. Accordingly, video focused on disclosing the depth and complexity of each UCN student’s field-recorded and open-ended unsolicited interview experience giving rise to underlying concepts and constructs. LeCompte and Schensul (1999) affirm these processes play a central role in the description of indicators originating from awkward results, overlapping participant attributes, latent constructs, and behavior. During UCN student interviews, I found that participatory video was particularly well suited to documenting and increasing understanding of this northern reality and its associated characteristics. In turn, my findings show that 1) there is still a remarkable lack of awareness and understanding regarding student learning modalities in the North; and 2) attrition rates which remain high, have not changed in two decades.

Overall, a strong participatory video theme in these 97 UCN student accounts relates directly to the principles of experiential facilitation that involved instilling a spirit of critical inquiry in the student. This approach gave students an opportunity to take control of ‘their’ awareness (90/97), academics (91/97), extra-rational experiences

(65/97), and behavioral (transformational) changes (25/97). As advocates of educational technology, Miller and Cruce (2004) state such participatory promise (and the use of video) provides students with the means to receive and convey data, develop learning skills, analyze observations, and share insight, to act critically in the cultural fabric of Canadian education. Related to these UCN student experiences, this same sense of control over the production of northern and remote knowledge, skill acquisition, and behavioral intentions was reflected in actions on video.

Student comments indicated the depth of decisions made in the categorization of task and their video-recorded responses to educational delivery and regional fresh water use. Shaw, Brown, and Bromiley (1998) contend that such ‘stories’ are central to human intelligence and memory. As such, retrieved stories served to define causality, setting, holistic memory retention, and relationships. This situated experience and streamside ‘ceremony’ created a mutual basis for entering into a common dialog (Stonechild, 2006; Wilson, 2008). Everyday language was used and all students could participate first-hand and largely on their own terms. Basically, there was no need to acquire special skills or vocabulary.

As posited by Atleo (2001), the exploration of these processes ‘requires us to move through several levels of analysis in the development of metaphoric blends which weave the native and non-native worlds together’ (p. 37) and that all knowledge(s) must be considered from strategies and relationships that give meaning. For instance, if many northern students are not able to competently master ‘*number-based mathematics*’, how do they become the “*natural resource specialists*” that are needed (Phare, 2009, p. 196). Regardless of their subjective nature, qualitative responses were rich and informative,

and student-centred; that is, when the research is based on the participants' experiences, and freed from the researchers' bias (S. McLachlan, personal communication, 2012). If this is the case, the findings of my research are transparent, coherent and communicable.

The idea of video as a finished creation, did not take precedence once coding via Final Cut Pro had commenced. What did matter was the fact that student participants with little 'formal' education became effective providers in the capturing of their own acquisition of knowledge, skills, and behaviors. As such, the camera facilitated learning when combined with either didactic (DPV) or situated (SPV) lesson types, but most so with the latter. In this evaluative approach, video proved theoretically and conceptually useful and even cost-effective. Similar to Stewart et al. (2008), I also determined that the value and impact of a finished video 'product' is of secondary importance.

I found every student functioned to some degree, depending on how finely their responses were assessed. At a coarse level, different students realized a simple *multiple choice* question request, and answered 'appropriately'. However, it was more useful to view learning in a more refined way, especially in northern and remote contexts assessing adult learning. For my purposes I focused on a level of inspection that was fine enough to reveal changes in behavior and perhaps even the inclusion of already-existing traditional knowledge and skills. This was the goal of using participatory video and conceptualizing a model with a 'fine enough grain' to operationalize northern constructs in statements that could empirically be evaluated in way that was highly relevant.

Finally, a critical review of the literature shows that there is a gap in empirical examination of student transformative learning. This seems particularly so in the North. In response, my modified participatory video process provides a way for northern student

development, research, evaluation, and training to evolve. Using participatory video and a mixed methods integration of variables allows for contemporary educational institutions to sense change in adult student ‘gestures’ and perhaps to adapt accordingly (Oliveira, Menezes, & Canavarro, 2012). In response to Lunce (2008) and his report that participatory video has an ability to ‘help other methods go even further’, my use of participatory video not only advanced qualitative methodologies, but also quantitative approaches to learning in the environmental sciences.

That said, Day and Baskett (1982) show that such experiential contexts are frequently shunned institutionally by “*problems in matching states of learning readiness to course content and learning process*” (p. 149). My description of UCN student results indicate that an alternative perspective and paradigm is much needed, one that presents non-conventional methods of learning and assessment consistent with a remote northern context.

### **Model Conceptualization – situated and working collaboratively (Model Level One)**

I have thus far reviewed exploratory factor analysis axes, PV as a *process*, and conceptualizations forwarded as a hierarchical four-level model of learning. But as with all educational philosophies, implementation of situated and cooperative deliveries also have limitations including the fact that experiential learning programs are: time-consuming to develop; needful of intrinsically motivated learners; and hamper the delivery of factual information (Hung & Chen, 2000). However, according to Lunce (2006), these perspectives are unfortunate as everyday cognition in situated arenas is not

only well suited to transferring knowledge and solving problems, but such benefits must be considered more frequently in complex educational and social contexts.

Countering Hung and Chen (2000), my northern Manitoba findings show that **situated learning** had a positive influence on this UCN student sample group. Besides shortening the time required to relay discharge calculation skills from 90 to 15-minutes, non-conventional and collaborative lesson delivery was well suited to place-based problem solving while enabling opportunities for behavioral change. Viewing context and student interview results from the perspective of presenting a conceptual model, the discharge calculation exercise was initially both '*situated*' and '*collaborative*' in nature. For two-thirds of these students, there were aspects involved with the richness of this short-term situated exercise that resonated with each, as well as their relationships to the environment with different lesson types. Gee (2010) similarly documented affinities between being situated and the creation of 'new literacies' by understanding that individuals learn through 'experience'. For Barab and Roth (2006) and Greeno (1994), situated knowing has these same affinities, co-determined by engaged participants and a contextual environment. For Lave and Wenger (1991), it is not just a matter of arriving at a single multiple-choice answer – it is about having a student arrive at a 'place-relevant' and emerging stance.

It has been almost a century since Spearman (1927) emphasized the importance of this evaluative 'stance' and 'new literacy' meaning, positing that the capacity to identify and solve problems depends on a simultaneous understanding of the 'whole' and knowing which incoming stimuli could be ignored. This ability to squeeze concentrated insight involves making new meaning from confusion to forge 'constructs' that probe

exchange and insight - going beyond the traditional pedagogy of 'exposition and drill' (Simkin & Kuechler, 2005). As expressed by one UCN student who recognized this 'meaning' in the experience; *"I guess for me - you know it's just a consistent anxiety for me with anything new I always wonder ok how will I measure up to others because sometimes it comes as a rude surprise when you think you are going to do well at something and find out you are the worst in the class - and with this one I really thought I wouldn't get on with it - I thought I might be the worst in the class and sometimes you think that and you really are - this time I thought I might be - and I wasn't"* (Student 66). For Mezirow (2000, p. 7), this statement refers to a learner transforming taken-for-granted frames of reference in order to make them *"more inclusive, discriminating, emotionally capable of change, and reflective so they may generate beliefs and opinions"*. These new frames of reference will no doubt guide future action of these 25 mature northern participants.

The stream calculation exercise with these UCN students also incorporated an aspect of '**collaboration**' defined as working together to achieve success by sharing knowledge and building consensus within the functioning groups. Central to effective participation, was development of a critical reflection, and being challenged to consider alternative ways of thinking and behaving (Gardner, 1991). According to Collins and Brown (1988), collaboration-generated student reflection must be anchored by these shared experiences. Subsequently, these democratized groupings through which this foundational level and stream activity proceeded allowed UCN students to become involved in a shared and rich learning environment, while each participant was encouraged to incorporate their own knowledge and perspectives.

According to Mezirow (2000, p. 22) and as indicated in the above student quotes, adult learners move through a series of ‘meaning phases’ to undergo development from disorienting dilemmas in order to build competence into an **awareness** and a reintegrated life experience. The Situational Model of Hersey and Blanchard (1982) recognizes that this same effective ‘self-assessment’ and ‘personal development’ depends not only on the individual, but the specific situation. Their model similarly considered participant ability, motivation, the task, performance, collaboration and feedback in facilitating personal progress and knowledge growth.

Newman (2010, p. 14) suggests such feedback is “*good learning*” and is a reworked consciousness along the lines of Freire’s ‘*conscientization*’. Agreeing with Freire, Lange (2009) also believed that wider approaches to theorizing about transformative learning and situated-collaborativeness as challenging issues are key. Accordingly, Garland (1992), submitted that “*it appears that natural resource scientists could more effectively share their knowledge if they simplified it, assumed no prior understandings, and helped people learn by informally and subjectively putting it in a more holistic context for them, including making inferences to application and implication*” (p. iii).

In viewing this initial and foundational level of **situated** and **collaborative** context, every UCN student participant interacted with the stream environment, determining what ‘affordances’ or opportunities were available to ground their new ‘effectivities’. Shaw, Turvey, and Mace (1982) first introduced the term ‘effectivities’ as the ability of a student to determine what they ‘could’ do - likely co-determined by ‘northern’ affordance and effectivities which acted together in a situated and

collaborative context, while ‘in the moment’ (Young, Kulikowich, & Barab, 1997). According to Nideffer (2002), experience-generated student ‘concentration’ shifts along competing dimensions (in countless learning modalities) related to very narrow and broad foci, simultaneously. To be effective, students must be able to shift their focus of concentration in response to the changing and group-based demands of any learning experience, including the calculation of river flow, when placed in the middle of it.

### **Being aware and the potentiality for eureka! (Model Level Two)**

Following the in-stream exercise being ‘situated’ and providing the opportunity to work collaboratively at a base level, participation provided for not only an *awareness*, but a fresh potential for an elevated affective level of consciousness and subjectivity that arose from a shared first-hand experience. By definition, ‘*awareness*’ was considered the ability to perceive, or be conscious of events and patterns culminating in a new and established mindfulness. Awareness, however, may also be focused on an internal state where it provides the raw material for a visceral feeling or culturally subjective ‘*aha*’ or ‘eureka!’ moment from which participants may develop transformative ideas about ‘their’ experiences. McDowell (1998, p. 42) defined this same awareness as a “*raw feel*” or “*bare presence*”; a perceptual experience where description is impossible to convey verbally and regarding certain perceptual experiences for which no account of purely physical information exists.

In defense of acquiring this subjective learning possibility, attempts to establish that there are non-physical dimensions of learning that could be discovered through

situated participation have been foregrounded in my model. For instance, Nagel (1974, p. 437) claimed that being situated and conscious has a subjective character, a “*what is it like*” aspect, a mental state which is insufficiently accounted for by objective evaluation and didactic delivery. Jackson (1982) also offered ‘*something more*’ exists, and if true, that participants acquire knowledge, ability, and a particular ‘*wow*’ they did not possess before. This ‘transformation’, Jackson argues, is a ‘*quale*’<sup>1</sup>. Philosophically, the term refers to a ‘eureka!’ moment apprehending something so transformative that it can existentially cleave a participant’s mind. James (1961) described this panoramic clarity as a snap-resolution of the ‘divided self’.

<sup>1</sup>Lewis (1929) was the first to use the term ‘qualia’, but Schrodinger (cited in Moore, 1992) described quale as “*an intrinsic subjective experience that does not form a one-to-one correspondence with stimuli*” (p. 14). At the same time, Dennett (1991), pronounced ‘*properties*’ of qualia including the notions they are: 1) ineffable and thus incommunicable by means other than direct experience; 2) intrinsic and thus unchanging; 3) a private rendering making comparisons impossible; and 4) apprehensible. To experience a quale is to know that one experiences it (Dennett, 1991). Ramachandran and Hirstein (1997) proposed ‘*laws*’ of qualia - these being irrevocability; open-endedness once created; short-term memory shaping allowing time for a choice of output; and close linkages to ‘attention’, effectivities, and affordances supplied via a situated experience. In friendship with definition, properties, and laws, a ‘quale’ is a monadic, introspective, and qualitative feature such as the sound of my now-deceased dad’s voice asking if I had time for coffee from a saved five-year old MTS phone message - and what it means to me to hear it now.

Lycan (2001) summed such meaning as a qualitative collection of sensory experiences, while Dennett (2005) wrote ‘qualia’ are an ‘unfamiliar term for something that could not be more familiar to each of us: the way things seem to us’. Since there are differences between those who have access to a ‘*wow*’ and those who do not, it is conceded that qualia must be real and were therefore considered in my analysis of situated learning experience reflected in this UCN study.

In his criticism of ‘eureka!’ moments, Conee (1994, p. 144) argued that the ‘knowledge’ participants acquire post-release is only ‘acquaintance knowledge’ requiring being “*familiar with the known entity in the most direct way*”. A decade later, Lewis (2004) argued that experiencing ‘eureka’ doesn’t even transmit knowledge; instead ‘eureka!’ moments only communicate ‘abilities’. For instance, when students in this study stood in the stream, they did not acquire new information. They gained new abilities: to *remember* what discharge calculation entails; to *imagine* what calculating discharge in other streams might consist of, and; to *recognize* future instances of potential requirements for calculating discharge. For all intense purposes, however, Lewis is merely indicating that students receiving didactic teaching are prevented from using situated experience to gain entangled and unanticipated ‘know-how’ (as it is uncontroversial some things cannot be learned didactically); articulating information and ability are two different things.

Irrespective of such criticisms, Llinas (2002, p. 205) and (Kovan & Dirkx, 2003) argue that ‘eureka!’ moments are ancient and necessary for survival. And although Henderson (1956) discussed Jungian psychology and its educational significance more than a half-century ago, the role in active evaluation of qualitative constructs, including behavior and ‘eureka!’ within adult learning, have been understated and ill-researched here in the North. Hence, in pursuing behavioral change related to non-conventional lesson delivery, I considered extra-rational perspectives forwarded by student participant statements and incorporate the possibility of existence into my integrated assessment.

Building on the lack of a documented critical analysis of an extra-rational approach in remote learning, I offer one potential platform level framework for a ‘fair’

evaluative critique of northern adult learners. My model and empirical strategy rests on both empirical quantitative testing and unsolicited qualitative insights into student in-field learning experiences. Moreover, since I entertained the metaphysical possibilities of ‘eureka!’, I had to address them at some point in this analysis although they posed a nasty empirical challenge. And since definition was impossible and difficult to convey, I forward a more tangential approach; that 65 of 97 (70%) unsolicited video-recorded responses reflected some level of ‘eureka!’ indicates that they are pervasive and undeniably important.

Conferring the importance of ‘eureka!’ moments, Walter (2011) raises particularly interesting questions regarding strategic approaches to education using emotionally charged and disorienting dilemmas as catalysts. Van den Noortgaete (2015) suggests such a holistic process of transformative learning may even involve emotional, spiritual, physical, personal identity, an intrinsic value beyond utility, and some connection to nature and social justice. Although the integration of psychic structure and extra-rational perspectives in transformative learning have yet to be adequately explored with respect to northern adult education, there remains no consensus about the legitimacy of this type of knowledge in the South (Kucukaydin & Cranton, 2012). Necessarily, and in the absence of ‘direct’ proof, I offer interesting considerations that suggest *constructs* of ‘eureka!’ are empirically possible to index, measure, and ponder with respect to lesson delivery.

In sum, this model level and its findings reflect the days in the stream where each UCN student participant had the opportunity to create subjective ideas from participating in the collaborative stream discharge calculation activity, but all while also being exposed

to principles associated with competency of skill and environmental knowledge acquisition with video camera in-hand. Subsequently, my results indicate that most (in at least 55% of UCN sample cases –inclusive of both didactic and situated learners) of these in-stream experiences ‘elevated’ the participant from situation-based awareness to intentional ‘knowledge and/or skills’ acquisition (Model level 3) – and then catapulted these same learners to overt behavioral change (i.e., environmental advocacy – Model level 4).

### **Knowledge and Skill Advance (Model Level 3)**

Following the stream activity being ‘situated’ and ‘collaborative’ (Model level 1), and the idea participation provided increased opportunity for ‘awareness’ and a possibility for an elevated raw-feel ‘eureka!’ (Model level 2), the potential for the generation of new **knowledge** ‘necessary for understanding’ and/or **skills** ‘mandatory for procedure’ were examined. Employability skills were defined as transferable skills, along with some technical understanding and subject knowledge; a group of essential abilities that involves the development of a knowledge base, expertise level, and mindset increasingly necessary in the modern workspace (Lew & Hardt, 2011). These employability skills are considered as essential qualifications for many resource management positions in northern Manitoba and hence have become my academic area of focus necessary for regional success and reducing the ‘notion of failure’ (described in Chapter 4).

### **Overt Behavior Change ‘Transformation’ (Model Level 4)**

Following the activity being ‘situated’ and ‘collaborative’ (Model level 1), the idea that participation provided an elevated level of ‘awareness’ and possible designation of a raw feel ‘eureka’ (Model level 2), and the generation of situated knowledge and/or skill (Model level 3), there was a subsequent occasion to provide each participant with an opportunity to contemplate a future, and to have an intermediary ‘intention’ that could ultimately ignite an ‘**overt**’ transformative learning experience, here recognized as some measurable act of a personal sense of environmental advocacy (Model level 4). This overt transformative behavior was my ultimate targeted response that would presumably be more likely to arise from non-traditional lesson delivery and assessment, and is thus reflected in my hierarchical and conceptual four-level learning model.

Because I felt there was a need for greater specificity and clarity for this observable (i.e., measurable) ‘overt’ behavioral *construct*, I sought to identify the structure of this ‘transformative’ construct of interest. Consequently, an ‘overt behavior’ or environmentally-positive act (i.e., advocacy) refers only to the manifest actions of a student in relation to the stream-side experience provided, the surrounding environment, collaborative groupings, the possibility of an intrinsically associated awareness and/or eureka, and associated knowledge and skill acquisition. Each of these actions was posited to culminate as behavioral development in the form of an overt environmental act of personal advocacy. One UCN student described it this way; *“it opened my eyes - like I don’t really know how to explain it but I have changed - like I’ve started recycling and before I just didn’t care cause it is just going to go to the dump anyways - I pick up*

*garbage now - before this research I didn't care - cause when we were there in the water we found keys and glasses and like it's our drinking water - we don't want to be drinking stuff like that in our water - it changed me"* (Student 92).

Unfortunately, regarding '*intentions*', good ones are simply that - they will not save the planet. *Intentions* were therefore considered only as a student's location on a subjective dimension involving a relation between recipient and some action (Knobe, 2003, p. 192). An 'intention' in my analysis referred only to 'possibility' – the possibility that a student would enact some overt behavior. In this respect, the assumption was the more favorable a student's 'attitude' (or intent) towards environmental advocacy, the greater the possibility that she or he would demonstrate a personal and positive 'transformative' behavior in that regard.

Subsequently, it is important to note student observations implied knowledge and skill acquisition was not simply cognitive, but that it had *affective* components. This stance assumed there was a fracture when evaluating northern adult student academic performance that arose from didactic delivery and rote testing. Each participant's behavior would inextricably be linked to their life experiences and community values, which would generally remain unassessed. Identifying non-conventional types of learning activities that students cared about and then assessing their cognitive and affective insights while processing lesson-related challenges made for democratic spaces in the learning. Understanding this perspective better informed my phenomenological position that explored the 'many' subjective dimensions of student learning, as students from the poorest and most remote northern communities present a rich and long-standing

store of traditional knowledge and experience that should be incorporated into meaningful evaluations and that they do have a power to transform behaviors.

Mezirow's concept of transformative learning and its emphasis on rational and scientific 'Western' thinking has been criticized for its lack of attention to historical and cultural contexts and its exclusion of 'other ways of knowing' (Newman, 2010; Merriam & Ntseane, 2008). Highlighting the integration of transformative opportunities and associated affective evaluation of student performance into this northern study therefore begin to address long-standing political inequalities and cultural misunderstandings. Doing anything else is unjust and, from a more pragmatic perspective, would only perpetuate the low graduation rates found in Manitoba and across northern Canada (Sims & Falkenberg, 2013). My conceptual model demonstrates there is a regional 'space' for a genuinely inclusive evaluative system using non-traditional curriculum design not only as a course of lesson delivery, but as a 'caring conversation' of assessment with a goal of acknowledging locally-rich experiences.

Most likely as germane to northern Manitoba as it is in Sierra Leone, Kanu (2011, p. 215) presents this same need to disseminate "*knowledge that balances the strength of Aboriginal peoples with the problems they face*"; a balance or 'currere' in part catalyzed by environmental, cultural, regional, and emotional dilemmas that provoke a latitudinal shift from southern homocentric views to northern biocentric understandings of ecological consciousness and conscience (Walter, 2013). For instance, in my model's structure, it was assumed that 'eureka!' were associated with and perhaps directly arising (to a greater degree) from unconventional lesson types, collaborative interaction, awareness, place-based activity, intention and attentional pulses, and behavioral

alteration. As Jarvis (2005) suggests, self-directed learners often “*need to make situated and sometimes lateral, emotional and intuitive decisions about the best course of action*” (p. 44). Hence, my research focus was on how such ‘tipping points’ fostered critical learning and identity development in newly arriving UCN students. Of the 65 students that experienced ‘eureka!’ in this study, 36 shared that these reflected some kind of environment-related behavioral change. That is, 55% of those students who referred to ‘eureka!’ moments also indicated a promoted behavioral advance related to some form of overt advocacy related to fresh water.

### **Implications for UCN and northern Manitoba**

My research findings emphasize that quantitative evaluation alone does not recognize affective proposition as meaningful because it is too difficult to deduce from operationalized facts and numbers. However, difficult-to-understand constructs ‘do’ evolve on the ground, erupting into seemingly dis-ordered overt acts and transformative behaviors that are often overlooked by standardized performance measures. Thus, quantitative and qualitative mixed-assessment of these UCN students was crucial to this northern regional understanding. Inclusive engagement during evaluation must not be neglected. Educators and researchers must pay closer attention to intentional and behavioral facets related to ‘eureka!’ while providing students with relevant opportunities to learn, opportunities other than didactic delivery (Heron, 1992).

Through transformative learning, Sims and Sinclair (2008) likewise argue that approaches to learning must be participatory, interdisciplinary, and of the right context -

evoking passion, emotion, and 'eureka!' for deepening understanding. It follows, as far as behavioral development is concerned, that UCN ask which aspects of curriculum design and delivery might result in greater success and productivity - locally and provincially. I argue against a sole dependence on didactic deliveries that typify much of the learning at UCN, and instead promote the inclusion of 'non-conventional' teaching in northern remote curricula. My alternative methodological approaches would provide increased access and student success, new thoughts and goals, all while promoting attitudes and behaviors beneficial to fresh water sustainability.

Present interrelationships among social and environmental challenges, the confluence of poor secondary education, increasing numbers of students from the South, First Nations band sponsorship, and high unemployment of local people in Manitoba's North - create a metaphoric 'remote penalty' which is somewhat incomprehensible at an institute like UCN that does have real options for promoting classroom curricula and popular education. My model is one meaningful response to these student challenges and is grounded in my two decades of facilitating Natural Resources Management in the new multicultural North. It is empirically about coalescing into a new conceptual approach to learning that describes a relationship between accrediting local skill and cross-cultural approaches, reaching out to 'at-risk' learners while presenting new northern curriculum designs.

Granted, every physical fact related to stream discharge calculation could have been obtained by students in a didactic setting. Yet, upon leaving the classroom and experiencing the activity first-hand and in the water, these UCN students obtained new knowledge, technical abilities, new acquaintances, and often 'eureka!' about this

experience-based activity that were not typically shown in the classroom. My UCN findings help search relationships between situated and didactic accounts of cross-cultural learning that lead us away from a binary ‘one-or-the-other’ designs to learning that is regionally-evolved and ‘emergent’ in - and from the North.

My research findings also raise relevant questions about the role of facilitation in remote regions when fostering opportunities for critical transformational learning given the increasing recognition of the importance of ‘eureka!’ for northern adult learners. Although many scientists regard ‘emergence’ as having only a pseudo-scientific status (Emmeche, 1997), new teachings at cross-disciplinary institutes (e.g., the NRI at the University of Manitoba) focus strongly on such high-level ‘collective behaviors’ in complex systems. There is ‘more’ for students in situated northern learning; it is easily accessible; it is relatively inexpensive; and it is responsible for personal change - the kind of change that is major and significant if evaluators are perceptive.

Yet ‘understanding’ may *not* be necessary to acquire competency or the standard operating procedures necessary for employability in this depressed northern region as some students are simply not interested in graduating. Four years of education with early-career ‘academics’ and a framed certificate may not be necessary or even wanted. At some point in the future, the participant may (and can) re-register so as to revisit the development of knowledge, enhanced belief, attitude, and intention – and may then be more receptive to post secondary learning - whether this be didactic or nonconventional in approach.

Suspicion aside, my perspective of a Traditional Knowledge (TK) and science knowledge (SK) merge with respect to learning modality is revealing. The relationship

between technocratic science and Traditional Knowledge plays itself out in my daily academic life, but it is increasingly apparent that the diversity in everyday classrooms means there are multitudes of association regarding real student learning and cultural preservation. Claiming that these many knowledge systems were equivalent and insisting that TK and SK are ‘things’, when they are actually ‘processes’, was realized early on as a category mistake (Ryle, 1938/1971). On a more hopeful note, the incorporation of knowledge from an Indigenous worldview may unexpectedly come from a ‘counter transfer’, which is often more interesting to non-Aboriginals students in this region. Thus, my mixed delivery, method evaluation, and the resulting hierarchical model that is accessible, relevant to both TK and SK, and beneficial to participants - has a great deal to offer.

The implications of the design of my stream discharge calculation activity reflect other relevant examples in real-world situations as a means of illustration (Young, 1993) and will likely be relevant to other regions across northern Canada. It was *context* that allowed me to differentiate purpose and to motivate interest while providing a sustained and complex northern living learning. With this in mind, if I could help foster differences in learning styles that would help affirm student experiences and lead to greater student retention and success, then my substantial effort could help lay claim to educational research related to natural resource conservation and fresh water sustainability everywhere these issues are relevant.

## Chapter 6: Discussion

### Restatement of purpose and findings

To reaffirm my thesis statement and discuss challenges raised in the preceding chapters, my research supports an ‘operational’ and ‘intrinsic’ approach regarding *non-conventional* lesson delivery in northern Manitoba. The former conveys the application of knowledge and technical skills that will directly contribute to student employability in the region - whereas the intrinsic, will help realize broader student learning and ‘growth’ with a focus on fresh water sustainability and a ‘personal’ sense of advocacy.

As Garland (1992) suggested “*natural resource scientists could more effectively share their knowledge if they simplified it, assumed no prior understandings, and helped [students] learn by informally and subjectively putting it in a more holistic context for them, including making inferences to application and implication*” (p. iii). It is from participating in such experiential contexts that I believe remote postsecondary institutions will benefit from my examination of lesson styles, innovative dimensions of evaluation, and as presented here, non-conventional lesson deliveries in the form of situated learning using participatory video (PV) as a mediating technology. Insights arising from this research will help reform both adult education and fresh water sustainability in the North.

To restate my position on why it was important for me to write this thesis as I near the end of my career, I have become increasingly aware of the inadequacies of current approaches to adult education in this region. From my experiences over two decades and working with almost 700 students as a college instructor, the hereto

untapped potential of PV as a mediating technology, popular education theory, and situated learning theory to facilitate the building of technical skills, a personal sense of environmental advocacy, and more generally the increased awareness and growth of these northern students, has been something astonishing to ponder.

This sought after northern-living, traditional, and meta-ethical knowledge centers on recognizing the significance of both the mature learner and *context* when addressing longstanding educational challenges facing the North - and while incorporating cultural traditions arising from the inhabitants of surrounding and mostly Indigenous Cree communities (UCN Academic Plan, 2015). Little in the still-dominant didactic approaches to education addresses these ongoing challenges. And, since it is difficult to generate opportunities for self-expression and alternative ways of behaving in didactic lesson delivery, an important qualification of my research was to use ‘*what was available*’ with students at University College of the North (UCN).

My lesson delivery and evaluative approach assumes adult education is a transactional ‘value-based’ encounter where ‘engaged’ learners are immersed in a collaborative and situated process of negotiating their learning priorities. Likewise, Applegate (2008) advanced that if erudition is considered to include ‘something more’ (i.e., what ethical principles are best to follow), and ‘behavior’ is about *constructs* that improve understanding, then assessment should also be integrative in approach. Hence, heuristic evaluation in which student perceptions concerning ‘their’ participation (and the system within which they act), was my educational focus as it is these evaluations that represent the undergirding of sincere adult learner assessment in this northern region.

Similar aims have been advanced by Grudens-Schuck (2001) and Knowles, Holton, and Swanson (2005) who queried the degree to which mature learners bring ‘unrecognized’ perspectives to contemporary educational practice. Comparable methods were also examined by Garland (1992) to provide theoretical insight concerning barriers to students persisting in, and withdrawing from, postsecondary environmental science programming. Although separated by at least a decade, the problems remain and the outcomes of these studies are similar to my findings. For instance, UCN student scholastic results indicated an interconnectedness between cognitive and affective (i.e., *eureka!* moments) knowing, besides the ability to solve problems (i.e., viewpoints demanding high levels of inference) that reflected new abilities and student relationships that arose from participating in the situated and experiential stream exercise.

Ultimately, outcomes related to my quantitative performance testing (Chapter 4) and *unsolicited* qualitative student interview codings (Chapter 5) were used to construct a conceptual four-level model that revealed experiential, academic, and behavioral dimensions of interconnectedness in this remote learning environment. My results showed that 55% of participating adult students *were* able to bridge a transactional *gap* from solely ‘academic’ content to personal, participatory, and collaborative understanding, perhaps realizing that a shift in environmental *awareness* and working together is necessary to ensure that (as northern residents of isolated communities) they each have opportunities to contribute to a healthy society respectful of diverse land-based Indigenous values, ecology, local beliefs, and limits to natural resources.

Additionally, my findings indicate the *failure* to broaden and diversify the assessment of remote enrollees inadvertently reinforces a euro-dominant model of

tertiary-level education onto local Indigenous ‘ability’, perpetuating a deficit view whereby existing (mostly Indigenous) student experiences and life skills are overlooked within the guise of achieving modern provincial-wide postsecondary ‘academic’ success.

More than two decades ago, Anderson et al. (1996) presented this same concern stating “*what is needed to improve learning is research into circumstances that determine when narrower or broader contexts are required and when attention is optimal for effective and efficient learning*” (p. 10). Unfortunately, as Day and Baskett (1982) submitted 40 years ago, attempts to develop new educational contexts are frequently shunned institutionally by “*problems in matching states of learning readiness to course content and learning process*” (p. 149). My thesis findings indicate an alternative solution to a century-old educational model, thereby presenting a new but ‘familiar’ theoretical framework, evaluative method, and northern perspective that is consistent with a self-reflective community focus, a place-based student assessment, and using ‘*what is available*’.

## **Motives for Methodological Practice**

### **The Northern setting, imbalance, solution, turning point and climax**

It was found the educational ‘*setting*’ for this northern region of Manitoba reflects decision-making regarding local environmental concerns that typically rely on data gathered by skilled technicians and technologists. Northern-based technicians need place-based skills rather than an outsider ‘etic’ knowledge base that reflects didactic learning shaped by ‘distant’ educational priorities and *visiting* technicians from the South.

Although effective training of remote students requires competent skills and knowledge delivery, innovation truly rests on a process of making these skills and knowledge ‘available’ and ‘accessible’ (Leeuwis & Aarts, 2011; Tufte & Mefalopulos, 2009). The ‘imbalance’ in the UCN’s serviced communities is that institutional didactic training imposes social stressors (and a generic sense that all adults learn and can be assessed in a certain arbitrary way) to those who typically leave before completing their programs of study. Indeed, the University College of the North’s Natural Resources Management Technology Program has attrition rates that are usually greater than 75% each year (UCN Strategic Plan, 2016).

Similar to all instructional methodologies, conventional (didactic) instruction has some strengths, including the building of basic foundational skills in reading, writing, document use, and numeracy (Sanchez & Wiley, 2009). Of particular concern, however, are the limitations of this approach to education and the disconnect from northern context when the approaches that are used are alien and participatory techniques are ignored altogether (Duffy & Cunningham, 1996; Harden & Levalliant, 2008). Didactic lectures fail to adequately reflect existing student experience, keeping mature learners from reinterpreting anything according to their own locally imbedded dispositions. Simply, generic didactic lectures to adult audiences where no link exists between learner experience and the topic under discussion is poor heuristic practice (Applegate, 2008). These inadequacies frequently result in physical and mental absenteeism, and as such these didactic approaches are of little use to remote educators if seeking to promote critical thinking or flexibility in attitude and behavior (Lunce, 2006).

As didactic delivery does not generally recognize affective disposition as meaningful because extra-rational concepts are difficult to define (much less measure in the classroom), Klerkx (2008) argues the ‘telling, not asking’ tendency in education is highly problematic in remote settings. Sperry and Sperry (2011) also question the benefits and intentions of such approaches in underdeveloped and low-income areas. Alternatively, difficult-to-understand *constructs* ‘do’ evolve, erupting into overt acts and realities that I witness each day with northern students. The challenge is that it is difficult to effectively incorporate, much less evaluate, these realities and local knowledges.

Emphatically, the same obstacles of geographic distance that Snowden found in 1963, including the inability to access information, the lack of confidence, and the lack of organization, remain. Consequently, the opportunity to define and research a northern Indigenous learning model was chronotopically (i.e., of place and time) important to me, and an imperative given the crises that still confront adult education and students I facilitate in the North.

Northern Manitoba realities require fresh thinking about curricular design and evaluation in order to generate meaningful outcomes with respect to an isolated and ‘sparse’ population. About 38% of Canadians live in rural and remote regions (Du Plessis, Beshiri, Bollman, & Clemenson, 2001; Statistics Canada, 2016), and an adequate supply of graduates from these areas is particularly important when addressing ongoing and dramatic fresh water declines across northern Canada (Pryor et al., 2012). Review of my quantified-qualitative results and related theoretical constructs will ideally advance such popular education efforts and demonstrate the importance of non-conventional lesson deliveries and innovative evaluation when addressing the needs of northern

Indigenous student cohorts. My land-based science approach suggests a validity in non-conventional strategies that encourage student interaction and regional success.

For example, by using PV technology and a mixed-evaluative structure, '*long answer*' and '*calculation*' question types generated the greatest opportunities for students to have high test scores when these lessons were disseminated using situated and situated plus PV deliveries. More abstract competencies were increased when facilitated in a situated context where students were able to articulate *their* interests and needs.

Alternatively, the didactic transmission of knowledge was far less successful. Moreover, test scores and the results of the exploratory factor analysis show the need to question the *singular-minded* transmission and evaluation of technical and scientific material.

Ecology is a difficult scientific discipline requiring mathematical competence and specialized jargon, but it also demands an aspect of 'doing' something demonstrating the use of holistic thinking. Learning about fresh water sustainability without experiencing it, limits its value as an educational tool. Lunce (2006) and Ricard (2017) similarly suggest highly favored modes of learning that relate to ecological and environmental education include inspirational interaction, apprenticeship and experiential learning.

Clearly, at different levels of evaluation, the performance of each student depends on how adequately their responses are assessed. At a coarse level, for example, different students may take and succeed at simple *multiple choice* tests. However, it is more useful at tertiary entry levels to view student learning differently. For my purposes in this northern region, I focused on a level of video inspection that was sensitive enough to determine indices of awareness, extra-rational capacity, and behavioral change. This is the purpose of my conceptual four-level model, which has a 'fine enough grain' to

operationalize exploratory factor analysis ‘*constructs*’ from video statements that could empirically be evaluated at a level relevant to northern application and thus be effective in reflecting and facilitating blended patterns in student behavior and academic performance.

Justifiably, in northern regions, an exceptional ‘*academic score*’ may be of little consequence and far less important than a graduate being open to allowing group contributions to be cooperatively interpreted, uniting behind a common concern, or having an ability to persuade others regarding resource conservation in a region threatened by local or regional misuse. A key caveat is that grade point average not be determined solely by rote testing, but also by other factors relating to intrinsic motivation, developed or changed beliefs and values, and the role of holistic assessment in facilitating student development inclusive of non-traditional learning.

One such ‘*solution*’ is that knowledge and skill transfer may be facilitated by using video and other non-conventional methods that minimize socio-cultural stressors that otherwise undermine learning. The ‘*turning point*’ is that some degree of situated non-conventional lesson delivery and germane evaluation acknowledging deep *personal* insights and impact is possible (and perhaps measureable). The observed ‘*climax*’ is that northern learner schema are posited to evolve along a continuum of ability and behavior, from simple exposure to deep insight and *construct* creation, which require complex evaluation strategies.

It was almost a century ago that Spearman (1927) emphasized this same critical need to know which incoming stimuli make meaning from confusion to forge ‘*constructs*’ which go beyond rote evaluations of chronicled lists. Following two decades facilitating

learning in the North, I have no doubt that identifying and solving ecological challenges depends on fostering situational insight and an understanding of the 'whole'.

These approaches bring to light integrated features of PV, situated theory, popular education theory, and an evaluative patterning of student insights related to fresh water protection. In essence, I identified complementary affinity-groupings of student learning that emerged from open-ended video interviews which were contrasted to and combined with their quantitative and empirical test scores.

## **Summary of my Main Findings**

### **Situated learning and modified participatory video**

Still missing from this discussion is a focus on the communal stream-side situation itself and how students interacted to develop knowledge, skills, and perhaps the opportunity to experience a 'eureka!' or '*aha*' moment. These 'real' situations have been perceived as essential for experiential learning for more than a half-century (Dewey, 1938). Grounded in Williams' (1967) notion that all culture is educative, and Jarvis' (1992) submission that culture has progressively influential effects on learner perspective, it is naïve to assume significant transactional learning is restricted to only a didactic teaching environment.

Like Buckland (2010), I believe it vital to focus on non-institutional adult learning because it is partially through spaces outside educational organizations that student-identities are shaped. Sandlin et al. (2011) maintain learning not only occurs in situated contexts, but emerges naturally as a consequence of learners recognizing the practical

utility of the knowledge conveyed as well as the need to use, interpret, and solve real-world challenges with it. As a result, mature participants engaging in situated contexts often exhibit emergent meta-cognitive *behaviors* in demand-driven activities (Land & Hannafin, 2000; Wright & Sandlin, 2009). I witness this every year at UCN. Gee (2010) also recognized similar affinities between being situated and understanding.

Comparatively, my study results show that northern UCN learners subjected solely to traditional didactic lectures did not do as well.

Hence, in light of a flowing or frozen stream, situated cognition theory postures ‘knowing’ is inseparable from doing and argues that knowledge is activity-bound to social, cultural, and physical contexts (Greeno & Moore, 1993; Wilson, 2008).

Historically, theoretical perspectives were embraced in education and instructional design (Brown, Collins, & Duguid, 1989) gaining recognition in the late twenty-first century, sharing principles and perspectives of psychology, communities of practice, and behavioral study (Young, 2004). Unfortunately, as styles of learning occur in various environments, teacher-facilitators like myself are constantly challenged by context, time tabling, issues of standardization, and in developing a common student understanding (Blackmore, 2007). This paradox is particularly puzzling for remote educational institutions like the UCN.

In contrast, situated learning does have documented limitations relative to didactic strategies (Anderson et al., 1996). Situated learning programs are often seen as time-consuming to develop, needful of intrinsically motivated learners, and awkward for facilitating factual information (Hung & Chen, 2000). As critics, Anderson et al. (1996) argue whether learning is truly even bound to context, whether development depends on

the kind of learning and on the way learning takes place, and that task transfer depends on the degree to which a successive task has similar cognitive elements to a prior task. Jennings (2000, p. 4) states that situated philosophies are expensive to conduct, and Howley (2005) argues follow-through, continuous collaboration, and consistent delivery with a coherent exit strategy tends to be non-existent. However, in contrast to Hung and Chen's (2000) suggestion that experiential learning activities are awkward, situated delivery with these UCN students permitted the compressing of time to relay technical information from 90 to 15 minutes while nurturing the much greater 'possibility' of overt behavior change related to fresh water sustainability and environmental awareness.

### **Modified participatory video findings**

Accepting that participatory video (PV) has been recognized as innovative for decades, it has yet to fulfill its promise according to Goodman (2003). Minardi and Ritter (1999) first eviscerated this idea of integrating PV technology in education, stating the use of video techniques has been advocated without any empirical evidence regarding its scholastic efficacy. As it stands, relevant literature on evaluation in adult education suggests that the 'value' of PV has only been inferred from limited 'qualitative' data. Case studies providing rules and processes for programs committed to the quantitative physical and biological sciences remain undocumented.

However, according to Lunce (2006) and Miller and Cruce (2004) these rigid perspectives are unfortunate as everyday cognition in situated arenas with new technology is well suited to problem solving and hypothesis testing, and instructional

broadcastings must be considered in new and complex educational and social contexts. Contemporary experiential situations are being advocated to plan, elicit and value ‘authentic’ local input sustaining the validity of educational programs (Howley, 2005; Lunch, 2008).

This is a notable aspect of my thesis. Northern Manitoba and the UCN are being reshaped by unexpected industrial forces pitting marginalized Indigenous residents against increasingly exploited wild lands, competing interests, cross-cultural dialectics, and ‘invading academics’ from the south that evangelize *their* educational perspectives. To complicate regional dynamics, First Nations scholars announce that comparable opportunities for creative expression that are grounded in local culture and knowledges are being ignored (Mercredi, 2010; Wilson, 2008). In terms of these challenges and complications, my UCN based results suggest that academic performance improved a full grade-level using non-conventional lesson dissemination for both genders and both self-declared Indigenous and non-Indigenous students. Findings suggest there is evidence that successful transfer of ‘knowing’, and the way that it is learned, did have a positive and important influence with this student sample group at this time. A positive student ‘interaction’ with PV increased *quantitative* test scores from didactic through non-conventional deliveries by as much as two grade levels.

Concerning educational processes specific to my study of northern adult learning, putting video technology into the hands of students is a recent development (Kallis et al., 2006), and although participatory methods improved academic performance, some UCN candidates did find it difficult to separate PV from promotional advertising for UCN. Fortunately, my PV efforts were modified pre-design to be used as a ‘process’ rather than

to create a product, generating meaningful evaluative criteria and unsolicited student responses that were then coded (Johnson, 2002).

Considering the activity a 'process' (i.e., a means and not an end), my modified PV method allowed the majority of student participants to digitally record and speak for themselves, to form collaborative multi-way communicative relationships, to enhance curriculum design via bottom-up strategies, to have opportunities for fluid cooperation and/or a preference for autonomy, and to help establish a participatory and northern student-generated model for communication, thereby strengthening performance through their *own* efforts and voices. Quantitatively, results showed that my *process* is an improvement on previous PV documentation as a scholastic tool, commenting specifically on the efficacy of using video for academic advance and learning on the part of students.

An equally strong PV theme in these 97 UCN student accounts relates to previously mentioned principles of effective social constructivism (McKinley, 2015), in that 91 of the 97 students reported that PV instilled a spirit of cooperative critical inquiry. This permitted participants to take control over their *personal*, social, often extra-rational, and academic proceedings. Chapter 5 of my thesis shows that interaction with fellow students was perceived useful in both the scaffolding of learning and providing a much-needed emotional support. In effect, course facilitators could pair or group students so that participants have, and experience, a formal opportunity for peer support while learning.

Simply put, ecological programming should include a variety of different learning and evaluative processes, with the currently dominant rote lecturing at UCN kept to a

balanced minimum. Participants should be encouraged to build and capitalize on their own learning styles and strengths, and on supporting and learning from each other. As advocates of educational technology, Miller and Cruce (2004) similarly speculated that the participatory promise (and the use of video) would provide students with the means to receive and convey data, develop learning skills, analyze observations, and act critically within the cultural fabric of Canadian education.

### **Relevance to Manitoba's North and the UCN**

Lastly, as dramatic educational achievements have sprung from differences in '*motivation*' (Haynes, Perry, Stupnisky, & Daniels, 2009; McClelland, 1961), the differences in the performance of students in my research were derived mainly from incoming program enrollee values and experiences, manifesting as substantial differences among academic programs. For instance and perhaps predictably given the focus of this stream flow exercise, mean Natural Resources Management Technology (NRMT) enrollee test scores were two grade-levels higher than non-NRMT student scores.

For Barab and Roth (2006) and Lave and Wenger (1991), situated knowing is a 'construct' co-determined by a *motivated* problematizing individual *and* a contextual environment. As with hurdling oneself across *a transformative gap*, it is not just a matter of arriving at a single multiple-choice answer but rather a relevant and emerging (i.e., motivated) stance situated within some context (e.g., my dad, a house fan, and a frozen river as will be discussed below). Subsequently, it seems worth considering, when assessing remote adult student skill and knowledge acquisition, that the UCN first

identify the kinds of activities that students care about and then document any student success that is displayed when completing those activities. The UCN might find that many more students than anticipated engage in such high-level educative processes. This tendency to learn from situated experience is notable in my results, particularly as some participants come from households and communities less concerned with the accuracy of militant academic testing and from secondary schools that generally still ignore traditional cultural expression and contexts. The ‘take home’ here is that a linear didactic approach to learning and assessment in northern Manitoba and the UCN need not be employed singularly.

Essentially, every one of these assessed students interacted with the stream environment, determining what affordances were available to base their ‘effectivities’ upon. Shaw, Turvey, and Mace (1982) introduced the term ‘effectivities’ as the ability of a student to determine what ‘they could’ do. Perception and action were therefore assumed to be co-determined by these local and ‘northern’ student effectivities, which acted ‘in the moment’. Young and Barab (1999) described these dynamics of *intentions* involved in a student’s interaction with the environment as deciding whether or not to adopt a particular goal when presented with a challenge. Once adopted, however, students proceed by intentionally interacting with ‘their’ environment. There are many levels of intentions, but while in ‘their’ moment, the student has just one, and that intention can constrain their attention and ‘behavior’ until it is fulfilled, or abandoned.

This positive positioning, is held to occur if the student moves about in the natural environment (Gibson, 1966; Sims & Sinclair, 2008; Walter, 2013). Countless incompatible sets of in-stream actions would have realistically been set in motion by the

configuration of an experiential and '*neckered*' in-stream activity (Necker, 1832).

Consequently, my reasoning suggests that the didactic dissemination of uni-dimensional information be supplemented, and even replaced by local tasks and examined if the desire is to gain deeper insight into cross-culture learning in the remote North. To emphasize this notion, an Elder in one focus group I conducted at the beginning of this study felt the UCN's mission might be culturally destructive and that viewing nonparticipating students as 'disadvantaged' would be wrong. In her perspective, lack of education was not a cause for concern, but the unfortunate outcome of an long-standing impasse between two 'cultures of knowing' in the North.

Consequently, integrating transformative opportunity and 'other ways of knowing' into educational assessment at the UCN must be considered holistically when addressing long-standing misunderstandings and inequalities due to low graduation rates in northern Manitoba. There is a northern regional need for a genuinely inclusive evaluative system that uses a curriculum design not only as a course of study but as a '*currere*' and running personal conversation with the goal of acknowledging pre-existing and locally-rich student experiences (Kanu, 2011; Merriam & Ntseane, 2008; Sims & Falkenberg, 2013). Most likely as germane to northern Manitoba as it is to Sierra Leone, Kanu (2011, p. 215) presented this same dimension of need to disseminate "*knowledge that balances the strength of Aboriginal peoples with the problems they face*". She reiterated her stance this past year as recipient of the Canadian Symposium on Indigenous Teacher Education Award at the Shawane Dagoiwin Aboriginal Education Research Forum in April, 2017.

In sum, the right context and collaborative exchange were shown in my results to evoke student passion, emotion, and ‘eureka!’ for deepening understanding here in the North. As do Lave and Wenger (1991), I believe an observer’s situated knowledge and understanding is constructed by an interaction with some type of experience. The ‘experience’ is then expressed as a story or statement about what the participant views as important. Unfortunately, ‘meaning’ can be something that defies easy definition and therefore, as my research indicates, such approaches require flexible and refined approaches to evaluation. To simply assert that the educational challenges are too complex in the North would be to ‘academically’ fleece these local students.

The point of my analysis and emerging conceptual model therefore, was to simplify the meanings these UCN students presented by examining not only what was complex, but what was ‘*normative*’ about experiencing the collaborative stream-based exercise. These methods and methodology dealt with ‘undefined’ variables perceived as ‘*constructs*’ which emerged as similar patterns that were captured via exploratory factor analysis of quantitative test data, as well as streamside student experiences as reflected in non-Likert generated and quantified qualitative interview responses.

These un-observable student-contributed ‘norms’, as made visible using exploratory factor analysis, were the students’ contributions to what was experienced streamside and what they decided was relevant. They were unsolicited and local. Subsequently, the point of my qualitative analysis was to find a basis for some equivalence in overt fresh water advocacy. I did not have access to these participant *constructs* but could infer them as patterns appearing in the unsolicited interviews. I’m not stating these ‘constructs’ were definable; but they were involved in what I, as an

evaluator, measured. In a sense, I coupled overt behavior with realizations of constructs (or ‘incalculables’) that laid behind a pattern of some type of student-offered equivalence or norm. But only my conceptual modeling gave it meaning (Chapter 5).

### **Limitations of the Research**

Although no participant formally withdrew nor asked to have data removed, one limitation of my study was student candidate retention [i.e., 348 to 97]; the number of participants expected to complete requirements of the broad range of data to be collected by six required activities. Reduced participant number (i.e., first term disinterest, attrition, and sponsored students unable to meet minimum requirement) limited generalizability of the results, although this was less important since my outcomes are so grounded in these 97 candidates’ local, place-based experiences and insights.

Another potential limitation was the generalizability of this stream-based exercise to broader learning as related to the field of natural resources, to say nothing of northern education as a whole. While the student sample was quite diverse and included participants from seven academic programs, it is uncertain to what degree my results are generalizable to other subject matter. This of course could, and ideally will, be the focus of follow-up research.

It is also unclear to what degree and how this educational crisis at UCN relates to other northern educational experiences across Canada. On one hand, this crisis does reflect broad systemic problems such as colonialism, industry related environmental degradation, and the perpetual under-resourcing of education. That said, each region also

reflects its own unique contexts that also need to be elucidated. These were indirectly reflected in pre-UNC lives of the student participants, and in retrospect I could have spent more time documenting these earlier life experiences in order to assess how and to what degree they interacted with their learning experiences at UCN.

### **Contributions**

Ultimately, the power of my research in this isolated region may be about the capacity to convince both Indigenous and non-Indigenous residents that everyone is sharing a regional experience. As a northern Manitoban, I am a privileged person of this world fortunate enough to be living in a country and province with fresh water; only one in five such individuals are able to do so in a global context. Resolution of this life-sustaining inequity will no doubt require new and innovative considerations of cultural, educational, and behavioral development that at first will seem overwhelming. However, by emphasizing elements that are distinctive in my research, my study has made some significant contributions.

*First*, participants in my research were early-stage adult learners reporting an increased self-confidence when it came to problem solving - and in considering this new ability, my study will further contribute to understanding the development process of beginner knowledge and skill acquisition. *Second*, my discussion of these findings raises relevant questions about the role of education in remote regions and in fostering opportunities for critical transformational learning given the increasing recognition of the importance of high-level collective behaviors in fresh water sustainability. *Finally*, there

is 'more' for students in situated northern learning - it is easily accessible, it is relatively inexpensive, and it gives rise to personal growth if assessed respectfully - the kind of development that is essential now (and into the future) for northern adult learners of the UCN, the province of Manitoba, and the world.

According to Sandlin et al. (2011), those who propose the integration of extra-rational concepts and psychic structures into transformative learning must create and use functional analyses in a way that place-based knowledge claims become understandable. Millenbah and Millsbaugh (2003) state educational institutions in particular must be responsive and accountable to local peoples by affirming that teaching is a moral vocation, that academia is a community trust, and that educational research is a major institutional obligation. Evaluation of such extra-rational concepts must be incorporated.

Unfortunately, research regarding the critical assessment of non-conventional learning methods in remote contexts is still rare (Shiple, 2002). As described by Bronfenbrenner (1990), our [Canadian] economy has shifted from an industrial to a technological model, yet occupational patterns in remote locales continue to reflect a euro-centric 'factory' work ethic. Liberating technologies and situatedness should free northern students from the time and place boundary and distant secondary schooling, yet the culture of conventional didactic lecturing, rigid subject matter, and rote evaluation in this region still contribute to poor student performance, high levels of attrition, the ubiquitous experience of 'failure', and outcomes that will remain unaddressed unless unconventional and student-centered approaches to learning and evaluation are adopted at a wider scale and in the near future.

The time has arguably come for the UCN to conduct some multi-scaled research of its own into the impact of a wide-ranging student evaluation and review processes. As an institution, the UCN provides a ready geographic stage for researching the extent to which students can rely on 'situated' participatory frameworks inclusive of non-conventional learning; whatever their academic programmes and whatever their life experience and worldviews.

My research findings show that environmental advocacy and problem solving patterns are indeed measureable. In a narrative sense, this ability to effectively *problematize* within a situation is what I refer to as being able to traverse 'Gord's Gap'. It is within this simple two-word phrase I use a late autumn mid-morning teaching experience to present and reflect upon the practical implications of my research, and the meaning it has for northern remote communities and society as a whole.

### **Autobiographical reflection - Gord's Gap and the ability to problematize**

Imagine a two-hour road trip north of UCN to measure stream flow as a situational class exercise; our group consisted of 17 students, myself, and my father - Gordon. Following the morning's drive, we all stepped out of rented passenger vans into the cold and started down a riparian footpath navigating through an unlit *Picea mariana* forest. Within 300 meters or so, I was shocked by how a change in weather had darkened everything.

Within this intra-boreal forest, only random sun rays illuminated my father. Glances at him showed his seventy-plus years, but his eyes were dancing; old age had

forgotten him as he arrived at the stream-edge first. I was glad my dad was using his day to lobby for my dissertation, but as I ambled down the stream bank behind him, I saw he was bent at the waist, with his arm outstretched and tapping a frozen river surface. Ice blanketed the small stream. To break the silence that hung between us after his ice-knocking, my dad stated “*nuff said*”. I felt instantly uninformed. I struggled to reshape my understanding of the situation. My mind went in unhelpful directions. I was uncomfortable as a facilitator and in a free-floating ‘student-like’ anxiety. How did the stream freeze so quickly? What was I to do with these students now?

Only hours before, my plan was to be standing in a ‘flowing’ stream, collaboratively interacting with no less than 17 remaining students. I had hoped to inhale the autumn’s senescence, perhaps laughing at students stumbling over slippery rocks with my dad. Unfortunately, *Wisakedjak* chose to challenge my perception by creating, and then limiting what Mezirow (1990, p. 2) referred to as the “*habit of expectation*”. The silent return to the UCN that same morning without this on-site lesson demonstration was oppressive.

As I watched the forest pass through the passenger window driving back to the UCN, I questioned what the students had experienced ... if anything. What I should have been doing was ‘watching’ my father’s mind. Where I was experiencing only ‘*a gap*’, my dad was problem-solving wildly. According to Dennett (1991), the most salient fact about conscious experience is that when a cognizant being is *experiencing*, they are capable of forming reasonable and mature judgments. My judgment, however, had been impaired by the ice and the relative abject failure of my didactic lesson plan for this exercise. I was also utterly out of touch with my dad’s conscious experience. I sat only

inches away from his wisdom. As a facilitator of water and resource conservation for two decades, I was metaphorically sitting in the passenger van and letting the faucet run.

Well, facilitating (and learning) is about challenge, especially when it intersects with adult education and nature beyond the 53<sup>rd</sup> parallel. Woven through this experience was a theme narrated by a riveting homage to my dad's ability to problem-solve and to traverse an affective and cognitive *gap*. In the evening that followed, and because it was impossible to measure stream flow at the intended (but frozen) stream site with this last group of students, my father's excitement and my anxiety were 'combined' to create an *alternate* model stream discharge calculation exercise later that evening. Bearing on his shoulders the welfare of his son, my dad suggested using a rotating variable-speed house fan that would mimic river flow when pointed at the stainless steel velocity meter.

To create benthic relief and portray a reasonable range of fluvial characteristics, the variable speed and directionally-rotating fan circulated 'air' (rather than water) through a current meter supported by an assortment of boxes, plastic pails, a desk, and a roll of packing tape. Variable times and pre-measured distances between the fan and meter were created so mock flow characteristics could be mimicked demonstrating the effects of backwaters, unstable flow features, and the diversity of currents that provide important elements of boreal aquatic habitat. Hours later, our idea was to artificially portray the stream process, salvaging the previous day's lesson expectations and permitting the understanding of complex concepts that had been inaccessible only hours earlier. Wearing toques and chest waders (while in the classroom) convinced the student participants that assessing stream flow was fun, interesting, and essential in knowing how to better manage this precious 'resource'. Pseudo-fluvial processes were observed over a

surprisingly short period of time. Regardless of the previous day's catastrophe, student participants from this last student cohort in my research were fascinated by our model.

Looking back, my dad was in a life phase when contributing was no longer just being a part of something, but a means for the two of us to understand and think together. There is still a vibrancy to these last days in my memory and I thank him for reminding me of something few classroom sessions unfortunately could not - to '*problematize*'. He was able to perceive a 'gestalt' and juggle inter-variable relationships to bridge a presented challenge and an intellectual '*gap*'. His ability to perceive and coach me was likely based on experience, collaborative situated context, time constraint, perhaps age, and most certainly being an external and *caring* companion.

My 'perceived' catastrophic situation of having to facilitate a place-based lesson in light of a bewildering icy challenge required a particular solution and 'intention' (Gibson, 1977) that was then invisible to me. Most important was that a situated expression of a challenge was altered directionally by varying relevant aspects of a learning reality, and relationships for each participant involved (and under a twelve-hour time restraint no less).

Interestingly, during participant testing, PV interviews, and 'data' coding in the weeks that followed, most of the students seemed perfectly sensible in their beliefs about the stream discharge calculation experience even though these 17 students had *never* actually waded in a northern boreal stream. Unlike the previous 80 students that had participated in my 'field' research, this remaining group's assumptions required an epistemological shift - from situativity to (in reality) classroom empiricism - suggesting a

didactic model that required applied ‘thinking on the fly’ was in some ways no different from the in-situ experience, if created fittingly.

In essence, active cognition was not separated from the ‘context’. Instead, problem-solving and ‘knowing’ existed in-situ, but *separated* from ecological and ‘stream-bank’ context. Problematizing for this last remaining student group was perceived in terms of effective performance across sites that were 200 kilometers apart, but now co-determined by ‘19 students’ and two completely different contextual (or experiential) environments. Unbelievably, I could not empirically (nor qualitatively) point to any unusually poor insights or inferences among these remaining 17 students and their unsolicited interview responses - compared to those who previously had experienced the actual in-stream lesson.

As Ellsworth (2005, p. 123) argues, the most powerful learning experiences arise from public pedagogies that emphasize non-cognitive, non-representational processes and events. For Ellsworth, critical learning does not occur in straightforward, rational, or linear ways as I had initially planned that sampling day. She explains new ways of seeing a ‘challenging world’ can be released only through movement into (and within) messy intervals of space and time - between ‘things’ we already know and between ‘beings’ we perceive of ourselves and others. Ellsworth states this ‘in-between’ is the *gap* where personal, social, and cross-cultural transformations occur.

I believe this ‘in-between-ness’ is a metaphor for a vision of being an ‘adult learner’, having an identity, and organizing self-advance. It is what I witnessed observing my father traverse a ‘gap’ – **Gord’s Gap**. In contrast to the rigid intentions of legitimate peripheral participation (LPP), Ellsworth suggests that this in-betweenness (or

‘gap’) – and moving away from cohesion and unity - is actually what constitutes where learning and ‘knowing’ flow freely. From her perspective, and my stream situated challenge, knowledge acquisition seemed to be a ‘relational’ practice that first disrupted and then rebuilt paradigms of those engaged, consisting of “*experiences radically in relation to one’s self, to others, and to the world*” (p. 2).

My initial stream-side assumptions could surely have focused more on embodied, holistic and aesthetic aspects of real student learning, but I now see transformation and critical learning as tentative and ambiguous following that day working alongside my dad and these 17 students. To both my father and Ellsworth (2005), the dimensions of learning that occurred that autumn day, did so in the hard to define ‘in-between’ spaces traversing a *gap* (**Gord’s Gap**) that placed self, students, society, and a son’s PhD education in relationship with one another. In accordance with Lather (2004), it was through this process of getting *lost* that interesting learning started for each of us. These transitional spaces begin where knowing is incomplete and unfinished - and dimensionally in the same ‘place’ where new student enrollees likely begin with me each year. These powerful situations are forces through which we come to have surprising ideas (i.e., ‘eureka!’ or ‘aha’ moments or qualia) and sensations that undo us and set us in motion toward an open future for knowing and behaving.

Following the *experience*, I now believe this kind of constitutive learning is subjective, and is only accessed by an *engaged* and ‘mature’ learner in context. I have no doubt this kind of knowledge is open to creative questioning and further research in the context of remote communities and adult facilitation. Unfortunately, such concepts pose challenges in reaching consensus and learning. As with Nagel’s (1974, p. 437) subjective

“*what it is like*”, James’ (1961) ‘divided self’, Lewis’ (1929) ‘things-in-themselves’, McDowell’s (1998, p. 42) “*raw feel*”, and Sellars’ (1919, p. 414) “*differential correlation*”, ‘*Aha*’ or ‘eureka!’ moments or qualia are not only not knowable, but any attempt at explanation uses other unknowns and consequently requires some level of unconditional acceptance and exploratory examination which must reach out and meet students where they are already positioned.

In defense of my search for ‘extra-rational’ *constructs* or factors using exploratory factor analysis, my results show that UCN student ideas seeped from ‘their’ evaluation of thoughts and unexpected insights, linking them across ‘construct’ *gaps* from awareness through knowledge and skill acquisition to eureka! or quale and personal advocacy in a deliberate manner. Although described as mystical, Miller (2001) noted such epiphanies can be a fast-forward in self-actualization: conscious triggers originating from intense psychological pressure. But the moment such epiphanies happen, candidates know they have gone through a one-way door. Wright (2008) and Sandlin et al. (2011) consider such change an aspect of not only awareness and learning, but a potential ‘*gap negotiation*’ towards overt behavior change. Notably, Figueredo, de Baca, and Woodley (2013) recognize that not a single recipient typically returns to their pre-epiphany ways even decades later; recipient values thus change irrevocably.

Building on the apparent lack of critical literature related to my extra-rational approach to lesson delivery and student evaluation, I offer researched data and an applied conceptual framework for consideration and critique. In agreement with arguments, laws, properties, criticisms and empirical strategies that center on *unsolicited* student realizations, I not only entertained the metaphysical possibilities of eureka! moments, I

addressed them; that 65 of 97 (70%) unsolicited video-recorded responses centered on such moments is undeniable.

In my model's structure, it was assumed that these eureka! are correlated with and perhaps directly related to lesson type, collaborative interaction, awareness, place-based activity, intention-attentional pulses, and changes in behavior. As Jarvis (2005) suggests, self-directed learners often need to make situated and sometimes lateral, emotional and intuitive decisions about the best course of action. Hence, my focus was on how such *epiphanies* might foster critical learning and identity in these UCN students. Notably, of these 65 candidates coded as being recipients of eureka!; 36 provided verbal evidence of an overt behavioral change; that is, approximately 55% of those who mentioned eureka!, also unsolicitedly indicated a behavioral advance related to some form of overt fresh water advocacy. In contrast, only 37% (i.e., 12 of 32) of those who had not experienced eureka! cited behavioral change. Interestingly, Kripke (1971) claimed a consequence of eureka! even existing, leads to the possibility of a student recipient capable of intentional thought extension crossing 'construct' *gaps* to design personal behavior.

In sum, the days in the stream where each student had the opportunity to create subjective ideas from participating in the lesson deliveries and collaborative stream discharge calculation activity, all while being exposed to principles associated with competency of skill and knowledge acquisition – with video camera in-hand - is posited to have 'elevated' these UCN students to a situation-driven consciousness, intentional 'knowledge and/or skills' acquisition, and behavioral advance (i.e., a personal sense of advocacy) related to environmental sustainability and fresh water conservation.

Van den Noortgaete (2015) suggests such holistic processes inclusive of transformative learning involve human emotional and spiritual identity, intrinsic value beyond utility, and some connection to nature and social justice. Similarly, Walter (2011) raises particularly interesting research questions regarding strategic educational delivery using emotionally charged and disorienting dilemmas as catalysts. Although Henderson (1956) discussed this same educational significance more than a half-century ago, the role in active evaluation of qualitative constructs, including behavior and eureka! within adult learning, has been neglected (Kucukaydin & Cranton, 2012).

My dad solidified the significance of such experiences for me, but in undertaking this personal journey, it has recently been my mom who remains with me becoming invaluable providing some of the most stimulating editing sessions of my dissertation's composition. Through her caring parental approach to academic and affective constructs that play in relation to her son's doctoral experiences, ones that at first glance would exceed any of her own formal education, I have also gained yet new understanding as to my own professional values and frustrations in bringing about change in belief and attitude.

## CHAPTER 7: Conclusion and Recommendations

### Concluding Thoughts

A number of concluding thoughts surface from my research examining *non-conventional* lesson delivery at the University College of the North (UCN) in northern Manitoba. **First**, traditional models for local knowledge transmission, skill acquisition, and testing are too simplistic. Educational psychologists have known for years that true learning and long-term retention of knowledge is enhanced by ‘deep processing’ (i.e., higher-order thinking, analysis and synthesis) (Henke & Conkey, 2017). UCN student test score results showed northern adults in many cases fail abjectly when confined to conventional didactic learning and rote assessment as lessons present as disconnected from context when participatory and embedded techniques are ignored. This was especially true for students who were Indigenous, female, and in programs other than Natural Resources Management Technology with respect to this particular exercise. Conventional lesson approaches selected only for greater rote scorings and question type, and did not develop new insights or the ability to perceive what is not immediately obvious while handling complex in-stream problems. Simply, an over-reliance on empirical test scores generated via traditional didactic delivery seems to at once reflect and perpetuate the ongoing adult education crisis in Manitoba’s north.

**Second**, student success also seemed dependent on ‘more’ than motivational disposition. Participant knowledge and skill acquisition clearly improved using non-traditional situated deliveries emphasizing ideas of ‘*praxis for credit*’, qualitative insight, and scholastic test score improvement, affirming education must take the learner to where

they are and build on already existing skills, traditions, and interests. By and large, these results lead to a number of key insights regarding remote adult learners. Generally, UCN students who experienced situated lesson types were more likely to acquire knowledge and demonstrate technical (and traditional or cultural expression-related) skills compared to students who experienced didactic lessons only. Female students in particular responded most positively to non-conventional lesson deliveries, as evidenced by increases in overall (24%), MFP only (30%), and NFU only (15%) test scores. Further, a most interesting finding was that non-conventional lessons seemed to enhance Indigenous student performance. Indigenous MFP test scores increased a full grade level (12%) in non-conventional lesson delivery environments.

I also considered extra-rational perspectives forwarded by student statements offered and incorporated their existence into my assessment. That 65 of 97 (70%) unsolicited video-recorded responses reflected some level of ‘eureka!’ suggests that they are undeniably important with respect to assessment. My results indicated that most in-stream experiences ‘catapulted’ participants from situation-based awareness to overt environmental acts, that quantitative evaluation alone does not recognize traditional or affective propositions as meaningful, and that mixed-assessment of these UCN students was crucial to regional understanding.

On the basis of *unsolicited* student accounts, I argue that non-conventional lesson delivery advanced many personal student behaviors related to this stream-based activity. Participants reported (and demonstrated) increased self-confidence related to their ability to problem-solve, an interconnectedness between cognitive and affective knowing, the

promotion of critical thinking and flexibility in attitude, and some private connection to nature, each other, and social justice.

Of three dominant exploratory factor axes, *environmental engagement* and its variable conglomeration ranked highest in importance. Hence, student success is dominated not by a specific quantitative empirical attribute or academic test scoring (Factor 2), but rather some *construct* reflecting non-conventional lesson delivery and place-based ecological intelligence; this in stark contrast to existing UCN assessment strategies. Notably, an important third *non-conventional lesson delivery* factor ultimately gave rise to a ‘foundational base’ with which to develop a conceptual and four-level learning model. Indeed, these insights have substantial implications for adult learnedness at UCN.

And **third**, building on the documented lack of ‘quantitative’ insight in published PV literature, I offer an operational framework for learning that could be of use in a wide diversity of postsecondary environments. Although the use of PV helped facilitate training and learning, affirm student experiences and insight, and provide a positive mechanism for engaging marginalized UCN students in small groups, my ‘quantitative’ outcomes made it clear PV-related changes *empirically* increased a focused academic performance related to student gender, self-declared culture, and program type.

Female students took advantage of PV technology slightly more so than male counterparts, displaying average test score increases of 5%. In relation to self-declared culture, PV increased Aboriginal Total, MFP (i.e., applied technique and skill) and NFU (i.e., theory and concepts) test scores. No such improvement was exhibited by non-Indigenous students, signifying the difference in performance between the two groups

was reduced by PV. Finally, differences in test scores were greater (8%) between Indigenous males and females than non-Indigenous males and females, indicating that Indigenous males responded particularly strongly to PV. In sum, PV in both conventional and non-conventional lesson delivery was found to be effective in *enabling* the academic performance of Indigenous students, and is thus certainly worthy of further exploration in addressing the widespread barriers that Indigenous students face at UCN and likely other post-secondary institutions considered remote.

Analysis of variance suggested PV and '*program*' interacted significantly ( $p=0.002$ ) to increase total test scores (by 19.4%) for NRMT students, while also increasing Total, MFP, and NFU test score totals empirically between 5-20% for students in each of the six remaining program types. Moreover, PV also interacted with '*lesson*' type resulting in significantly greater academic scores with respect to *long answer* and *calculation* 'question types' when both a situated environment and a video-camera were used. Most significantly ( $p=0.01$ ), participatory video and lesson type combined to increase total test scores (17%) and NFU test scores (26%) for students engaged in situated (S) and situated plus participatory video (SPV) learning.

Contextually, I found that PV was particularly well suited to documenting and understanding this northern reality and its associated characteristics. Overall, a strong PV theme in these 97 UCN student accounts relates directly to the principles of experiential facilitation and instilling a spirit of critical inquiry. The idea of video as a finished creation, did not take precedence once coding had commenced. What did matter was the fact that student participants with little 'formal' education became effective providers in the capturing of their own acquisition of knowledge, skills, and behaviors. Notably, even

didactic lessons used in conjunction with PV increased total test scores by 17%. In sum, my use of participatory video not only advanced qualitative methodologies, but also quantitative approaches to learning perhaps helping other researchers go even further.

In northern context, the UCN is a higher educational institution, which by definition is open and accessible to a wide diversity of students, requiring few formal pre-requisites. Indeed, this approach is deliberate in order to make the institution as accessible as possible to resident northerners, and thus represents a 'starting point' for advanced study. While it is acknowledged that empirical measures of academic performance are important, the extent to which these 'western' tools of student evaluation dominate the NRMT curriculum remains largely unchallenged. Such customs serve well in static settings, but in times of flux (e.g., high student failure, attrition, band sponsorship, and increased trends in program parasitism by undergraduate students from the south), inflexible approaches to educational delivery and assessment can be disastrous to Indigenous students (Haidt & Kesebir, 2010; Martin, 2014). To help address attrition and to best allocate scarce resources, meaningful changes to the core curriculum are essential and overdue.

These new enrollees are also sensitive to many of the the same circumstances as other students across southern Canada (Young & Saxe, 2011), and according to Decety and Sveltova (2012), one of the most rudimentary mechanisms for positive change is a 'bottom-up' (student) inclusion in learning to self-facilitate success, especially as it relates to popular education philosophies and action regarding complexities of the environment. For instance, Bal and Veltkamp (2013) report that student behavior can change substantially over the course of *only one week* for readers of fictional stories,

while Pinker (2011) posits that such changes in behavior can improve the capacity of mature students to identify, understand, and respond to ‘other’ students’ affective and cognitive mental states. The results of my research will help build on these educational and environmental narratives as I will recommend below.

## **Recommendations**

My recommendations regarding northern adult lesson delivery **first** suggest a ‘*student leadership and development design*’ drawing on exercises related to local environs and community. Initial UCN endorsements might consider inclusion of heuristic testing that includes a balanced mix of didactic and situated delivery linked to assess the extent to which new postsecondary adult enrollees are capable of traversing academic and affective gaps, rather than relying solely on rote testing. Northern mature student facilitation must find ways to better assess and affirm the inclusion and performance of incoming students while also reducing local student attrition.

Although it is acknowledged sponsorship and budgets are dependent on securing large numbers of students, northern remote postsecondary institutions purporting to provide effective practice and small class sizes must acknowledge the multiplicity of adult student learning modalities. What should be important is the nature of the transaction and the extent to which lesson praxis is made available. This idea of *engaged* praxis is closely associated with Freire’s (1970) process centering on the need for educational activity to engage the attending learner in a continuous process of study, followed by local action grounded in familiar exploration, reflection on that action, and

followed yet further by investigation and exploration. Fundamentally, this means curricular design and evaluation must be set within the context of the learners' past and present experiences - and their future aspirations.

Results from Chapter 5 in particular, suggest that *motivation* needs to be in place if students are to engage in sufficient depth for an impact to be substantial. Unsolicited student offerings stated they enjoyed and gained something from taking part in the experiential study as they generally had only previously experienced didactic teaching. Being able to relate new learning to more than one context allowed for curiosity, encouragement, reflection, and a strengthened motivation that in turn made participants feel positive about forthcoming academic pursuits. I found the potential of these adult learners was underestimated. Their receptivity to technical learning and conceptual knowledge, together with the opportunity to integrate their prior life and work-related experiences provided a solid foundation for success and advance, if assessed (particularly so for self-declared Indigenous and female participants). Although my study was specific to an in-stream learning context, it is possible my four-level model has relevance for lesson planning and evaluation that could be developed in other fields of education in the future.

Fundamentally, my methodology offers a different kind of perspective on the meaning of remote formal *adult* education. With the advantage of both hindsight and maturity, these northern-living adults *easily* identified the worth of key lesson features and critical skills competency. Although additional lesson delivery methods may well have been possible, on-the-land delivery and the inclusion of PV were high in impact.

**Second**, remote curricular design might rely on *long-term contextual or narrative-based assignments* that also build on situated concepts in local practice. A ‘front-loading’ (or pre-lecture outing) of experiential lesson praxis is supported by the fact that the UCN is geographically located to offer a complete package inclusive of practical ‘classroom’ experience for adults in natural resources and environmental fresh water sustainability awareness. The goal of an experiential ‘narrated instruction’ that links to a ‘story’ presenting anchored and authentic tasks across multiple interdisciplinary domains presents situations that require learners to create and adopt meaningful goals (Barab and Roth, 2006). Interviewing UCN students through their academic development, discovering how they perceived tasks and what made lessons difficult or interesting, would yield tremendous insight into transformative processes of a student-directed design. Technology, PV in particular, encouraged increased attentiveness to a ‘personal surveillance and narrative building’ and also to a ‘cultural-relay’ of Indigenous story-making and telling, thereby integrating stronger cross-cultural foundations upon which to consider and address regional curricular and lesson style demands.

Both Chapters 4 and 5 show this impact can come in many forms. Pre-activity interviews, for instance, could organize prospective student expectations for a particular course by reflecting on areas where change might happen, areas in which new enrollees feel learning ‘needs’ might take place, and the kind of skills and behaviors students would prefer to acquire. One means of achieving this might be to analyze lessons before and after they were taken. For example, why does a certain lesson approach seem to ‘work’ or not work regarding engagement, enthusiasm, understanding, and displayed behaviors.

**Third**, the UCN might contemplate using provincially existing *critical incident methodologies* and *outcomes research* to generate regionally-relevant academic and extra-rational behaviors, helping students to engage productively in larger interrelated provincial systems (i.e., fresh water availability, wolf depredation, moose hunting bans). It may well be necessary to design a *value-based framework for lessons* as my research in Chapter 5 indicates development is inextricably linked to ‘values’. In the same way, Heimlich and Horr (2010) focused on how national parks foster critical environmental awareness among adult visitors. Packer and Ballantyne (2010, p. 31) noticed park visitor interactions with animals sparked emotional responses “*developing an appreciation for the uniqueness of each animal and the ways different parts of an ecosystem are linked together*” when visitors identified with wildlife tragedy. And, Kidd and Castano (2013), and Parrish (2010) offer that zoos and museums are heightening emotions among visitors through affective activities, which are perceived as instrumental in fostering social change. Remote educational institutions are place-based locales where these complicated conversations should occur, where students should identify themselves, where communities must strategically design education and research, and where complexity and controversy must be embraced (Lucia, 2007).

Within such value-based educational ideologies, assessing motivational dispositions and advocacy-generated behavior is demanding but new adults are unlikely to display these traits unless they are presented with such an *opportunity*. The results of my exploratory factor analyses indicate that educational success is not simply academic (i.e., Factor 2), but that it includes major affective and personal behavioural components (i.e., Factor 1). Subsequently, it is of value to identify the kinds of activity that students

care about and then to examine ‘academic’ and extra-rational behavior displayed when completing those activities.

As an ensuing **fourth** recommendation, I believe it particularly necessary as a northern educational researcher and a provincial tax-paying citizen ‘of place’, that postsecondary institutes consider the inclusion of educational psychologists and perhaps *educational accountants* to document ‘mimetic’ investment in educational research like those possibilities mentioned above particularly with respect to fresh water sustainability.

As a **fifth** recommendation, my video-based approach to lesson planning and delivery created an essential participatory *opportunity* for students to engage in this work. My findings broadly line up with Snowden’s (1983) Fogo Project philosophy, except that my modified PV technique promoted dialogue that leaves a ‘thalweg’ of interconnection for northern Manitoba research exchange. My advancement of PV as a formal educational technique addresses the query posed to me personally by Nick Lunch in 2008 concerning its evolution: to formalize its obvious potential as a “*monitoring and evaluating tool*”. My methodological approach shows that both quantitative AND qualitative data can play a crucial role in using such mediating tools for ‘academic’ advance, which hereto have only been assessed using qualitative findings, and to do so in a way that was still inclusive and student-directed.

As a **sixth** recommendation, one way of helping to manage student expectations and stimulate academic performance may be to include a modular DVD or course website allowing prospective students to select courses (skills and knowledge) tailored to their certificate, diploma, and degree requirements. This may allow for the effective use of both field-based ‘and’ didactic opportunities in practical learning. Perhaps completing

meaningful exercises in the student's home, much less the classroom, with a rotating fan should no longer be regarded as bizarre. In this conventional sense, fieldwork is the study of learners 'in their' natural environment and therefore of particular importance to ecological sciences (Ryan, 2017; McDonald, 2017). And, because field experience 'by camera' may be planned, video can be linked to particular learning objectives (Edge, 2017). Large numbers of students could theoretically be 'transported' to first-class field localities that The Pas offers. A PV-created DVD supplied to prospective students could help them choose their academic programs strategically. Short modules of varying degrees could also provide students with a flavor and pace of genuine learning expectations and research activities. For example, how does the population of small mammals in a pristine boreal control and altered treatment site differ from one another?

Customized DVDs could present ecological questions that relate to an environment that is complex and often relatively inaccessible (to students living with disabilities for example). Powerful interviews could reinforce important teaching points and help with the avoidance of potentially hostile environments. Perhaps equal significance in appreciation can be gained by 'eyes-dropping' from a helicopter (or drone) which bring together large scale and three-dimensional views with a clarity not usually evident to the unaided eye. Conversely, skills that do require a field setting with sophisticated instruments, manipulative skills and team work may not be the areas which provide a video or didactic focus for UCN.

Combinations of strategically incorporated PV and DVD technology may eventually allow for learning experiences to be extended, strategically-enabling change in both the delivery and style of northern-based ecology lessons. The UCN could be poised

to take full advantage of such ecological and educational combinations presented by technological and non-conventional delivery options. Flexible curriculum would enable students to choose a concentration and allow them to enter degree programs with different career goals. Edge (2017) found that online programs provided educational approaches to a different demographic than on-campus programs, many of these students being working parents who cannot afford to quit their day jobs and uproot their families to attend university.

As a **seventh** recommendation, my examination of lesson delivery and PV proved useful as this mediating technology ‘can be’ considered high in impact and cost-effective as it was used. Thus, PV certainly has a future function in the larger processes of educational research and training. I also found the value and impact of the video was not determined by its technical quality; it simply did not matter once coding had commenced. What did matter was that mature enrollees with little ‘formal’ education were effective providers in capturing dull institutional processes. Using video and non-conventional participatory mixtures of lesson delivery and evaluative assessments (as a process rather than a product) appears to be a sound strategy for northern institutions looking to sense change in student ‘gesturing’ - and then to adapt accordingly (Oliveira et al., 2012).

By authentically inviting these students to *revisit* essential questioning of a local activity using PV and in validating ‘their’ extra-rational experiences, both students and myself as a facilitator, developed an improved ability to share insight. These results, therefore, may be seen as justification for re-focusing the use of situated and PV techniques in skills training and tangentially, for promoting extra-rational affects to determine if skills and overt behaviors are personally transformed and retained.

It follows that administrators at UCN might ask which aspects of curriculum design and delivery result in greater student success and productivity, as each have real options for northern adult student experiences and insights. My discussion of these findings raises relevant questions about facilitation in remote regions while fostering opportunities for critical transformational learning. Simply put, there is ‘*more*’ for students in situated northern learning; it is easily accessible, it is relatively inexpensive, it enables students to succeed, and it is responsible for personal change: the kind of change that is significant with respect to fresh water sustainability. In the end, ‘context’ allowed me to differentiate purpose and motivate interest providing a hierarchical four-level model that is as relevant to both traditional Indigenous and western cultural expression as it is transparent in expression. In short, my northern research has a great deal to offer.

In sum, insights from my study represent a comparison of unconventional and didactic learning experienced by students in northern Manitoba. Tasks of uni-dimensional delivery, such as those traditionally employed in didactic presentation, must be supplemented by local tasks and examined by collaborative cross-cultural participation if the desire is to gain deeper insight into holistic learning in remote environs. The data and conceptual model that arise from this research and my 20 years of teaching in the North speak to changes in connection to fresh water sustainability, ecological effectivities, academic advance, and ‘personal awareness’. This distinction in adult learning involves experiencing deep structural shifts in the basic premises of student thoughts and feelings. O’Sullivan, Morell, and O’Connor (2002) insist crucial learning takes place non-verbally. It is a shift in academic consciousness that permanently alters ‘being’ in a *new* learning environment according to O’Sullivan et al. (2002). As

Ellsworth (2005) suggested, and my father demonstrated, the real power of adult learning lies in this indeterminacy, and that well-structured education and learning can be the most powerful catalysts for transformational development when it does not dictate a final ‘correct’ answer. To end as I began, I once again reiterate the Senegalese poet Baba Dioum (1968)...

*“In the end, we conserve only what we love. We will love only what we understand. We will understand only what we are taught”.*

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